

An aerial photograph showing a wide river delta with several islands and channels. The landscape is a mix of dense green forest and agricultural fields. The text is overlaid on the upper portion of the image.

*A Strategic Vision for
Bird Conservation on the
Leopold–Pine Island Important Bird Area*

A STRATEGIC VISION FOR BIRD CONSERVATION ON THE LEOPOLD-PINE ISLAND IMPORTANT BIRD AREA

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PURPOSE

The purpose of this report is to summarize and interpret the bird survey that was conducted on behalf of the participating landowners for the establishment of the Leopold-Pine Island Important Bird Area (IBA). With this survey, we have established a baseline to which subsequent surveys can be compared. This alone is exciting; however, interpretation with the hope of building a shared perspective among the participating landowners was the higher goal. During one of the very first partner meetings, ‘perspective’ was a word that surfaced many times. Partners wondered how our IBA could contribute to the North American, Midwestern, and statewide bird conservation plans, how our IBA could complement other IBAs in Wisconsin or the region, how the partnering lands were ecologically similar and different, which of our current management efforts were already helping birds, and how we could see our lands as a whole system using birds as an indicator. Some of this perspective is in this report; other will be revealed over time as we deepen our relationships to each other and the land.

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The cranes stand, as it were, upon the sodden pages of their own history. These peats are the compressed remains of the mosses that clogged the pools, of the tamaracks that spread over the moss, of the cranes that bugled over the tamaracks since the retreat of the ice sheet. An endless caravan of generations has built of its own bones this bridge into the future, this habitat where the oncoming host again may live and breed and die.

Aldo Leopold, Marshland Elegy (1937)

ACRONYMS

BRWPA – Baraboo River Waterfowl Production Area

GMC – Grassland Management Concern

IBA – Important Bird Areas

LBRFF – Lower Baraboo River Floodplain Forest

LMR – Leopold Memorial Reserve

NRCS – Natural Resources Conservation Service

NHI – Natural Heritage Inventory

PIF – Partners in Flight

PIWA – Pine Island Wildlife Area

PT – Phill and Joan Pines Tract or Property

SGCN – Species of Greatest Conservation Need

USFWS – United States Fish and Wildlife Service

VWT – Van Wormer Tract or Property

WBBA – Wisconsin Breeding Bird Atlas

WDNR – Wisconsin Department of Natural Resources

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ABSTRACT

This report proposes a conservation vision for the 16,000-acre Leopold-Pine Island Important Bird Area (IBA) based on results of bird survey efforts conducted throughout the IBA between 2001 and 2006. Our vision strives to be strategic, emphasizing what this IBA can best contribute to bird conservation. We describe the process of using the bird survey data to situate the IBA in a regional and statewide context, identify Priority Species, explore bird-habitat relationships, and determine relative opportunity of species and habitats. We then present recommendations for each property within the IBA that highlight significant features and special opportunities, integrate the needs of Priority Species and habitats, and suggest what each property can contribute to the overall IBA vision while respecting individual property goals. The overall vision emphasizes a mosaic of open and semi-open communities especially native and surrogate grasslands, shrub communities, marshes, savannas and barrens, and limited areas of floodplain forest.

INTRODUCTION

THE IMPORTANT BIRD AREAS PROGRAM

The Important Bird Areas (IBA) Program is an international effort to identify, protect, and manage sites that contain critical habitats for birds. Initiated in Europe by BirdLife International in 1981, the IBA Program now exists in over 160 countries and 48 U.S. states. IBAs are identified using straightforward, science-based criteria. Identification of a site as an IBA requires supporting documentation, particularly data on bird species diversity and abundance, and review by a panel of bird and habitat experts. This process provides a scientifically defensible way to prioritize conservation actions and allocate limited resources to ensure maximum benefit for birds. Once sites are identified as IBAs, collaborative conservation strategies can be developed voluntarily to maintain and manage the sites for the species they support. In Wisconsin, the IBA Program is being implemented as part of the Wisconsin Bird Conservation Initiative (WBCI), a statewide coalition of over 160 organizations working collaboratively to advance bird conservation. Eighty-six IBAs have been identified in Wisconsin (Steele 2007) and the program is transitioning into the conservation-management phase.

THE LEOPOLD-PINE ISLAND IBA

The Leopold-Pine Island IBA is located along the Wisconsin River in south central Wisconsin, in a mosaic of marsh, grassland, barrens, floodplain and upland hardwood forest, and agricultural land in private, state, federal, and non-governmental organization ownership. The development of the IBA into its current form began in 2004 when several partners, primarily through the Aldo Leopold Foundation, proposed expanding the boundaries of an existing IBA nomination for the Pine Island State Wildlife Area to encompass several

adjacent public and private parcels containing a variety of high quality natural communities. A lack of recent bird data for these areas, necessary to evaluate them against IBA criteria, led to the development of this bird survey which inventoried breeding and migrating birds across the entire proposed IBA. These data supported the proposed boundary expansions and the area was approved as a single IBA in December 2005. The bird survey also established a project boundary and a baseline for future monitoring, and identified bird species and associated plant-animal communities for which management might be targeted based on the area's natural characteristics, ownerships, and regional context.

The process of IBA nomination, data collection, and formal recognition served as the catalyst for a diverse group of stakeholders to come together to discuss voluntary collaborations for managing the IBA as a landscape while respecting individual property goals. The bird survey results provided an excellent foundation for identifying potential stewardship activities, a foundation few other IBAs enjoy. This process can serve as a model for inventory, evaluation, and goal-setting on other IBAs and important resource management areas with single or multiple ownerships.

IBA recognition does not confer any legal status or carry any regulatory requirements. The inclusion of land within an IBA boundary is entirely voluntary on the part of the landowner or land manager. The IBA Program relies on voluntary collaboration to meet its conservation goals, and considers such grassroots participation to be a strength. All landowners are invited to participate in the stewardship of this Important Bird Area.

STUDY AREA

SITE DESCRIPTION

The Leopold-Pine Island IBA is located in Sauk and Columbia counties, straddling the Wisconsin River between Wisconsin Dells and Portage (Figure 1). The IBA encompasses 16,000 acres and includes six main areas. This broad, sandy floodplain originated from the outflow of Glacial Lake Wisconsin when it broke through its morainal dam at present-day Wisconsin Dells to flow around the east end of the Baraboo Hills. It is characterized by islands and shores in various stages of succession from open sand to barrens and mature floodplain forest. Farther from the river are emergent marshes and sedge meadows, lowland and upland forests, prairies, savannas, oldfields, and agricultural fields.

The six main areas making up the IBA are as follows:

PHILL AND JOAN PINES TRACT (PT)

This is the largest private parcel in the IBA, and the only tract on the north side of the Wisconsin River. It is owned by Phill and Joan Pines, and encompasses 2,078 acres of Wisconsin River islands, floodplain forest, wetlands, restored prairies, upland forests, and abandoned and active agricultural fields. This area also includes a few small inholdings belonging to other landowners.

LEOPOLD MEMORIAL RESERVE (LMR)

This is a 1,743-acre landowner cooperative owned by the nonprofit Aldo Leopold Foundation, Sand County Foundation, Terbilcox Family, Coleman Family, and Van Hoosen Family. Beginning with Aldo Leopold's first purchase of land in 1935, these lands have been managed for ecological and aesthetic value. The Reserve consists of Wisconsin River islands, barrens, floodplain forest, sedge meadow, emergent and submergent wetland, prairie, oak savanna, hardwood forest, and agricultural lands. It also includes the shack and land that inspired Leopold's *A Sand County Almanac* as well as the Leopold Legacy Center, an educational and interpretive facility that opened in 2007.

VAN WORMER TRACT (VWT)

Owned by Gary and Judy Van Wormer, this 323 acre tract is surrounded by the Pine Island Wildlife Area. It consists of floodplain forest, a conifer plantation, sedge meadow and emergent marsh.

PINE ISLAND WILDLIFE AREA (PIWA)

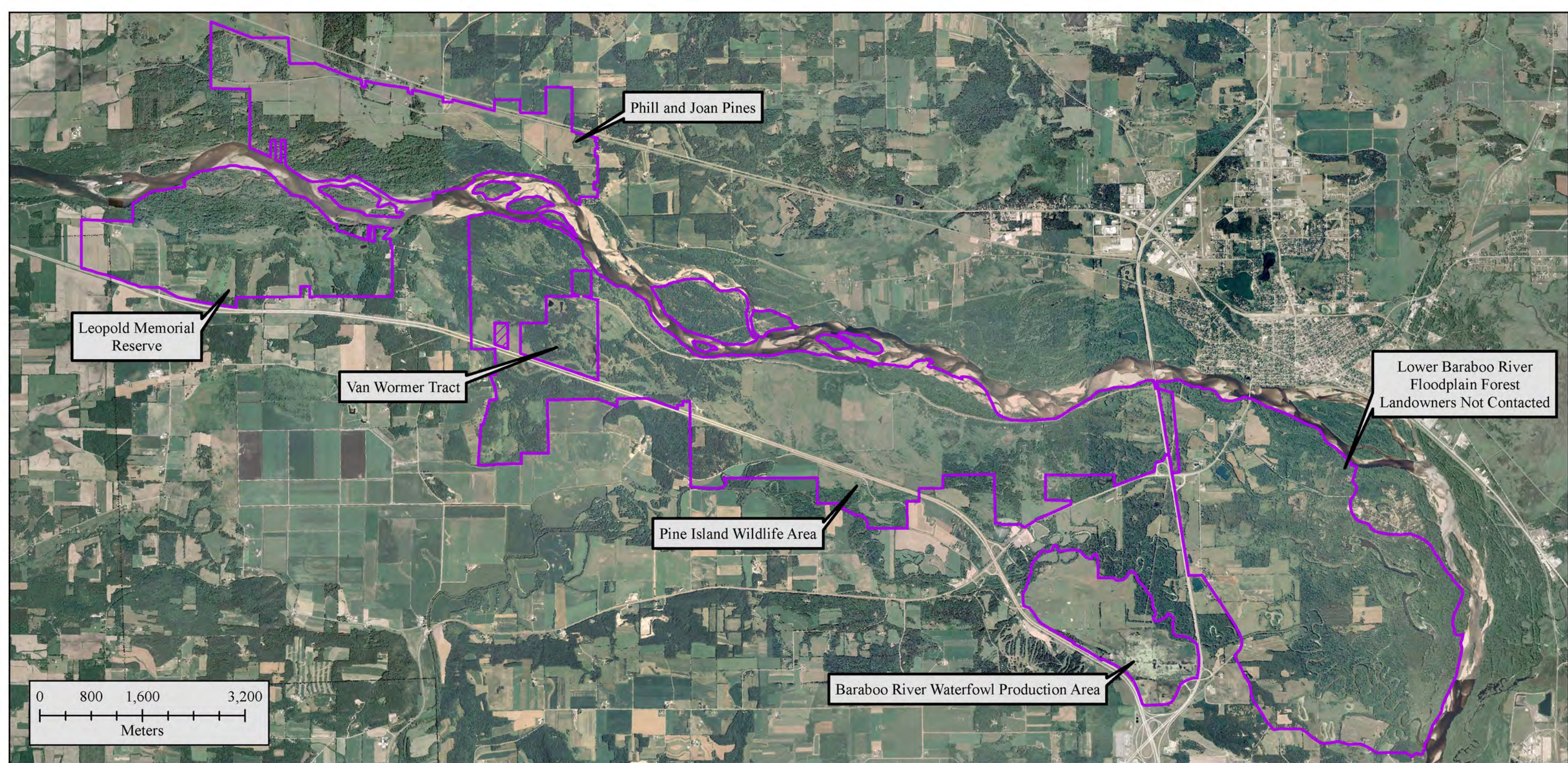
PIWA is owned by the Wisconsin Department of Natural Resources (WDNR). It is the largest tract in the IBA at 5,706 acres and is managed for hunting, dog training and trialing, and other outdoor recreation. It includes Wisconsin River islands, restored savanna and barrens, floodplain forest, emergent marsh, sedge meadow, shrub swamp, restored prairie, oldfield, upland forest and some cropland.

BARABOO RIVER WATERFOWL PRODUCTION AREA (BRWPA)

This tract is owned by the U.S. Fish & Wildlife Service (USFWS) and Natural Resource Conservation Service (NRCS). The site consists of 847 acres of former muck farm whose ditches have been filled to create a large impoundment where shallow emergent marsh is now developing. Surrounding fields have been planted to native grassland. At its boundary a fringe of floodplain forest lines the banks of the Baraboo River. The area primarily is managed for waterfowl and other wetland birds.

LOWER BARABOO RIVER FLOODPLAIN FOREST (LBRFF)

This loosely defined area encompasses the 22-acre Baraboo River Floodplain Forest State Natural Area owned by the USFWS, at least one state-owned island in the Wisconsin River, and approximately 5,000 acres of private land in 1-300 acre parcels. It extends about 3 miles up the Baraboo from its confluence with the Wisconsin River, and contains floodplain forest and active and former agricultural fields. It was worthy of definition and inclusion into the IBA because of the current quality and continuity of the habitat. The vast majority of landowners within this area have not been contacted about the IBA. This represents an opportunity for outreach to these many private landowners.



Phill and Joan Pines

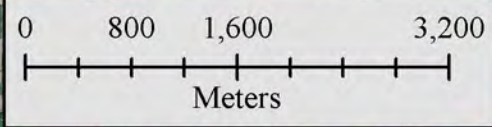
Leopold Memorial Reserve

Van Wormer Tract

Pine Island Wildlife Area

Baraboo River Waterfowl Production Area

Lower Baraboo River Floodplain Forest
Landowners Not Contacted



Legend

IBA Boundary

Owner

Private Inhold

Figure 1. Leopold-Pine Island Important Bird Area, Wisconsin, with ownership or affiliation identified.

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ECOLOGICAL CONTEXT

This IBA is located in the Central Sand Hills Ecological Landscape (WDNR 1999); it borders the Central Sand Plains and Western Coulee and Ridges Landscapes. Four of the six major areas within the IBA—PT, LMR, VWT, and PIWA—display topography and vegetation typical of the Central Sand Hills: a mosaic of gently rolling glacial moraines and pitted outwash supporting a variety of plant communities growing on sandy, well-drained or peaty soils.

The LBRFF grows on a delta of richer, finer sediments originating from the unglaciated Western Coulee and Ridges. The LBRFF is more similar to the floodplain forests found along the Lower Wisconsin River, with larger trees, fewer oaks and white pines, and more pools and sloughs than the floodplain forest farther upstream within the IBA. The BRWPA is transitional between this and the other four areas. The transitional nature of the IBA, at the juncture of these three ecological landscapes, is reflected in the variety of natural communities and vegetation structures found throughout the IBA and in the diversity and abundance of the bird species they support.

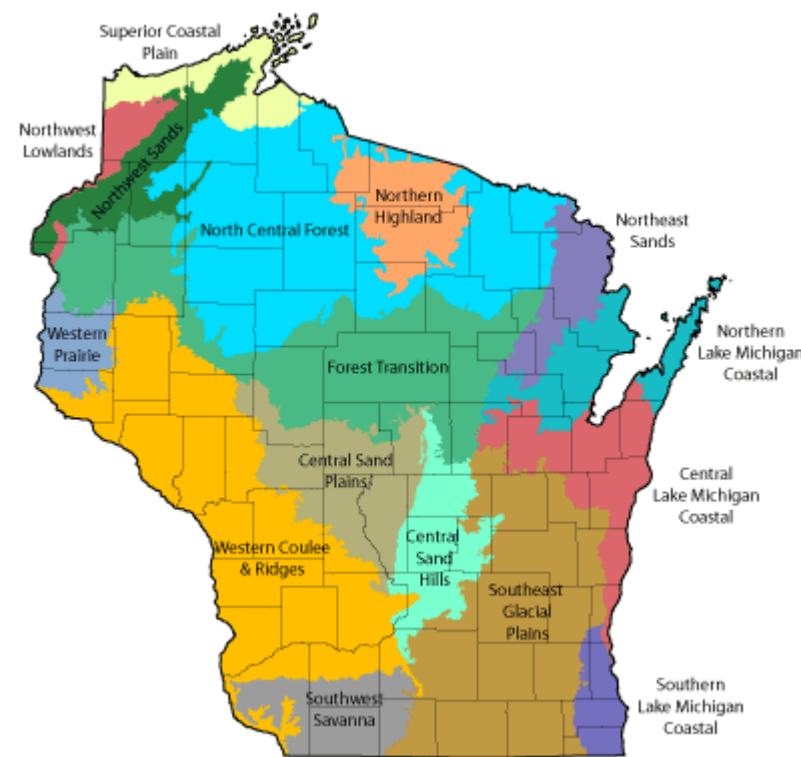


Figure 2. Ecological Landscapes of Wisconsin (WDNR 1999). Leopold-Pine Island IBA is at intersection of Central Sand Plains, Central Sand Hills and Western Coulees and Ridges.

ECOLOGICAL CLASSIFICATION SCHEME

In the process of exploring and articulating a shared vision for the IBA, we recognized the need for a common language to describe the ecological systems that comprise our lands, individually and collectively, in order for land owners and land managers to communicate effectively about management. Lacking a comprehensive survey of plant communities across the entire IBA, we developed an ecological classification scheme based on notes gathered during the bird survey, land manager experience and knowledge, and existing land classification systems maintained by WDNR and the U.S. Forest Service. The classification system is nested to allow for greater specificity at lower tiers, and incorporates structural elements appropriate for describing bird habitats. The IBA partnership may wish to conduct a comprehensive and more detailed spatial delineation of the plant communities on each property to further refine this classification scheme. The LMR has three such surveys—one for the pre-settlement vegetation, one from the 1930s, and one from 1980s—and these have proved immensely valuable for land management planning.

Our classification scheme begins at the Landscape level, characterizing the larger landscape within which the IBA is embedded. Unifying elements of the Landscape level include geomorphology (physical landforms and the processes that shape them), surface geology, climate, local weather, and basic soil features. Our Landscape we called the Glaciated Wisconsin River Landscape, reflecting the importance of glaciation and meltwater flow in its origins. Glacial ice covered the entire landscape 11,000-14,000 years ago; as the glacier retreated, the newly formed Wisconsin River cut its path and deposited thick beds of sand that now underlie much of the area.

The tier below Landscape is the Ecosystem level. Two major ecosystems define the entire IBA: an Upland Ecosystem and a Lowland Ecosystem, sharing commonalities of temperate vegetation, approximate elevation, and influences of water processes. The Upland Ecosystem is outside the floodplain, with precipitation as the only source of water. The Lowland Ecosystem is in the floodplain and some low areas outside of it, with influences from groundwater and overland flooding.

The tier below the Ecosystem level is Plant Community. Plant communities are distinct assemblages of plants, usually having characteristic animals associated with them. There are many different types of plant communities represented within each of the two ecosystems. Examples of plant communities within the Upland Ecosystem are Sand Prairie, Oak Opening, and Southern Oak Forest; examples of Lowland Ecosystem communities include Emergent Marsh, Shrub Carr, and Floodplain Forest. These plant communities form the basic units of land management and characterize bird habitat generally.

The final tier, below the Plant Community, is Habitat Association. Associations are characterized by dominant species (e.g., Aspen, Black Oak and Swamp White Oak associations within Floodplain Forest),

structural features (e.g., recently cutover forest, hedgerows) or some combination of both. Shrubby Oldfield is distinguished from Native Lowland Shrub by dominance of exotic groundlayer species and from Floodplain Oldfield by >25% cover of woody vegetation. Typically, a bird species breeds in a range of several habitat associations, but some generalists breed in many and others in as few as one or two. These habitat associations are known to reflect habitat preferences of individual species and communities of birds, and correspond to those of the nested habitat scheme of the Wisconsin Breeding Bird Atlas (Cutright et al. 2006), as originally developed and subsequently modified by Mossman. The plant communities, habitat associations, and their codes, are described in Appendix A.

METHODS

DATA COLLECTION AND ANALYSIS

TRANSECT POINT-COUNT SURVEY

PT, LMR, VWT, PIWA, and BRWPA were surveyed along 25 east-west transects (total 108 km, 67 mi) spaced at 400 m (440 yd) intervals, and 234 five-min point-count stations at 400 m intervals along the transects (Figure 2). Some transects and point-counts on the Wisconsin River were accessed by canoe. The grid of transects was placed randomly on the study area, and the regularly spaced set of stations was placed randomly on each transect. No stations were placed within 150 m of property boundaries, or in Wisconsin River depths >0.1 m. All stations and transects were guided by, and geo-referenced with, a hand-held Garmin Map76 GPS unit and the locations were described in narrative. Surveys were conducted by Mossman except for 5 stations sampled by Robert Costanza. PT, LMR, PIWA and VWT were surveyed on 20 mornings during 2 June – 6 July 2005. BRWPA was surveyed 3 times, on 4 and 6 June 2001, 6 and 9 June 2003, and 14 and 25 June 2006. Data for this report are from 2006.

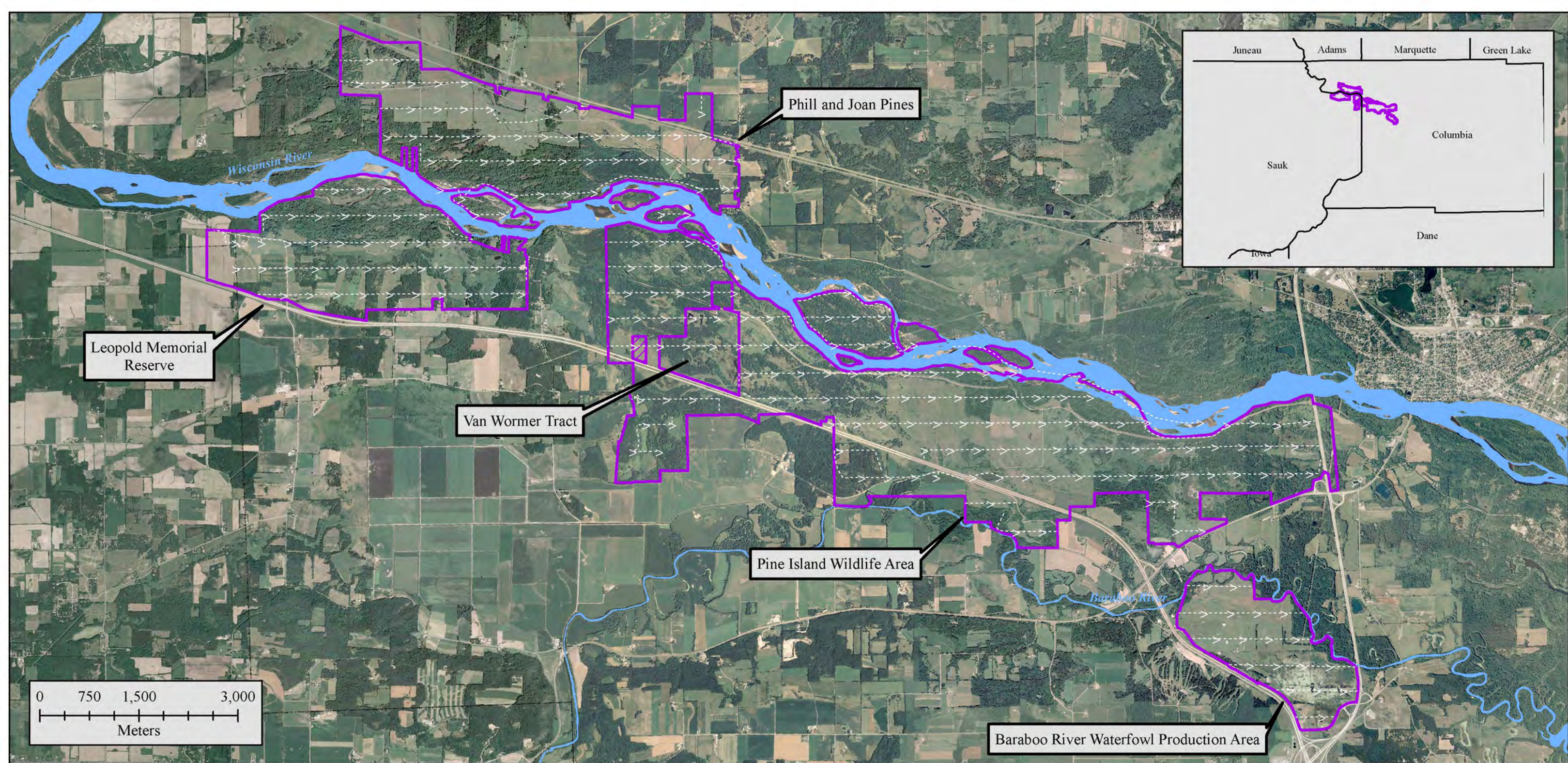


Figure 3. Transects and point-count stations sampled during 2005-2006 bird survey of the Leopold-Pine Island Important Bird Area

Mike Mossman, Wisconsin DNR, Bureau of Integrated Science Services
 Steve Swenson, Aldo Leopold Foundation
 Yoyi Steele, Wisconsin Bird Conservation Initiative, Important Bird Areas Program

- > Point-count Stations
- Transects
- ▭ IBA Boundary
- ▨ Private Inholding
- ▭ River



Counts were conducted between 0525-1042h (with 87% completed before 0930h), when wind was <19 km/h (12 mi/h). Transects nearest interstate highways were usually surveyed on Sundays to minimize traffic noise. Along each transect, Mossman counted all birds seen or heard within 200 m, and at each station he counted all birds seen or heard within 100 m and 200 m radii. Individual birds noted on both a walk and point-count period were tallied only on the latter. For every individual bird recorded, an attempt was made to determine the habitat in which it occurred at first observation, and this was recorded independently of the transect and point-count tallies, in separate columns of the field data sheet. These habitats were assigned to categories of the nested habitat scheme used for the WBBA (Cutright et al. 2006), as augmented by Mossman (Appendix A). Point-count stations with only one WBBA habitat occurring within 100 m were termed “single-habitat stations”, and these were used to estimate an index to abundance for species in these habitats.

VOLUNTEER SURVEY

In 2005, Swenson, Mossman, and ALF interns Alanna Koshollek and Craig Maier elicited help from 8 primary volunteers from within a 110 km radius of the study area. These volunteers had many years of experience as bird watchers, with several having participated in other organized bird surveys or the WBBA. After an initial orientation meeting, volunteers selected one of the properties (PT, LMR, PIWA) to cover, and beginning on 30 April they (with friends and family members) surveyed these areas as their time allowed, collecting information on bird presence, general abundance, habitats of occurrence, and evidence of breeding—similar to the methods recommended for the WBBA. Volunteer surveys were not conducted on BRWPA and LBRFF. Over 1,500 observational records were submitted for 2005. Observations were referenced to standardized maps.

LOWER BARABOO RIVER FLOODPLAIN FOREST SURVEY

Mossman conducted formal surveys of breeding birds by canoe on 6 June 1986 and 2 June 2001 (also a walk on the State Natural Area); and kept bird notes during other visits by canoe or boat on 19 April 1980, 4 May 1985, 14 July 1986 and 2 May 2001. Surveys ran from Hwy 33 or Hwy U to the confluence with the Wisconsin River. Transect and point-counts are planned for this area in the future.

DATA ANALYSIS

The bird survey data were entered and summarized numerically and spatially using Excel 2007, version 12 (Microsoft) and ArcGIS ArcInfo, version 9.2 (ESRI).

ESTABLISHING BIRD CONSERVATION PRIORITIES ON THE LEOPOLD-PINE ISLAND IBA

The process of setting bird species priorities for the Leopold-Pine Island IBA has followed a step-down approach in which the IBA was considered within the context of continental, regional, and state bird conservation efforts. Planning documents setting out conservation priorities for the four major bird groups—landbirds, shorebirds, waterbirds, and waterfowl—have been completed at the continental (North America) scale. Additional planning efforts have “stepped down” these priorities to the regional (Upper Midwest) scale. Various Wisconsin-specific efforts (Wisconsin Wildlife Action Plan, Wisconsin Bird Conservation Initiative All-bird Plan, Wisconsin IBA Program) have then stepped down regional priorities to the state level and to different regions within the state (e.g., Ecological Landscapes). The Leopold-Pine Island bird survey data have been viewed within the context of these nested priorities and used to determine how this IBA can best contribute to state and regional conservation objectives, and to explore what special opportunities this IBA might offer compared to other IBAs in Wisconsin. This strategic approach allows effort and resources to be allocated where they will have the greatest conservation benefit.

In this vein, several state and regional schemes, described below, were used to identify Priority Species. Species designated under these various schemes are considered of conservation priority due to declining populations in the state or elsewhere in their range, declining or vulnerable habitats, specialized habitat requirements, or some combination of these. There is considerable overlap in the species listed under these different schemes, although each list contains species not found in others; a species’ appearance on more than one list tends to confirm its need for conservation attention.

SPECIES OF GREATEST CONSERVATION NEED (SGCN)

SGCN indicates bird species identified as being most in need of conservation attention in the Wisconsin Wildlife Action Plan (WDNR 2005). This plan identifies SGCN in almost all plant and animal taxa and presents priority conservation actions to protect them and their habitats. This plan will be a major driver of species and habitat conservation activity in the state and is tied to State Wildlife Grants, a program providing federal funds to prevent species and habitats from becoming threatened or endangered.

NATURAL HERITAGE INVENTORY (NHI)

NHI indicates birds that are on the Wisconsin NHI program’s Working List (WDNR 2007). The NHI program locates and documents occurrences of rare species and natural communities by conducting inventories around the state and managing a database. NHI data are used for a variety of purposes including conservation planning, land management, and environmental review. Species on the NHI Working List are known or suspected to be rare in Wisconsin and include those legally designated as Threatened or Endangered as well as those in an advisory Special Concern category.

IMPORTANT BIRD AREAS (IBA)

IBA indicates birds that are listed in the first two of the five criteria categories used to identify IBAs in Wisconsin. Category WI-1 covers breeding or non-breeding populations of state Endangered and Threatened species; category WI-2 covers breeding populations of species considered to be of high conservation priority in Wisconsin (Steele 2007). The WI-2 list was designed to reflect both state and regional bird conservation priorities. It includes species from the NHI Working List as well as species (identified in continental and regional planning efforts; see PIF, below) for which Wisconsin and/or the Upper Midwest contain a significant proportion of their breeding populations.

PARTNERS IN FLIGHT (PIF)

PIF indicates birds identified as priority species in the PIF bird conservation plan for the Upper Great Lakes Plain (Knutson et al. 2001), a region that encompasses roughly the southern two-thirds of Wisconsin, including the Leopold-Pine Island IBA (Figure 4). PIF is an international partnership of government agencies, conservation groups, academic institutions, private businesses, and citizens working to keep common birds common and address declines in the populations of landbirds by directing resources towards their conservation throughout North America and the Neotropics (Ruth 2006). PIF has spearheaded the development of a continental landbird conservation plan (Rich et al. 2004) as well as a series of regional plans like the one mentioned above that “step down” continental priorities; these plans are the cornerstone of PIF’s conservation strategy.

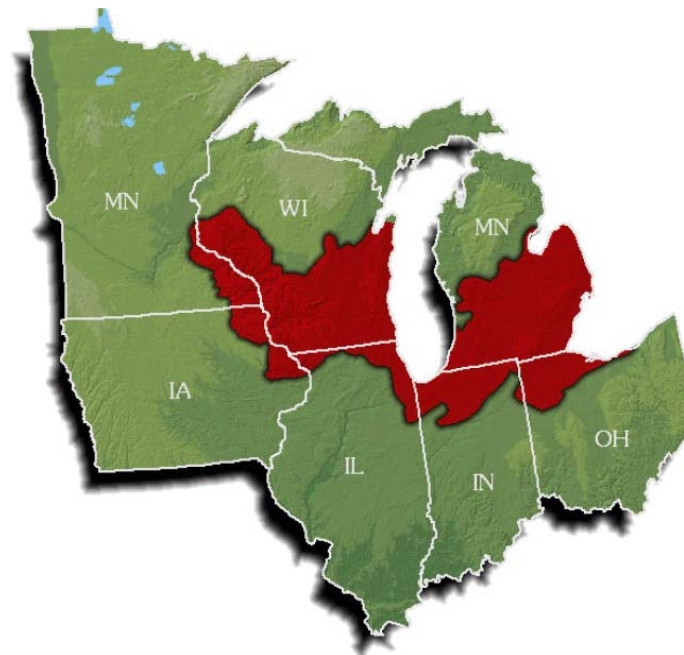


Figure 4. Partners in Flight Upper Great Lakes Plain (from Knutson et al. 2001), variously known as Physiographic Area (PA) 16 or Bird Conservation Region (BCR) 23.

GRASSLAND MANAGEMENT CONCERN (GMC)

This indicates grassland birds identified by Sample and Mossman (1997) as being of management concern in Wisconsin. This definitive work identifies priority grassland bird species and habitats across the state, as well as priority landscapes and sites at which to manage for them; discusses bird-habitat relationships and management issues; and provides management recommendations and specific practices to benefit grassland birds.

CONSENSUS OF PRIORITY SCHEMES FOR LEOPOLD-PINE ISLAND IBA

Birds occurring on the Leopold-Pine Island IBA that are designated under any of these schemes constituted an initial list of Candidate Priority Species. The bird survey data and local, state, and regional population estimates (Steele 2007; RMBO 2007; Soulliere et al. 2007a, b) were then used to identify species having low opportunity to inform land management at this IBA, or having much higher opportunities elsewhere in the state. This yielded a shorter list of Candidate Priority Species, appropriate to this region of Wisconsin and reflective of the habitats present on this IBA, both current and potential. The bird survey data, habitat information, and expert knowledge were used to examine the relative opportunity of these species in more detail, refining our Candidate Priority Species list to a shorter list of Priority Species capable of informing and directing management decision-making.

RESULTS

All results refer to 2005 data from PT, LMR, PIWA and VWT, and 2006 data from BRWPA (Tables 1-2, 4-19). Data for the LBRFF, from 1986 and 2001, are presented separately (Table 3).

155 bird species were recorded by all methods, in all seasons (Table 1). Of those, 116 species are considered breeding on the IBA. 133 species were recorded during migration periods (prior to May 27 and after July 15), many of which also were present during the breeding season. 39 species were detected only as migrants or non-breeders. The number of species migrating through the IBA certainly is higher; however, the majority of survey effort, by design, was during the breeding season (May 28 – July 15). 89 species were recorded as breeders on PT, 90 on LMR, 46 on VWT, 94 on PIWA, and 66 on BRWPA.

119 species were recorded by all methods during the breeding season (May 28 – July 15) (Table 2). Three of these are considered non-breeders: Ring-billed Gull and Herring Gull occur in non-breeding summer populations along much of the Wisconsin River in the southern part of the state; and an individual Acadian Flycatcher was recorded in atypical habitat and not found again on repeated visits to the site.

Status within the various priority schemes is noted for species found during the breeding season (Table 2). 46 species are listed in at least one of the priority schemes. These 46 species comprise the list of Candidate Priority Species for the Leopold-Pine Island IBA.

There was a total of 64 bird species recorded for the LBRFF, combining the 1986 and 2001 surveys (Table 3).

Table 1. Bird species recorded on the IBA by all methods, for all seasons, by area. PT, LMR, VWT, PIWA data from 2005, BRWPA data from 2003.

Species	Seasonal Status by Area					
	PT	LMR	VWT	PIWA	BRWPA	Total
Acreage	2,078	1,743	323	5,706	847	10,697
Total Breeding (B) ¹	89	90	46	95	66	116
Total Migrants (M) ²	108	81	0	81	0	133
Total Non-breeding (N) ³	1	1	0	4	0	3
Total Species Recorded	123	110	46	120	66	155
Canada Goose	B, M	B, M	B	M		B, M
Wood Duck	B, M	B, M		M	B	B, M
Mallard	B, M	M	B	B, M	B	B, M
Blue-winged Teal	M	M		B, M		B, M
Green-winged Teal	M					M
Hooded Merganser		B	B			B
Wild Turkey	B, M	B, M	B	B		B, M
Northern Bobwhite	B, M			B, M		B, M ¹
Pied-billed Grebe		M			B	B, M
Double-crested Cormorant				M		M
American Bittern	M					M
Least Bittern					B	B
Great Blue Heron	B, M	B, M		B, M	B	B, M
Great Egret	M			M		M
Green Heron	B	B		B, M	B	B, M
Turkey Vulture	B, M	M		B, M		B, M
Osprey	M			B	B	B, M
Bald Eagle	B, M	B, M		B, M		B, M
Northern Harrier	M			M		M
Sharp-shinned Hawk				M		M
Cooper's Hawk	B, M		B	B		B, M
Red-shouldered Hawk				B		B
Broad-winged Hawk	M			M		M
Red-tailed Hawk	B, M	B, M		B, M	B	B, M
American Kestrel	B	B				B
Virginia Rail				B	B	B
Sora		B		B, M	B	B, M
Common Moorhen					B	B
American Coot					B	B
Sandhill Crane	B, M	B, M	B	B, M	B	B, M
Killdeer	B, M	B		B, M	B	B, M
Greater Yellowlegs				M		M
Lesser Yellowlegs	M					M
Solitary Sandpiper	M					M
Spotted Sandpiper	B, M	M		B, M	B	B, M
American Woodcock	B	B		B, M		B, M
Ring-billed Gull	M, N	M, N		M, N		M, N
Herring Gull				N		N
Black Tern				N	B	B
Rock Pigeon	B, M	B, M			B	B, M
Mourning Dove	B, M	B, M		B, M	B	B, M
Black-billed Cuckoo				B		B
Yellow-billed Cuckoo	B	B		B		B
Great Horned Owl		B, M		B		B, M
Barred Owl	B, M	M		B		B, M
Chimney Swift	B, M	B				B, M
Ruby-throated Hummingbird	B, M	B, M		B, M		B, M
Belted Kingfisher	B, M	B, M	B	B, M	B	B, M
Red-headed Woodpecker		B, M		B		B, M
Red-bellied Woodpecker	B, M	B, M		B		B, M
Yellow-bellied Sapsucker				B, M		B, M
Downy Woodpecker	B, M	B, M	B	B	B	B, M
Hairy Woodpecker	B, M	B, M		B, M	B	B, M
Northern Flicker	B, M	B, M		B, M	B	B, M
Pileated Woodpecker	B, M	B, M	B	B, M		B, M
Eastern Wood-Pewee	B, M	B, M	B	B	B	B, M
Acadian Flycatcher				N		N
Alder Flycatcher	B	B		B	B	B
Willow Flycatcher	B	B		B	B	B
Least Flycatcher	B, M	B	B	B	B	B, M

Table 1. (cont.)

Species	Seasonal Status by Area					Total
	PT	LMR	VWT	PIWA	BRWPA	
Eastern Phoebe	B, M	B, M		B, M		B, M
Great Crested Flycatcher	B, M	B, M	B	B, M	B	B, M
Eastern Kingbird	B, M	B		B	B	B, M
Yellow-throated Vireo	B, M	B, M	B	B, M	B	B, M
Blue-headed Vireo		B		M		B, M
Warbling Vireo	B, M	B, M	B	B, M	B	B, M
Red-eyed Vireo	B, M	B, M	B	B, M	B	B, M
Blue Jay	B, M	B, M	B	B, M	B	B, M
American Crow	B, M	B, M	B	B, M	B	B, M
Horned Lark	B	B				B
Purple Martin	B					B
Tree Swallow	B, M	B, M		B, M	B	B, M
N. Rough-winged Swallow	B	B, M		B, M	B	B, M
Bank Swallow		B				B
Cliff Swallow	B, M	B		B	B	B, M
Barn Swallow	B, M	B, M		B, M	B	B, M
Black-capped Chickadee	B, M	B, M	B	B, M	B	B, M
Tufted Titmouse	B, M	B	B	B		B, M
Red-breasted Nuthatch	B	B, M	B			B, M
White-breasted Nuthatch	B, M	B, M	B	B, M		B, M
Brown Creeper		B, M		B		B, M
House Wren	B, M	B, M	B	B, M	B	B, M
Sedge Wren	B	B, M	B	B, M	B	B, M
Marsh Wren		B		B, M	B	B, M
Golden-crowned Kinglet		M				M
Ruby-crowned Kinglet	M	M				M
Blue-gray Gnatcatcher	B, M	B, M	B	B, M	B	B, M
Eastern Bluebird	B, M	B, M		B, M	B	B, M
Veery		M	B	B		B, M
Gray-cheeked Thrush	M					M
Swainson's Thrush	M	M		M		M
Hermit Thrush	M	M		M		M
Wood Thrush	B, M	B, M		B, M		B, M
American Robin	B, M	B, M	B	B, M	B	B, M
Gray Catbird	B, M	B, M	B	B, M	B	B, M
Brown Thrasher	B, M	B, M		B, M		B, M
European Starling	B, M	B, M				B, M
Cedar Waxwing	B, M	B, M	B	B	B	B, M
Blue-winged Warbler	B	B, M		B, M		B, M
Golden-winged Warbler				M		M
Tennessee Warbler				M		M
Nashville Warbler	M			M		M
Yellow Warbler	B, M	B, M	B	B, M	B	B, M
Chestnut-sided Warbler	B	B, M		M		B, M
Magnolia Warbler	M	M		M		M
Cape May Warbler		M				M
Myrtle Warbler	M	M		M		M
Blackburnian Warbler	M					M
Yellow-throated Warbler	M					M
Pine Warbler	M					M
Palm Warbler	M	M				M
Bay-breasted Warbler	M					M
Blackpoll Warbler	M					M
Cerulean Warbler	M				B	B, M
Black-and-White Warbler	M	B, M		B		B, M
American Redstart	B, M	B, M	B	B, M	B	B, M
Ovenbird	B, M	B, M	B	B, M		B, M
Northern Waterthrush	M	M		M		M
Kentucky Warbler	M					M
Mourning Warbler		B		B		B
Common Yellowthroat	B, M	B, M	B	B, M	B	B, M
Wilson's Warbler				M		M
Scarlet Tanager	B, M	B	B	B	B	B, M
Eastern Towhee	B, M	B, M	B	B, M		B, M
American Tree Sparrow	M					M
Chipping Sparrow	B, M	B, M	B	B, M		B, M
Clay-colored Sparrow	B, M			B	B	B, M
Field Sparrow	B, M	B, M	B	B, M		B, M

Table 1. (cont.)

Species	Seasonal Status by Area					Total
	PT	LMR	VWT	PIWA	BRWPA	
Vesper Sparrow	B, M	B		B		B, M
Lark Sparrow	M					M
Savannah Sparrow	B, M	B		B	B	B, M
Grasshopper Sparrow	B, M	B		B		B, M
Henslow's Sparrow				B	B	B
Fox Sparrow		M		M		M
Song Sparrow	B, M	B, M	B	B, M	B	B, M
Swamp Sparrow	M	B, M	B	B, M	B	B, M
White-throated Sparrow	M	B, M		B		B, M
White-crowned Sparrow	M			M		M
Northern Cardinal	B, M	B, M	B	B, M	B	B, M
Rose-breasted Grosbeak	B, M	B, M	B	B, M	B	B, M
Indigo Bunting	B, M	B		B	B	B, M
Dickcissel	B			B		B
Bobolink	B, M	B		B, M	B	B, M
Red-winged Blackbird	B, M	B, M	B	B, M	B	B, M
Eastern Meadowlark	B, M			B, M		B, M
Yellow-headed Blackbird					B	B
Rusty Blackbird	M	M				M
Brewer's Blackbird	M					M
Common Grackle	B, M	M	B	B, M	B	B, M
Brown-headed Cowbird	B, M	B, M	B	B, M	B	B, M
Orchard Oriole	B	B		B		B
Baltimore Oriole	B, M	B, M	B	B, M	B	B, M
House Finch	B, M	B	B	B		B, M
American Goldfinch	B, M	B, M	B	B, M	B	B, M
House Sparrow	B, M	B				B, M

¹ - Recorded during the breeding season (May 28 - July 15), or at any time for permanent residents considered to be breeding.

² - Recorded during the migratory season (prior to May 28 and after July 15)

³ - Recorded during the breeding season, but known not to breed in these locations.

Table 2. Number of individuals for each species recorded on point-count surveys and “X” if recorded during volunteer survey during the breeding season (May 28-July 15) on the Leopold-Pine Island IBA, and their priority scheme status. Non-breeders include Ringed-billed Gull, Herring Gull, and Acadian Flycatcher.

Species	Number of Individuals by Area ¹						Priority Scheme Status ²				
	PT	LMR	VWT	PIWA	BRWPA	Total	SGCN	NHI	IBA	PIF	GMC
Acreage	2,078	1,743	323	5,706	847	10,697					
No. point-count stations:	50	40	6	120	18	234					
No. species recorded:	90	91	46	98	66	119	25	12	39	25	11
Canada Goose	X	X	2	0	0	2					
Wood Duck	3	7	0	0	23	33					
Mallard	X	0	1	3	9	13					
Blue-winged Teal	0	0	0	3	0	3	✓		WI-2		✓
Hooded Merganser	0	4	1	0	0	5			WI-2	✓	
Wild Turkey	10	3	1	6	0	20					
Northern Bobwhite	1	0	0	0	0	1	✓	SC			✓
Pied-billed Grebe	0	0	0	0	6	6					
Least Bittern	0	0	0	0	6	6		SC	WI-2		
Great Blue Heron	X	X	0	2	11	13					
Green Heron	2	2	0	1	13	18					
Turkey Vulture	X	0	0	X	0	0					
Osprey	0	0	0	1	2	3	✓	T	WI-1		
Bald Eagle	3	1	0	3	0	7	✓	SC	WI-2		
Cooper's Hawk	1	0	X	X	0	1					
Red-shouldered Hawk	0	0	0	2	0	2	✓	T	WI-1		
Red-tailed Hawk	1	3	0	7	1	12					
American Kestrel	X	1	0	0	0	1					
Virginia Rail	0	0	0	2	1	3			WI-2		
Sora	0	X	0	1	1	2					
Common Moorhen	0	0	0	0	1	1		SC			
American Coot	0	0	0	0	3	3					
Sandhill Crane	6	1	1	6	6	20					✓
Killdeer	5	3	0	10	7	25					
Spotted Sandpiper	1	0	0	15	4	20					
American Woodcock	1	1	0	5	0	7	✓		WI-2		✓
Ring-billed Gull	13	5	0	8	0	26					
Herring Gull	0	0	0	1	0	1					
Black Tern	0	0	0	4	3	7	✓	SC	WI-2		✓
Rock Pigeon	X	X	0	0	X	0					
Mourning Dove	7	7	0	24	2	40			WI-2		
Black-billed Cuckoo	0	0	0	1	0	1	✓		WI-2		✓
Yellow-billed Cuckoo	10	4	0	10	0	24	✓	SC	WI-2		✓
Great Horned Owl	0	1	0	1	0	2					
Barred Owl	1	0	0	1	0	2					
Chimney Swift	1	1	0	0	0	2			WI-2		
Ruby-throated Hummingbird	X	1	0	3	0	4					
Belted Kingfisher	X	2	X	8	2	12			WI-2		
Red-headed Woodpecker	0	4	0	1	0	5	✓		WI-2		✓
Red-bellied Woodpecker	6	8	0	4	0	18					
Yellow-bellied Sapsucker	0	0	0	3	0	3			WI-2		
Downy Woodpecker	10	15	3	34	1	63					
Hairy Woodpecker	5	5	0	8	1	19					
Northern Flicker	1	6	0	5	4	16					
Pileated Woodpecker	2	1	1	3	0	7					
Eastern Wood-Pewee	51	48	7	89	3	198			WI-2		
Acadian Flycatcher	0	0	0	1	0	1	✓	T	WI-1		✓
Alder Flycatcher	1	2	0	15	1	19					
Willow Flycatcher	20	26	0	54	10	110	✓		WI-2		✓
Least Flycatcher	1	1	2	39	5	48	✓		WI-2		
Eastern Phoebe	2	2	0	5	0	9					
Great Crested Flycatcher	33	22	2	33	4	94					
Eastern Kingbird	9	4	0	14	4	31					
Yellow-throated Vireo	10	9	2	31	2	54			WI-2		
Blue-headed Vireo	0	3	0	0	0	3					
Warbling Vireo	17	11	4	64	9	105					
Red-eyed Vireo	41	18	4	78	2	143					
Blue Jay	13	12	1	26	1	53					
American Crow	25	7	2	14	4	52					
Horned Lark	10	1	0	0	0	11					
Purple Martin	1	0	0	0	0	1					

Table 2. (cont.)

Species	Number of Individuals by Area ¹						Priority Scheme Status ²				
	PT	LMR	VWT	PIWA	BRWPA	Total	SGCN	NHI	IBA	PIF	GMC
Tree Swallow	11	12	0	49	37	109					
N. Rough-winged Swallow	8	3	0	6	1	18			WI-2	✓	
Bank Swallow	0	X	0	0	0	0					
Cliff Swallow	31	16	0	3	86	136					
Barn Swallow	13	13	0	6	1	33					
Black-capped Chickadee	22	35	4	64	3	128					
Tufted Titmouse	8	2	1	4	0	15					
Red-breasted Nuthatch	X	2	1	0	0	3					
White-breasted Nuthatch	11	19	2	28	0	60					
Brown Creeper	0	1	0	2	0	3					
House Wren	57	51	4	150	10	272					
Sedge Wren	2	29	2	53	25	111			WI-2	✓	✓
Marsh Wren	0	16	0	13	62	91			WI-2	✓	
Blue-gray Gnatcatcher	16	20	2	49	5	92					
Eastern Bluebird	2	10	0	6	X	18					
Veery	0	0	1	23	0	24	✓		WI-2		
Wood Thrush	5	9	0	60	0	74	✓		WI-2	✓	
American Robin	32	27	5	103	9	176					
Gray Catbird	24	30	5	130	3	192					
Brown Thrasher	2	1	0	2	0	5	✓		WI-2	✓	
European Starling	10	4	0	0	0	14					
Cedar Waxwing	13	14	5	42	X	74					
Blue-winged Warbler	7	11	0	17	0	35	✓		WI-2	✓	
Yellow Warbler	13	34	3	233	9	292					
Chestnut-sided Warbler	X	X	0	0	0	0					
Cerulean Warbler	0	0	0	0	X	0	✓	T	WI-1	✓	
Black-and-White Warbler	0	X	0	3	0	3			WI-2		
American Redstart	2	6	1	92	3	104					
Ovenbird	33	35	6	64	0	138			WI-2		
Mourning Warbler	0	8	0	3	0	11			WI-2	✓	
Common Yellowthroat	59	82	11	237	40	429					
Scarlet Tanager	5	5	1	24	X	35					
Eastern Towhee	13	17	4	50	0	84					
Chipping Sparrow	41	33	5	10	0	89					
Clay-colored Sparrow	9	0	0	4	1	14					✓
Field Sparrow	15	14	1	38	0	68	✓		WI-2	✓	✓
Vesper Sparrow	7	2	0	X	0	9	✓				✓
Savannah Sparrow	7	1	0	12	28	48					✓
Grasshopper Sparrow	11	X	0	18	0	29	✓		WI-2	✓	✓
Henslow's Sparrow	0	0	0	31	5	36	✓	T	WI-1	✓	✓
Song Sparrow	148	142	9	335	80	714					
Swamp Sparrow	0	23	10	75	29	137			WI-2	✓	
White-throated Sparrow	0	X	0	1	0	1					
Northern Cardinal	34	24	1	26	4	89					
Rose-breasted Grosbeak	19	32	1	75	6	133			WI-2		
Indigo Bunting	23	30	0	16	5	74					
Dickcissel	1	0	0	12	0	13	✓	SC	WI-2	✓	✓
Bobolink	19	X	0	45	23	87	✓		WI-2	✓	✓
Red-winged Blackbird	116	99	6	192	226	639					
Eastern Meadowlark	37	0	0	19	0	56	✓		WI-2		✓
Yellow-headed Blackbird	0	0	0	0	26	26					
Common Grackle	X	0	1	15	13	29					
Brown-headed Cowbird	44	54	5	140	3	246					
Orchard Oriole	1	X	0	3	0	4					
Baltimore Oriole	11	16	3	17	4	51				✓	
House Finch	5	3	2	X	0	10					
American Goldfinch	31	33	5	83	21	173					
House Sparrow	1	13	0	0	0	14					
Total	1,303	1,283	139	3,332	920	6,977					

¹ - An 'X' indicates that the species was recorded during the breeding season by the volunteer survey only

² - Indicates that species is listed as of special management concern according to the following statewide or regional programs:

SGCN: Species of Greatest Conservation Need; Wisconsin Wildlife Action Plan (WDNR 2005)

NHI: Natural Heritage Inventory program's Working List (WDNR 2007); E = Endangered, T= Threatened, SC = Special Concern

IBA: Important Bird Areas criteria categories; WI-1 = breeding or non-breeding populations of state Endangered or Threatened species; WI-2 = breeding populations of high conservation priority species (Steele 2007)

PIF: Partners in Flight priority species in the bird conservation plan for the Upper Great Lakes Plain (Knutson et al. 2001)

GMC: Grassland Management Concern, grassland birds of management priority in Wisconsin (Sample and Mossman 1997)

Table 3. Number of individuals recorded for the Lower Baraboo River Floodplain Forest (LBRFF) during two canoe surveys.

Species	6-Jun-86	2-Jun-01
Great Blue Heron	6	6
Yellow-crowned Night-Heron	1	
Wood Duck	3	4
Mallard	2	8
Hooded Merganser	1	2
Red-shouldered Hawk	3	1
Spotted Sandpiper		1
Rock Pigeon		2
Mourning Dove	1	
Yellow-billed Cuckoo	9	
Great Horned Owl	1	
Barred Owl	2	
Chimney Swift		1
Belted Kingfisher	2	
Red-headed Woodpecker	4	
Red-bellied Woodpecker	8	5
Downy Woodpecker	9	4
Hairy Woodpecker	10	11
Northern Flicker		1
Pileated Woodpecker	1	1
Eastern Wood-Pewee	14	28
Least Flycatcher	1	
Eastern Phoebe		1
Great Crested Flycatcher	44	33
Eastern Kingbird	4	1
Tree Swallow	7	21
N. Rough-wing. Swallow	6	7
Bank Swallow		1
Cliff Swallow		108
Blue Jay	7	15
American Crow	8	10
Black-capped Chickadee	7	6
Tufted Titmouse		1
White-breasted Nuthatch	11	8
Brown Creeper	3	1
House Wren	96	31
Blue-Gray Gnatcatcher	7	10
Wood Thrush	1	
American Robin	5	25
Gray Catbird	4	8
European Starling	1	
Cedar Waxwing	3	2
Yellow-throated Vireo	5	9
Warbling Vireo		6
Red-eyed Vireo	6	26
Yellow Warbler		1
Cerulean Warbler	4	
American Redstart		15
Prothonotary Warbler	11	7
Mourning Warbler	2	
Common Yellowthroat	4	7
Canada Warbler		1
Scarlet Tanager	2	
Northern Cardinal	2	3
Rose-breasted Grosbeak	5	6
Indigo Bunting	17	3
Rufous-sided Towhee		2
Chipping Sparrow		1
Song Sparrow	39	62
Red-winged Blackbird	4	8
Common Grackle	12	
Brown-headed Cowbird	8	11
Northern Oriole	10	36
American Goldfinch		12
Total Individuals	423	578
Total species	49	51

DETERMINING PRIORITY SPECIES FROM CANDIDATE PRIORITY SPECIES LIST

Forty-six species recorded on the Leopold-Pine Island IBA (not including LBRFF) are designated under one or more of the priority schemes described above (Table 2). These 46 species represented our Candidate Priority Species. We placed each of these species into one of three categories (low, moderate, or high) based on that species' ability to inform management decision-making (Table 4).

Table 4. Assignment of the 46 Candidate Priority Species to categories of opportunity for informing management decision-making.

Opportunity category	Number of Species
Low	22
Moderate	14
High	10
Total	46

Twenty-two of these Candidate Priority Species were identified as having low opportunity to inform management decision-making for one of three reasons (Table 5). First, several species are difficult to monitor using typical bird survey techniques and require targeted monitoring efforts in order to gauge their opportunity (e.g., secretive marshbirds such as Virginia Rail and colony nesters like Northern Rough-winged Swallow). Second, other species are known to have much greater opportunity elsewhere in Wisconsin (e.g., Osprey, Least Flycatcher, Black-and-white Warbler, Mourning Warbler). Third, common stewardship species such as Ovenbird and Baltimore Oriole were placed in the low opportunity category because they are widespread and have relatively stable populations in Wisconsin, and are more appropriately characterized as species to maintain rather than use to focus specific management. Their populations will probably be maintained if habitat is managed for species with higher opportunity.

Table 5. Justification for Candidate Priority Species determined to have a low opportunity to inform management decision-making.

Species	Difficult to monitor ¹	Better elsewhere ²	Common stewardship species ³
Hooded Merganser		X	
Least Bittern	X		
Osprey		X	
Bald Eagle		X	
Virginia Rail	X		
Common Moorhen	X		
American Woodcock	X		
Chimney Swift	X		
Belted Kingfisher		X	
Yellow-bellied Sapsucker		X	
Eastern Wood-Pewee			X
Acadian Flycatcher		X	
Least Flycatcher		X	
Yellow-throated Vireo			X
N. Rough-winged Swallow	X	X	
Brown Thrasher		X	
Black-and-white Warbler		X	
Ovenbird		X	X
Mourning Warbler		X	
Clay-colored Sparrow		X	
Rose-breasted Grosbeak			X
Baltimore Oriole			X

¹ - Species is poorly monitored across its range or good population estimates at IBAs are not available.

² - Species was detected in relatively low numbers on the bird survey and has higher opportunity elsewhere in Wisconsin.

³ - Species having stable population in Wisconsin (possibly declining elsewhere in range) and for which Wisconsin has a high proportion (≥4%) of the species' estimated global population; these are not priority species but rather species for which Wisconsin has stewardship responsibility.

Of the remaining 24 Candidate Priority Species 14 were identified as having moderate opportunity and 10 were identified as having high opportunity to inform management (Table 4), based on their estimated populations at the Leopold-Pine Island IBA compared to other IBAs (Steele 2007). These 24 species were now considered our Priority Species for the Leopold Pine-Island IBA, and were used to create a strategic vision for bird conservation on the IBA.

The lists of Candidate and Priority Species are dynamic and may change somewhat with increased knowledge of bird populations here and elsewhere. However, the current lists – based on an exhaustive review of extensive review of databases from diverse sources – are meaningful and useful for both short- and long-term planning.

PRIORITY SPECIES’ HABITAT RELATIONSHIPS

Priority Species were arranged by habitat to examine patterns of opportunity across broad habitat categories (Table 6). Species were not evenly distributed across the habitat or opportunity categories. Almost half of the species, 10 of 24, are grassland birds, with 5 species in each opportunity category. By contrast, only 1 of the 5 forest species fell into the high opportunity category. The spatial distribution across the IBA for these Priority Species in their habitat groupings found in Figures 5 – 8.

Table 6. The 24 Priority Species with moderate or high opportunity to inform management decision-making at the Leopold-Pine Island IBA by broad habitat category.

	Grassland	Marsh	Shrub/Savanna	Forest
High Opportunity	Sedge Wren Field Sparrow Grasshopper Sparrow Henslow’s Sparrow Bobolink	Sandhill Crane Marsh Wren Swamp Sparrow	Willow Flycatcher	Yellow-billed Cuckoo
Moderate Opportunity	Northern Bobwhite Vesper Sparrow Savannah Sparrow Dickcissel Eastern Meadowlark	Blue-winged Teal Black Tern	Black-billed Cuckoo Red-headed Woodpecker Blue-winged Warbler	Red-shouldered Hawk Veery Wood Thrush Cerulean Warbler

To further elucidate these habitat relationships on the IBA, we estimated the relative importance of each community type and habitat to each Priority Species (Tables 7 & 8). For each habitat (described in Appendix A), the importance value for a given species represents the percentage of all individuals found in that habitat that belong to this species. For instance, Field Sparrows comprised 0.7% of all birds found within Floodplain Aspen, and 1.2% of all birds found within Floodplain Forest Edge. The bottom line of the table suggests the overall importance of each habitat to the Priority Species. For example, Priority Species

represented 11.4% of all individuals recorded within Floodplain Black Oak Forest, but only 3.6% of birds found within Swamp White Oak Forest.

These importance values should be tempered with information on the actual density (i.e., birds per acre) of birds in each habitat where this is known. Otherwise, the significance suggested for habitats by Tables 7 and 8 may be overestimated for habitats with low bird density. For instance, Upland or Floodplain Cultivated fields typically support very few birds per acre, whereas Upland Oldfield usually supports higher densities; thus although Savannah Sparrows comprise a similar percentage (5.1%, 4.7% respectively; Table 8) of all birds found on each of these habitats on the IBA, oldfields provide for more Savanna Sparrows per acre than do cultivated fields.

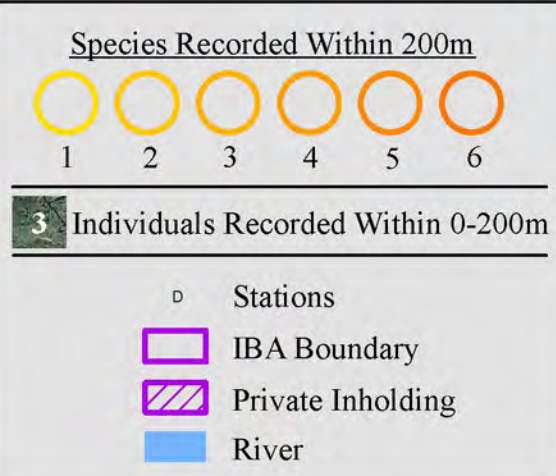
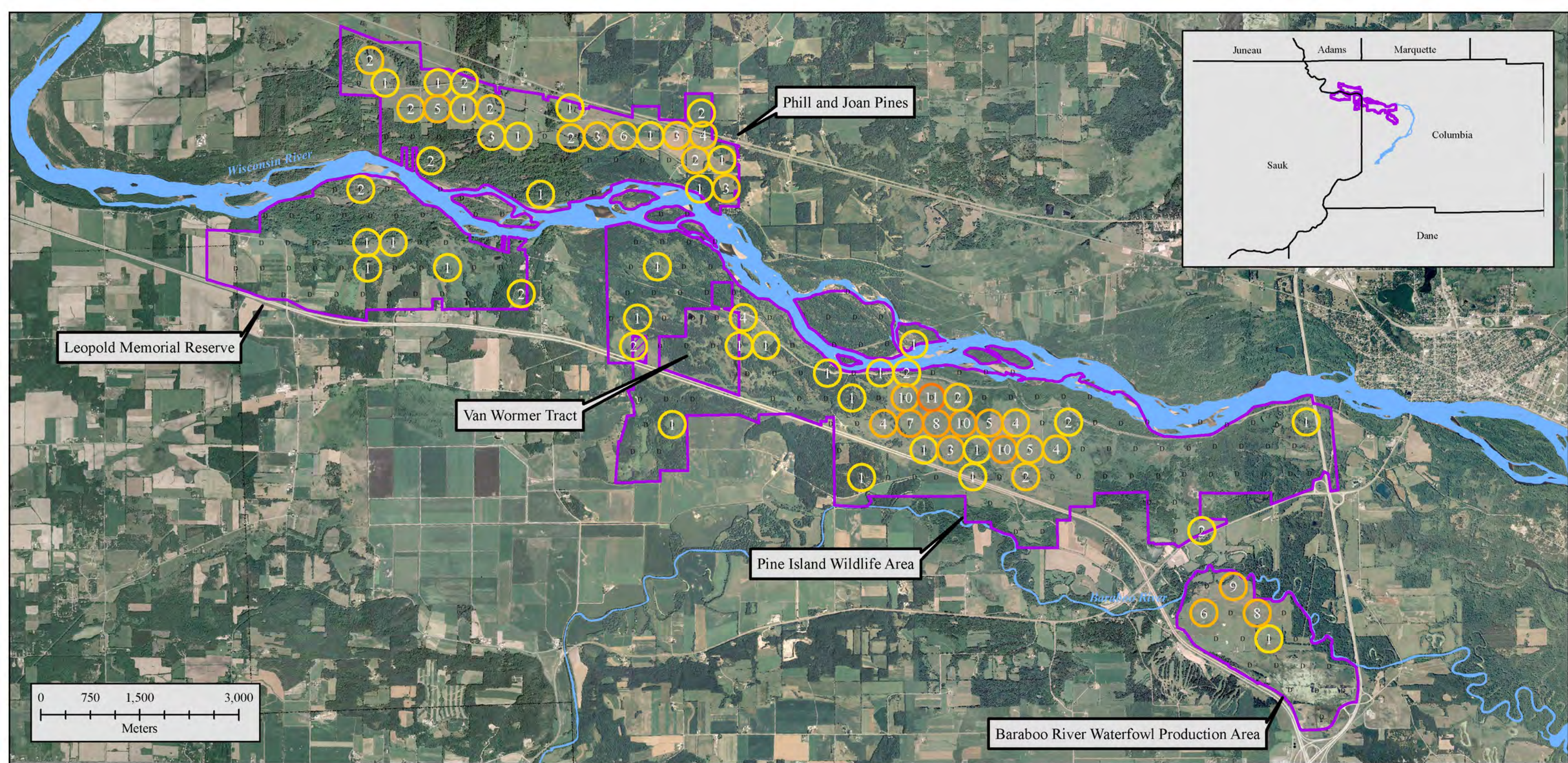
An index to bird density was calculated for 20 habitats based on “single-habitat” point-count stations (i.e., point-count stations that had only one habitat type for that station) (Table 9). Of these, 16 forested, shrubby and open habitats had a mean of 8-15 birds/count station. The highest values were attained for Native Lowland Shrub (14.8), Swamp White Oak Forest (12) and Marsh (11.6), and Floodplain Native Grassland (11.5). The 4 habitats with an especially low index to bird density (<6 birds/count) were Upland Mature Conifer Plantation, Upland or Floodplain Cultivated fields, Row Crops and River; these should be regarded as lesser importance to breeding Priority Species. This is regardless of their importance values in Tables 7 and 8. Upland Mature Conifer Plantation and Row Crops do not appear in Table 7 because no Priority Species were recorded in these habitats.

ABUNDANCE OF PRIORITY SPECIES WITH THEIR CURRENT AND POTENTIAL HABITAT

Priority Species’ abundance in each habitat association and a measure of the relative opportunity for management of each habitat association is summarized for each property in Tables 10-19. PT had its highest abundance for Priority Species in Upland Oldfields and Upland or Floodplain Grass Hay (Tables 10 & 11). LMR had its highest number in Floodplain Native Grassland and Marsh (Tables 12 & 13). At VMT most were in Floodplain Native Grassland and Native Lowland Shrub (Tables 14 & 15). PIWA’s Priority Species were most abundant in Floodplain Oldfield and Floodplain Native Grassland (Tables 16 & 17). In BRWPA, nearly all were found in Floodplain Oldfield and Marsh (Tables 18 & 19).

The “Opportunity” section at the bottom of each table is a subjective determination with several components. For each component, a small ‘x’ indicates relatively low opportunity, significance, or abundance of a given habitat, while a large ‘X’ indicates relatively high opportunity, significance, or abundance. A zero (0) indicates that the habitat was not recorded on that area during the bird survey, is not present in manageable quantities, or is an undesirable habitat. The first component, ‘Property’, indicates how extensive or significant that habitat is on that property. In several cases, the current extent of a habitat differs significantly from its potential or expected extent based on planned management activities; in these cases, actual extent is indicated first and potential is indicated second (e.g., x/X). The

second row, 'Relative to IBA', indicates the extent or significance of that habitat relative to the whole IBA, i.e., how much of that habitat the property contributes to the larger IBA. 'Significance for Priority Species in IBA', provides a determination of each habitat's importance to the 24 Priority Species based on Tables 7 and 8, and is the same for each area. The fourth row, 'Cumulative Emphasis' is a synthesis of the other three, indicating what each area could best contribute to the IBA as a whole and suggesting possible management emphasis for each property.

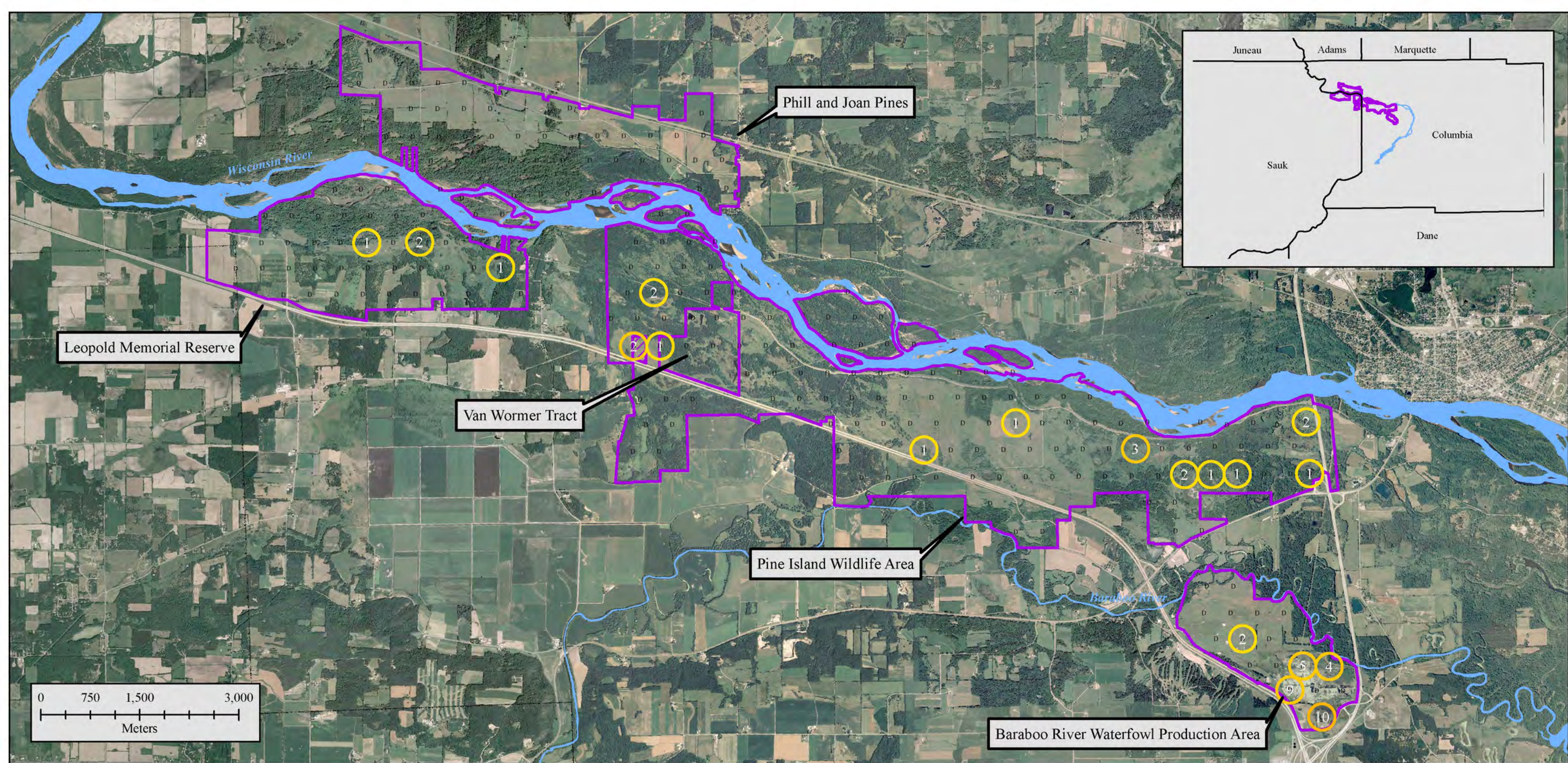


BREEDING BIRD DISTRIBUTION ON THE LEOPOLD-PINE IS. IMPORTANT BIRD AREA, WISCONSIN
 Data from 200m radius point-counts, 2005-2006

Figure 5. Priority Species of grassland habitats.

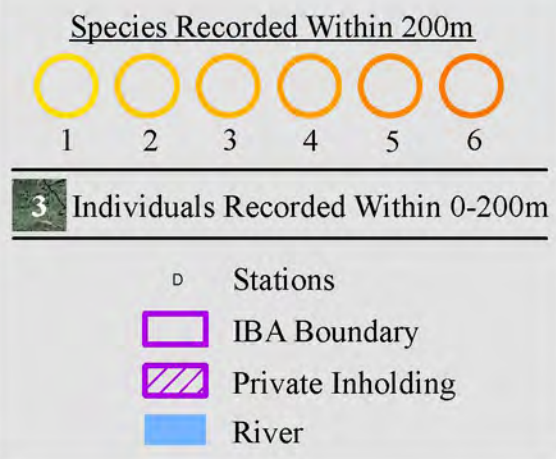
Mike Mossman, Wisconsin DNR, Bureau of Integrated Science Services
 Steve Swenson, Aldo Leopold Foundation
 Yoyi Steele, Wisconsin Bird Conservation Initiative, Important Bird Areas Program

- Species in Habitat Category
- Bobolink
 - Dickcissel
 - Eastern Meadowlark
 - Field Sparrow
 - Grasshopper Sparrow
 - Henslow's Sparrow
 - Savannah Sparrow
 - Sedge Wren
 - Vesper Sparrow
- Map Updated: March, 2008
 Mapped by: Brian C. Loeffelholz



BREEDING BIRD DISTRIBUTION ON THE LEOPOLD-PINE IS. IMPORTANT BIRD AREA, WISCONSIN
 Data from 200m radius point-counts, 2005-2006

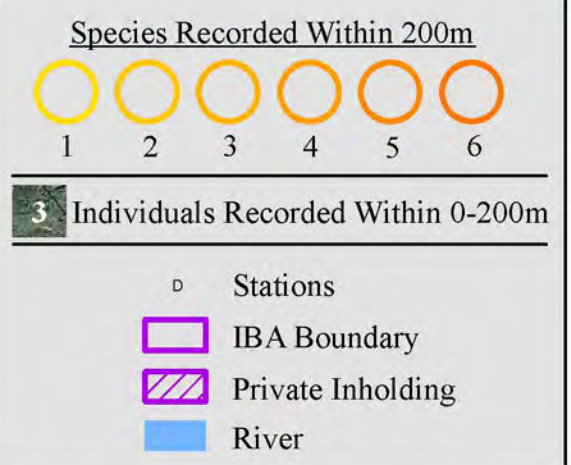
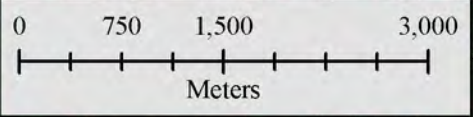
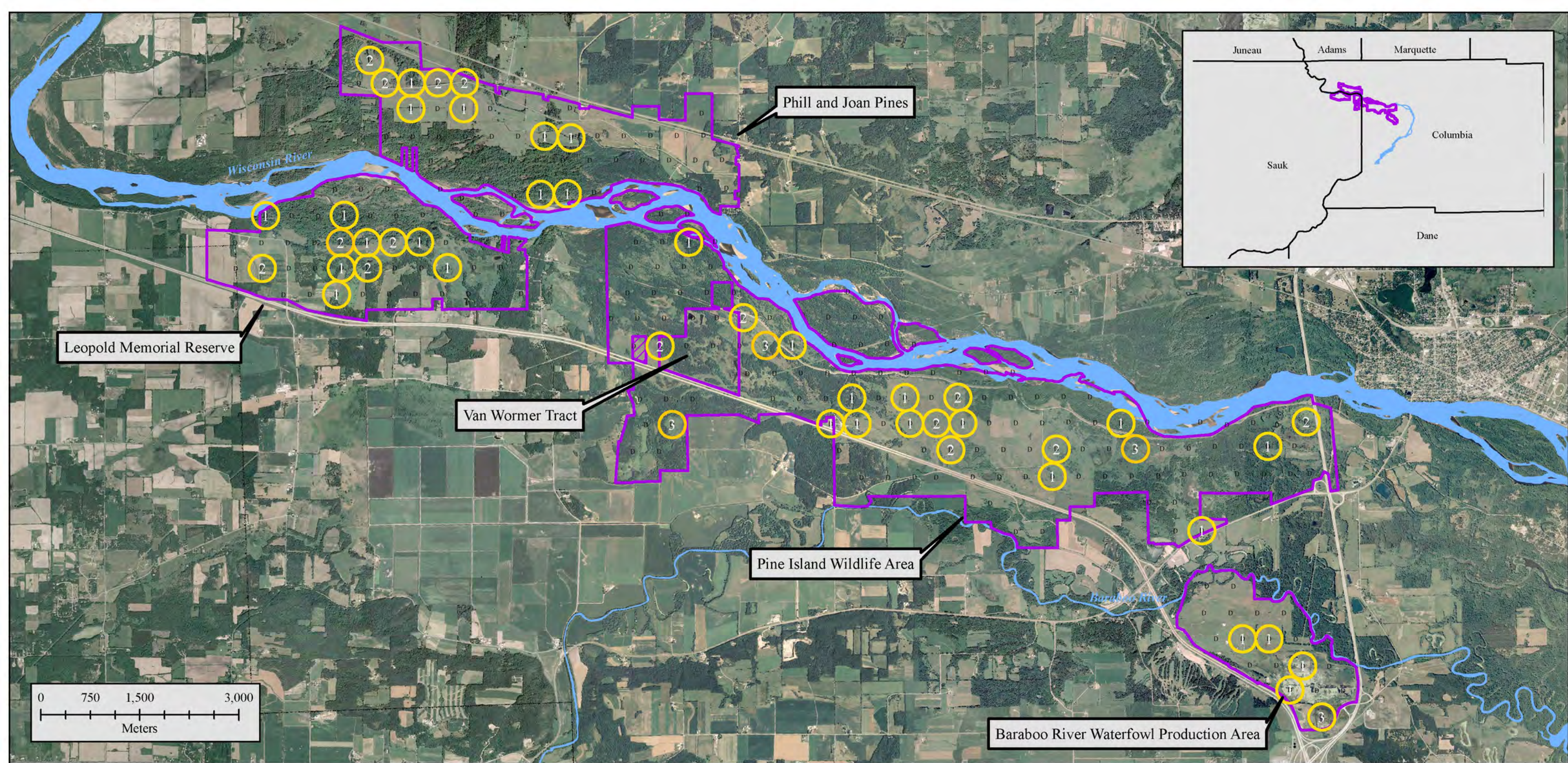
Figure 6. Priority Species of marsh habitat.



Species in Habitat Category

- Sandhill Crane
- Marsh Wren
- Swamp Sparrow
- Blue-winged Teal
- Black Tern

Mike Mossman, Wisconsin DNR, Bureau of Integrated Science Services
 Steve Swenson, Aldo Leopold Foundation
 Yoyi Steele, Wisconsin Bird Conservation Initiative, Important Bird Areas Program

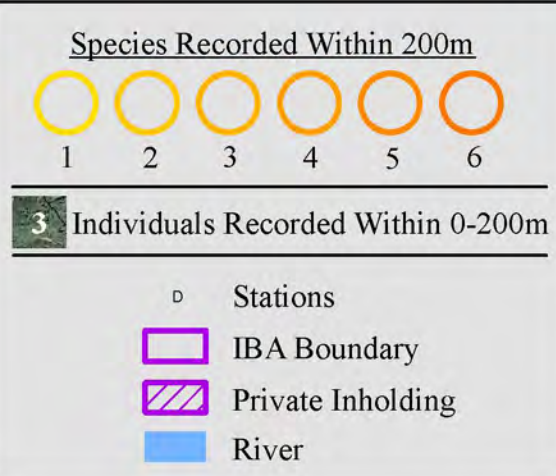
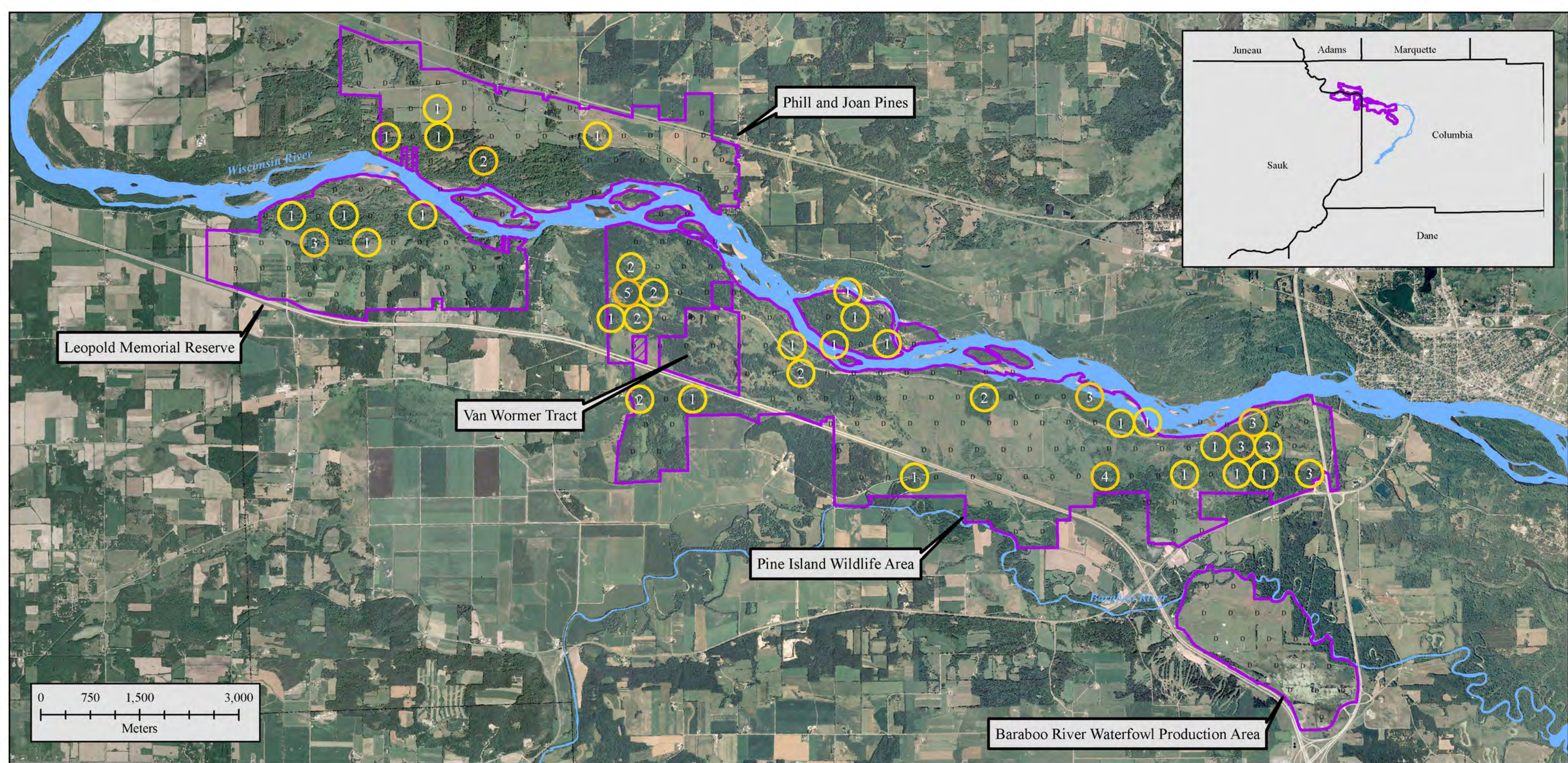


BREEDING BIRD DISTRIBUTION ON THE LEOPOLD-PINE IS. IMPORTANT BIRD AREA, WISCONSIN
 Data from 200m radius point-counts, 2005-2006

Figure 7. Priority Species of shrub/savanna habitats.

Mike Mossman, Wisconsin DNR, Bureau of Integrated Science Services
 Steve Swenson, Aldo Leopold Foundation
 Yoyi Steele, Wisconsin Bird Conservation Initiative, Important Bird Areas Program

- Species in Habitat Category
- Willow Flycatcher
 - Black-billed Cuckoo
 - Red-headed Woodpecker
 - Blue-winged Warbler
- Map Updated: March, 2008
 Mapped by: Brian C. Loeffelholz



BREEDING BIRD DISTRIBUTION ON THE LEOPOLD-PINE IS. IMPORTANT BIRD AREA, WISCONSIN
 Data from 200m radius point-counts, 2005-2006

Figure 8. Priority Species of forest habitats.

Mike Mossman, Wisconsin DNR, Bureau of Integrated Science Services
 Steve Swenson, Aldo Leopold Foundation
 Yoyi Steele, Wisconsin Bird Conservation Initiative, Important Bird Areas Program

- Species in Habitat Category
- Yellow-billed Cuckoo
 - Red-shouldered Hawk
 - Veery
 - Wood Thrush
 - Cerulean Warbler
- Map Updated: March, 2008
 Mapped by: Brian C. Loeffelholz

Table 7. Importance values for Priority Species within Lowland Habitats of the Leopold-Pine Island IBA. The importance value is the number of individuals of a given species encountered in a habitat expressed as a percentage of the total number of individuals of all species encountered in that habitat; habitat associations are described in Appendix A.

Ecosystem		LOWLAND																			
Communities		Floodplain Forest							Floodplain Oak Opening	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream		
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River	
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr	
Species																					
GRASSLAND	Northern Bobwhite																				
	Sedge Wren												2.4			6.8	2.5	10.0	1.1		
	Field Sparrow	0.7	0.7		0.2		1.2	1.9			3.3	2.8	1.1	3.8		1.5		0.2			
	Vesper Sparrow																				
	Savannah Sparrow															5.2					
	Grasshopper Sparrow															2.3		1.4			
	Henslow's Sparrow															5.4		1.8			
	Dickcissel															1.5		0.8			
	Bobolink												0.3			9.1		2.4			
	Eastern Meadowlark						0.3									3.9		1.0			
WETLAND	Blue-winged Teal													1.0				0.2			
	Sandhill Crane															0.4		0.4	1.1	2.0	
	Black Tern																		0.9	3.0	
	Marsh Wren																	0.2	18.8		
	Swamp Sparrow						0.9	1.6					7.0		2.2	0.6	5.0	6.7	8.3		
SHRUB/ SAVANNA	Black-billed Cuckoo					0.3															
	Red-headed Woodpecker											0.4									
	Willow Flycatcher												6.5		1.1	2.5	2.5	7.1	0.7		
	Blue-winged Warbler		0.3		0.8	1.2	1.2	0.2	1.6		1.3	0.9	0.3	1.0							
FOREST	Red-shouldered Hawk																				
	Yellow-billed Cuckoo		1.0	2.4	0.6	1.7		0.7		1.7	0.7	0.9									
	Veery	5.3	2.9		0.8		0.3		0.4												
	Wood Thrush	5.3	6.5	1.2	3.4	2.3		0.9			1.3									1.0	
	Cerulean Warbler																				
Total Importance (%)		11.3	11.4	3.6	5.7	5.2	4.1	5.4	2.4	1.7	6.5	4.7	17.6	5.7	3.3	39.2	10.0	32.4	30.8	6.1	

Table 8. Importance values for Priority Species within Upland Habitats of the Leopold-Pine Island IBA. The importance value is the number of individuals of a given species encountered in a habitat expressed as a percentage of the total number of individuals of all species encountered in that habitat; habitat associations are described in Appendix A.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Association		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUHc	FUMp	SUHMn	SUHo	SUHh	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren												
	Field Sparrow	1.5				6.7	10.0		3.7	3.7	1.2		18.8
	Vesper Sparrow	0.7				1.1	6.7	1.6		0.9		2.6	
	Savannah Sparrow									4.7	4.8	5.1	
	Grasshopper Sparrow									7.5	2.4		
	Henslow's Sparrow												
	Dickcissel									0.9			
	Bobolink							0.5		7.5	9.6	5.1	
	Eastern Meadowlark									13.1	16.9	2.6	
WETLAND	Blue-winged Teal												
	Sandhill Crane												
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker			3.2	5.0								
	Willow Flycatcher	0.9		12.7				5.2	1.2	1.9			
	Blue-winged Warbler	0.7		3.2		2.2		0.5					
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush												
	Cerulean Warbler	5.5											
Total Importance Value (%)		6.4	2.9	19.0	5.0	10.0	16.7	7.9	4.9	42.1	34.9	15.4	18.8

Table 9. Index to bird densities for 20 habitats based on single-habitat point counts.

Ecosystem	Habitat Association	Habitat Assoc. Code	Number of Stations	Mean Individuals per Count
Lowland	Aspen Forest	FLHa	2	11
	Black Oak Forest	FLHb	8	8.6
	Swamp White Oak Forest	FLHw	3	12
	Silver Maple Forest	FLHs	18	9.9
	Mixed Oak-Pine Forest	FLMp	8	11.1
	Open Shrubby Hardwood or Mixed Forest	SLHMw	6	10.2
	Cutover/Burned Over Forest	SLHc	7	8.9
	Savanna	SLHs	2	10
	River Barrens	SLHb	3	9.7
	Open River Terrace	SLHt	3	10.7
	Native Lowland Shrub	SLHn	6	14.8
	Shrubby Lowland Oldfield	SLHo	2	10
	Floodplain Oldfield	OLU	12	10.8
	Floodplain Native Grassland	OLN	8	11.5
	Marsh	OLWm	5	11.6
River	OLWr	1	2	
Upland	Conifer Plantation	FUCp(p)	1	5
	Grass/mixed hay	OUAg	1	8
	Cultivated	OUAc	1	3
	Row Crops	OUAr	1	2
# Stations			98	
Mean individuals/count per habitat				9.1

Table 10. Pines Tract Lowland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		LOWLAND																				
Communities		Floodplain Forest							Floodplain Savanna	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream			
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River		
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr		
Species																						
GRASSLAND	Northern Bobwhite																					
	Sedge Wren																					
	Field Sparrow	2							1		3											
	Vesper Sparrow																					
	Savannah Sparrow																					
	Grasshopper Sparrow																1					
	Henslow's Sparrow																					
	Dickcissel																					
	Bobolink																2					
	Eastern Meadowlark																11		1			
WETLAND	Blue-winged Teal																					
	Sandhill Crane																					
	Black Tern																					
	Marsh Wren																					
	Swamp Sparrow																					
SHRUB/ SAVANNA	Black-billed Cuckoo																					
	Red-headed Woodpecker																					
	Willow Flycatcher													2		1		5				
	Blue-winged Warbler	3							2		1											
FOREST	Red-shouldered Hawk																					
	Yellow-billed Cuckoo	2			3		3															
	Veery																					
	Wood Thrush	1		3																		
	Cerulean Warbler																					
Total number of individuals		0	0	3	9	3	4	0	0	0	1	4	2	0	0	15	0	8	0	2		
OPPORTUNITY	Property	x	0	x/X	X	x	x	x	x	0	x	x	x	0	x	x	0	X	x	X		
	Relative to IBA	x	0	X	x	X	x	x	x	0	x	x	x	0	x	x	0	x	x	X		
	Significance for Priority Species in IBA	x	X	x	x	x	x	x	x	x	x	x	X	x	x	X	x	X	X	x		
	Cumulative Emphasis	x	0	X	x	x	x	x	x	0	x	x	x	0	0	x	0	X	x	X		

Table 11. Pines Tract Upland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Associations		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUHc	FUMp	SUHMn	SUHo	SUHh	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren												
	Field Sparrow					1		2	2				
	Vesper Sparrow					1	2	2		1		1	
	Savannah Sparrow									5	2		
	Grasshopper Sparrow									8	2		
	Henslow's Sparrow												
	Dickcissel									1			
	Bobolink							1		8	8		
	Eastern Meadowlark									11	14		
WETLAND	Blue-winged Teal												
	Sandhill Crane									2			
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker												
	Willow Flycatcher	1						8	1				
	Blue-winged Warbler							1					
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush	1											
	Cerulean Warbler												
Total Individuals		2	0	0	0	2	2	12	3	38	26	1	0
OPPORTUNITY	Property	x	x	0	0	x	x	x	x	X	X	x	x/X
	Relative to IBA	x	x	0	0	x	x	x	x	X	X	X	X
	Significance for priority Species in IBA	x	x	X	x	x	X	x	x	X	X	x	X
	Cumulative Emphasis	x	x	0	0	x	x	0	0	X	X	x	X

Table 12. Leopold Memorial Reserve Lowland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		LOWLAND																		
Communities		Floodplain Forest							Floodplain Savanna	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream	
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr
Species																				
GRASSLAND	Northern Bobwhite																			
	Sedge Wren																			
	Field Sparrow																			
	Vesper Sparrow																			
	Savannah Sparrow																			
	Grasshopper Sparrow																			
	Henslow's Sparrow																			
	Dickcissel																			
	Bobolink																			
	Eastern Meadowlark																			
WETLAND	Blue-winged Teal																			
	Sandhill Crane																			
	Black Tern																			
	Marsh Wren																			
	Swamp Sparrow																			
SHRUB/ SAVANNA	Black-billed Cuckoo																			
	Red-headed Woodpecker																			
	Willow Flycatcher																			
	Blue-winged Warbler																			
FOREST	Red-shouldered Hawk																			
	Yellow-billed Cuckoo																			
	Veery																			
	Wood Thrush																			
	Cerulean Warbler																			
Total number of individuals		0	0	0	2	6	1	5	1	0	4	0	5	0	0	0	0	39	26	1
OPPORTUNITY	Property	0	x/X	x	x	X	x	x	x	x/X	x/X	x	x	0	0	0	0	X	X	x
	Relative to IBA	0	x	x	x	x	x	x	x	x	X	x	x	0	0	0	0	X	x	x
	Significance for Priority Species in IBA	x	X	x	x	x	x	x	x	x	x	x	X	x	x	X	x	X	X	x
	Cumulative Emphasis	0	X	x	x	x	x	x	x	X	X	x	x	0	0	0	0	X	X	x

Table 13. Leopold Memorial Reserve Upland Habitats and Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Associations		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUhc	FUMp	SUHMn	SUHo	SUhh	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren												
	Field Sparrow		1			4							3
	Vesper Sparrow		1					1					
	Savannah Sparrow										1		
	Grasshopper Sparrow												
	Henslow's Sparrow												
	Dickcissel												
	Bobolink												
	Eastern Meadowlark												
WETLAND	Blue-winged Teal												
	Sandhill Crane												
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker			2	1								
	Willow Flycatcher			8				2					
	Blue-winged Warbler		1	2		2							
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush		1										
	Cerulean Warbler												
Total Individuals		1	3	12	1	6	0	3	0	0	1	0	3
OPPORTUNITY	Property	x	x	x	x	x/X	0	x	0	0	x	0	X
	Relative to IBA	x	x	x	x	X	0	x	0	0	x	0	X
	Significance for Priority Species in IBA	x	x	X	x	x	X	x	x	X	X	x	X
	Cumulative Emphasis	x	x	x	x	X	0	0	0	0	x	0	X

Table 14. VanWormer Tract Lowland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		LOWLAND																			
Communities		Floodplain Forest							Floodplain Savanna	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream		
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River	
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr	
Species																					
GRASSLAND	Northern Bobwhite																				
	Sedge Wren	1																			
	Field Sparrow	2																			
	Vesper Sparrow																				
	Savannah Sparrow																				
	Grasshopper Sparrow																				
	Henslow's Sparrow																				
	Dickcissel																				
	Bobolink																				
	Eastern Meadowlark																				
WETLAND	Blue-winged Teal																				
	Sandhill Crane																				
	Black Tern																				
	Marsh Wren	1																			
	Swamp Sparrow	7																			
SHRUB/ SAVANNA	Black-billed Cuckoo																				
	Red-headed Woodpecker																				
	Willow Flycatcher	4																			
	Blue-winged Warbler																				
FOREST	Red-shouldered Hawk																				
	Yellow-billed Cuckoo																				
	Veery																				
	Wood Thrush																				
	Cerulean Warbler																				
Total number of individuals		0	0	0	0	0	1	0	0	0	0	0	0	6	0	0	0	0	8	0	0
OPPORTUNITY	Property	x	x	0	0	0	x	x	0	0	0	0	X	x	0	0	0	0	X	0	0
	Relative to IBA	x	x	0	0	0	x	x	0	0	0	0	x	x	0	0	0	0	x	0	0
	Significance for Priority Species in IBA	x	X	x	x	x	x	x	x	x	x	x	X	x	x	X	x	X	X	X	x
	Cumulative Emphasis	x	x	0	0	0	x	x	0	0	0	0	X	x	0	0	0	0	X	0	0

Table 15. Van Wormer Tract Upland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Associations		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUHc	FUMp	SUHMn	SUHo	SUHh	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren												
	Field Sparrow								1				
	Vesper Sparrow												
	Savannah Sparrow												
	Grasshopper Sparrow												
	Henslow's Sparrow												
	Dickcissel												
	Bobolink												
	Eastern Meadowlark												
WETLAND	Blue-winged Teal												
	Sandhill Crane												
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker												
	Willow Flycatcher												
	Blue-winged Warbler												
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush												
	Cerulean Warbler												
Total Individuals		0	0	0	0	0	0	0	1	0	0	0	0
OPPORTUNITY	Property	0	0	0	0	0	0	0	x	0	0	0	0
	Relative to IBA	0	0	0	0	0	0	0	x	0	0	0	0
	Significance for Priority Species in IBA	x	x	X	x	x	X	x	x	X	X	x	X
	Cumulative Emphasis	0	0	0	0	0	0	0	0	0	0	0	0

Table 16. Pine Island Wildlife Area Lowland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		LOWLAND																						
Communities		Floodplain Forest							Floodplain Savanna	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream					
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River				
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr				
Species																								
GRASSLAND	Northern Bobwhite																							
	Sedge Wren													9					17	1	24			
	Field Sparrow	1	2	1		2		8					2	4	8				1					
	Vesper Sparrow																							
	Savannah Sparrow																2							
	Grasshopper Sparrow																11				7			
	Henslow's Sparrow																23				9			
	Dickcissel																8				4			
	Bobolink																28				11			
	Eastern Meadowlark	1											9				4							
WETLAND	Blue-winged Teal													1					1					
	Sandhill Crane																2				2	2		
	Black Tern																							
	Marsh Wren																							
	Swamp Sparrow	1						6					21				15	17						
SHRUB/ SAVANNA	Black-billed Cuckoo	1																						
	Red-headed Woodpecker									1														
	Willow Flycatcher													13		11		1	22					
	Blue-winged Warbler	1	1			2		3		2		1		1										
FOREST	Red-shouldered Hawk																							
	Yellow-billed Cuckoo	3		1		1		1		1		1												
	Veery	8	9	5		1		1																
	Wood Thrush	8	20	19		3		2																
	Cerulean Warbler																							
Total number of individuals		17	35	0	27	0	8	18	5	1	5	1	46	6	0	119	2	100	33	3				
OPPORTUNITY	Property	X	X	x	x	0	X	X	X	X	X	X	X	X	x	X	0	X	X	x				
	Relative to IBA	X	X	x	X	0	X	X	X	X	X	X	X	X	x	X	0	X	x	X				
	Significance for Priority Species in IBA	x	X	x	x	x	x	x	x	x	x	x	X	x	x	X	x	X	X	x				
	Cumulative Emphasis	X	X	x	x	0	x	x	x	X	X	X	X	X	0	X	0	X	X	X				

Table 17. Pine Island Wildlife Area Upland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Associations		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUHc	FUMp	SUHMn	SUHo	SUHh	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren										1		
	Field Sparrow	1				1	3			2			
	Vesper Sparrow												
	Savannah Sparrow										1	2	
	Grasshopper Sparrow												
	Henslow's Sparrow												
	Dickcissel												
	Bobolink												2
	Eastern Meadowlark									3			1
WETLAND	Blue-winged Teal												
	Sandhill Crane												
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker												
	Willow Flycatcher									2			
	Blue-winged Warbler												
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush	4											
	Cerulean Warbler												
Total Individuals		4	1	0	0	1	3	0	0	7	2	5	0
OPPORTUNITY	Property	x	x	0	0	x	x	x	x	x	x	x	0
	Relative to IBA	x	x	0	0	x	x	x	x	x	x	x	0
	Significance for Priority Species in IBA	x	x	X	x	x	X	x	x	X	X	x	X
	Cumulative Emphasis	x	x	0	0	x	x	0	0	x	x	x	x

Table 18. Baraboo River Waterfowl Production Area Lowland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		LOWLAND																				
Communities		Floodplain Forest							Floodplain Savanna	Oak Barrens		Shrub Carr	Floodplain Surrogate Grasslands				S Sedge Meadow & Wet Prairie	Emergent Marsh	River or Stream			
Habitat Associations		Aspen	Black Oak	Swamp White Oak	Silver Maple	Mixed, Pine	Edge	Open, Shrubby Hardwood or Mixed	Cutover or Burned Over	Savanna	River Barrens	Open River Terrace	Native Lowland Shrub	Shrubby Lowland Oldfield	Floodplain Hardwood Hedge	Floodplain Oldfield	Reed Canary Grass	Floodplain Native Grassland	Marsh	River		
Habitat Association Code		FLHa	FLHb	FLHw	FLHs	FLMp	FLHe	SLHMw	SLHc	SLHs	SLHb	SLHt	SLHn	SLHow	SLHh	OLU	OLUr	OLN	OLWm	OLWr		
Species																						
GRASSLAND	Northern Bobwhite																					
	Sedge Wren																18			1		
	Field Sparrow																					
	Vesper Sparrow																					
	Savannah Sparrow																25					
	Grasshopper Sparrow																					
	Henslow's Sparrow																5					
	Dickcissel																					
	Bobolink																17			1		
	Eastern Meadowlark																					
WETLAND	Blue-winged Teal																					
	Sandhill Crane																					
	Black Tern																					
	Marsh Wren																					
	Swamp Sparrow													2	2	3	2			16		
SHRUB/ SAVANNA	Black-billed Cuckoo																					
	Red-headed Woodpecker																					
	Willow Flycatcher													3	1	1			2	3		
	Blue-winged Warbler																					
FOREST	Red-shouldered Hawk																					
	Yellow-billed Cuckoo																					
	Veery																					
	Wood Thrush																					
	Cerulean Warbler																					
Total number of individuals		0	0	0	0	0	0	0	0	0	0	0	5	0	3	69	2	4	82	0		
OPPORTUNITY	Property	0	0	0	x	0	x	0	0	0	0	0	x/X	0	0	X	x	X	X	x		
	Relative to IBA	0	0	0	x	0	x	0	0	0	0	0	X	0	0	X	x	X	X	x		
	Significance for Priority Species in IBA	x	X	x	x	x	x	x	x	x	x	x	X	x	x	X	x	X	X	x		
	Cumulative Emphasis	0	0	0	x	0	x	0	0	0	0	0	X	0	0	X	0	X	X	x		

Table 19. Baraboo River Waterfowl Production Area Upland Habitats and Management Opportunities: Priority Species counts (number of individuals recorded) for lowland habitats and management opportunity ratings (X – high, x - low, 0 – none) by habitat.

Ecosystem		UPLAND											
Communities		S Oak Forest			Central Sands Pine-Oak	Oak Savanna	Upland Surrogate Grasslands					Sand, Dry, Dry-mesic, Mesic Prairie	
Habitat Associations		Oak	Edge	Cutover or Burned Over	Mixed, Pine	Oak or Mixed Shrub/Savanna	Shrubby Oldfield	Hardwood Hedge	Young Pine Plantation	Upland Oldfield	Upland or Floodplain Grass Hay	Upland or Floodplain Cultivated	Upland Native Grassland
Habitat Association Code		FUHo	FUHe	SUHc	FUMp	SUHMn	SUHo	SUHH	SUCp	OUU	OLUAg	OLUAc	OUN
Species													
GRASSLAND	Northern Bobwhite												
	Sedge Wren												
	Field Sparrow												
	Vesper Sparrow												
	Savannah Sparrow												
	Grasshopper Sparrow												
	Henslow's Sparrow												
	Dickcissel												
	Bobolink												
	Eastern Meadowlark												
WETLAND	Blue-winged Teal												
	Sandhill Crane												
	Black Tern												
	Marsh Wren												
	Swamp Sparrow												
SHRUB/SAVANNA	Black-billed Cuckoo												
	Red-headed Woodpecker												
	Willow Flycatcher												
	Blue-winged Warbler												
FOREST	Red-shouldered Hawk												
	Yellow-billed Cuckoo												
	Veery												
	Wood Thrush												
	Cerulean Warbler												
Total Individuals		0	0	0	0	0	0	0	0	0	0	0	0
OPPORTUNITY	Property	x	x	0	0	0	x	0	0	0	0	0	0
	Relative to IBA	x	x	0	0	0	x	0	0	0	0	0	0
	Significance for Priority Species in IBA	x	x	X	x	x	X	x	x	X	X	x	X
	Cumulative Emphasis	x	x	0	0	0	x	0	0	0	0	0	0

DISCUSSION

OVERALL IBA VISION

Effective, strategic conservation and management necessitate an understanding not only of *what* to conserve and manage but also of *where* best to focus efforts to achieve the greatest benefit. The process of using the bird survey data to place the Leopold-Pine Island IBA into a larger context, and to identify Priority Species and explore their habitat relationships, provided both the broad perspective and the detailed understanding to determine what this site best contributes to conservation and how this might provide direction for management decision-making.

This IBA is embedded in a landscape characterized by much natural variability due to its location within the Wisconsin River valley with its adjacent lowland and upland communities and finer-scale mosaic of floodplain substrates (e.g., sandy river terraces, old oxbows, etc.). Its location near the boundary of three major Ecological Landscapes, the Central Sand Hills, Central Sand Plains and the Western Coulee and Ridges, also contributes to the diversity of communities, ecotones, and transitional habitats that naturally occur here. This means that no obvious large-scale opportunity exists for any particular habitat (e.g., large blocks of forest or extensive wetlands); rather, the site presents a variety of habitat opportunities.

Our data and prioritization process helped us distinguish among these various possibilities, clarifying the relatively greater actual and potential opportunity for the grassland and grass-shrub bird populations. This suggests that this IBA's best contribution to bird conservation lies with the more open-country habitats, particularly grassland, shrub, and savanna communities. Management and restoration activities should focus on expanding these habitat types. Marsh communities are well-represented in some portions of the IBA and support a diverse bird assemblage, including several Priority Species; these communities should be maintained and restoration opportunities pursued. The forest communities in the IBA also support several Priority Species; however, opportunity for those species is significantly higher at other sites farther downstream along the Wisconsin River and throughout the Driftless Area. Forest habitats should be maintained but not be targeted for restoration or additional management, except perhaps in the Lower Baraboo River Floodplain Forest, which needs more evaluation.

Overall, our process recognizes the following lowland habitat associations as highly significant for management in the Leopold-Pine Island IBA floodplain: Black Oak Forest, Shrub Carr, Native Grassland, Oldfield, Marsh and Grass Hay. Highly significant upland habitat associations include Cutover or Burned Over Forest, Shrubby and Non-shrubby Oldfield, Native Prairie and Grass Hay. Upland and lowland Savanna and River Barrens have high potential significance if expanded.

The bird survey data also allowed us to characterize the bird community on the various properties making up the IBA and to examine what each property could contribute to this overall vision.

In general, the PT provides special opportunities to manage for moderate to large tracts of upland native and surrogate grasslands on dry to mesic sites, with the unique possibilities of grazing and late-harvest haying as management tools. It also includes floodplain forest with little likelihood for conversion to savanna or more open habitats, and little economic need for logging, so this presents a good opportunity for developing a moderately sized tract of old-growth floodplain forest. The river along the PT also provides the best roosting habitat for migrating and non-breeding Sandhill Cranes anywhere within the IBA and a much longer extent of the river.

The LMR offers excellent opportunities for a mosaic of floodplain forest, savanna and barrens, and open wetlands contiguous with grassland, shrub, savanna and oak woodlands in the uplands.

The VWT, though small, has high quality meadow, marsh, lowland shrub and black oak communities similar to those of the surrounding PIWA, and appropriate management of either tract increases the significance of the other.

The large acreage of PIWA is almost entirely within the floodplain, with existing examples and potential for open and semi-open lowland communities and habitats, including grasslands, marsh, savanna and barrens. This area's large extent allows for valuable transitional forest (e.g., aspen) and shrub communities in conjunction with ongoing grassland, savanna and marsh management.

The BRWPA occurs in the downriver part of the IBA on more finely textured wetland soils. This area lacks any aspect of barrens or dry prairie that characterizes at least parts of each upriver area. Its main value to the IBA is in extensive marsh impoundment and grassland restorations. It also has some potential for expanding the floodplain forest corridor that connects with the adjacent LBRFF.

On the fine sediments of the Baraboo River delta at the downriver end of the IBA, the LBRFF provides the greatest potential for area-sensitive floodplain forest birds in this IBA. Though not included in the systematic bird counts that helped evaluate the remainder of the IBA, other data indicate this to be a significant floodplain forest community, despite its separation from the more extensive floodplain forest systems of the Lower Wisconsin River.

The following is a more detailed discussion of the plant-bird communities for each area within the Leopold-Pine Island IBA. This discussion represents current or potential management that is or could be beneficial to our Priority Species. Many bird species in addition to our Priority Species are mentioned in this discussion to provide example and demonstrate how these recommendations provide for dozens of other species; **Priority Species are in bold type.**

PHILL AND JOAN PINES TRACT

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

The Pines Tract is a working farm with some recent prairie, wetland and floodplain forest restorations. Thus, in comparison with other areas of the IBA, land use past and present dictates current habitat and community distinctions more so than upland-lowland ecosystem boundaries. Each of the three major categories of land use (forest, grassland and cultivated fields) occurs on both wet and dry soils. However, the lowland-upland distinction is critical to planning potential land cover, and surveys of soils and vegetation are needed to establish this boundary.

Lowlands are affected by a man-made levee that blocks overland flow along the eastern, downriver half of the floodplain but does not prevent flooding through groundwater upwelling. Lewiston Creek drains wetlands to the north, and bisects the property as it flows to the Wisconsin River. Historically, this creek was straightened to flow directly south through the PT. Recently it was returned to its natural streambed and now flows much farther to the east before entering the Wisconsin River, and a small wetland pool was scraped along its course. This recharged the water stores in hundreds of acres of swamp white oak and silver maple floodplain forest—the most extensive tract in the IBA outside of the LBRFF. Near the east end of the forest is a stand of oak with impressive supercanopy white pines, mixed with oak and terrace barrens by the river. The forest has some patches of aspen, mostly at the edges and in small stands among more open habitats farther from the river. A few upland oak woods and conifer plantations also are scattered among these open areas.

Adjacent to the floodplain forest and scattered farther from the river are open wetlands, including some small marshes, shrub swamps, sedge meadows, and both open and shrubby oldfields. The largest part of the tract is in open upland communities, including row crops, grass-dominated hay, some prairie restoration, and several oldfields with varying amounts of shrub encroachment. These sites range from sandy and well-drained, to finer, moister soils, often grading into lowlands. Although there are some large open tracts, most are fragmented by hedgerows of trees or shrubs, woodlots, a narrow county highway, two farmsteads, a few scattered homes, and a shooting range.

CURRENT AND POTENTIAL BIRD COMMUNITIES

PT is characterized by diverse and abundant grassland birds, which reflect the diversity and extent of the area's grassland habitats. The sparse oldfield vegetation or thin hay of well-drained, sandy sites provide for species like **Grasshopper Sparrow** while thick hayfields support **Bobolinks** and **Savannah Sparrows**. **Vesper Sparrows** breed where there is plenty of bare soil in sparsely vegetated grasslands, new prairie plantings, and cultivated fields. **Dickcissels** occur where grasses are mixed with tall, stiff forbs such as some oldfields and roadsides. **Eastern Meadowlarks** are more numerous here than on any of the other areas, in a wide variety of extensive grassland habitats. Clay-colored Sparrow has an interesting habitat distribution in Wisconsin, nesting abundantly in grasslands and barrens of central and northern Wisconsin; but in the south, rarely in large shrubby grasslands and most often in young conifer plantations, as it does at PT. **Field Sparrow** is fairly common in these plantations and in several other grasslands with some woody growth, especially shrubby oldfields and open river terrace barrens. So far, the PT lacks the large tracts of high-density grass and well-developed residual material necessary for **Henslow's Sparrow** and **Sedge Wren**. The latter species was found only in a small sedge meadow along a stream, surrounded by less suitable open land.

Due to its agricultural aspect and homes, the PT has more species such as Wild Turkey, American Crow, European Starling, Horned Lark, Chipping Sparrow and House Finch than do the other areas of the IBA. But these are not very common even here.

Of the shrub-loving species some prefer wooded settings; for instance, Eastern Towhee or **Blue-winged Warbler** which breeds mostly at gradual edges of upland or floodplain forest, river terrace barrens and sometimes hedgerows that are not far from woods. Others, like **Willow Flycatcher** occur among scattered or patchy shrubs in oldfields, more isolated hedgerows, and sedge meadows.

The birds of the floodplain forest include forest interior and edge species—a group that is fairly characteristic of moderate to high quality wet-mesic forest in southern Wisconsin. At PT, the most abundant are, in order of decreasing numbers: Song Sparrow, Eastern Wood-Pewee, House Wren, Red-eyed Vireo, Ovenbird and Great Crested Flycatcher. There also are fair numbers of the Priority Species **Yellow-billed Cuckoo**, **Blue-winged Warbler** and **Wood Thrush**. Near the river, where these forests blend with oak and terrace barrens, this bird community mixes with more open-country species like **Field Sparrow** and Eastern Bluebird. The forested islands have habitats and bird communities similar to those of the mainland floodplain forest, but with fewer interior species such as Ovenbird.

Isolated lowland and upland woodlots have more species recorded in their edges than interiors, and even the interiors are dominated by generalists and edge species such as Indigo Bunting, Gray Catbird and Song

Sparrow. Conifer hedges and plantations also were characterized by common generalists, especially Chipping Sparrow.

The most significant aspect of PT's river habitats is the concentration of **Sandhill Cranes** and occasionally Whooping Cranes. The sandbars are used for roosting by migrating cranes and by non-breeding cranes during the summer. The International Crane Foundation estimates that 10% of Wisconsin's cranes stage here during fall migration (Jeb Barzen, pers. comm.).

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

On this and other privately owned tracts, the landowner's economic, recreational and esthetic needs can be accommodated simultaneously with improving bird conservation. When guided by a property-specific plan set in a regional context, activities such as grazing, haying, row cropping, logging, restoration of wetlands and native vegetation, "hands off" policy, and even benign neglect can all be used to advantage. The following management recommendations are made with that understanding.

From the perspective of the entire Leopold-Pine Island IBA, the PT has special opportunities primarily for grassland and open shrubland birds on the northern 2/3 of the property, for floodplain forest and river terrace birds on the southern 1/3, and for staging cranes along the river. Overall, the habitats identified as having the greatest opportunity for management on the PT (Tables 10 & 11) are swamp white oak forest, floodplain and upland native grasslands, grass hay, and river.

The PT's potential for open-country birds will be realized to the extent that grasslands are conjoined into large tracts unfragmented by hedges and woodlots. Also, that a diversity of grassland habitat associations (e.g., sparse dry prairie, tall mesic prairie, dense sedge meadow, etc.) is developed in accordance with soils, site characteristics and management constraints. This diversity can include working land, native plant community restorations and managed, uncropped surrogate communities like oldfields. It should be noted, surrogate grasslands may provide the structure that grassland birds need but typically provide little for other plant and animal diversity. These areas should be considered for conversion to native vegetation types.

Because hedgerows are known to serve as corridors for nest predators and competitors, these should be removed, especially in areas where they fragment large open tracts. Similarly, the upland and lowland woodlots in the northern 2/3 of the tract could be opened to provide savanna-like conditions, or harvested and replaced with grassland or shrubby habitats. Peninsulas of forest, such as those projecting into a hayfield in the northeastern part of tract, would be high priority for removal. In general, shrubby areas suitable for species such as **Willow Flycatcher** and **Field Sparrow** could be provided as ephemeral patches among a more open landscape. Trees would be left scattered or in a few open groves.

For example, near the eastern end of the tract, a row of black locust separates a prairie restoration from a native grass planting. Removing the black locust would simultaneously eliminate an invasive species, while joining two small prairies into one that might be large enough to attract grassland birds that now do not occur in either.

Near the west end of the PT is a sandy oldfield with encroachment by red cedars and other woody species, perfectly suitable for **Field Sparrow**. Removing the cedars will tip the suitability toward more open-country species, especially **Grasshopper Sparrow**. As future cycles of brush removal are followed by inevitable reinvasion, the suitability of the site for either species will fluctuate accordingly. If this sort of dynamic occurs across many areas of the property, habitat suitable for both open and shrub-loving species will occur.

In cases where extensive grasslands border a forested block, the transition could be softened by thinning the trees along that edge, thus providing habitat for shrub-loving species such as **Blue-winged Warbler**, **Field Sparrow** and **Black-billed Cuckoo** without fragmenting either habitat block.

Conifer plantations are useful to some grassland birds until attaining a height of about 10 ft, after which they become poor habitat for any Priority Species. Existing plantations should be harvested as feasible, or they could be thinned in areas where they might add to a savanna-like structure.

Grass or mixed hay and small grains can provide excellent habitat for some grassland species, when cut after 15 July to allow nestlings to fledge. The PT has a unique opportunity within the IBA to utilize grazing as a means of grassland habitat management, useful for controlling some woody invasion and creating a variety of structures suitable for a variety of species from **Grasshopper Sparrow** and **Vesper Sparrow** to **Eastern Meadowlark** and **Bobolink**, depending on its intensity and timing, and on soil and site conditions.

To provide habitat for **Henslow's Sparrow** and **Sedge Wren**, which need thick grass or sedge cover and a well-developed mat of residual material, areas of warm-season or mixed-season grasses should be targeted on moist to mesic sites in open landscapes. In these areas, if prescribed burning is used, it should be infrequent and rotated among these fields, since it typically takes 2-4 years after burning for these species to return in any numbers.

Although row crops are generally poor habitat for all but a few Horned Larks and **Vesper Sparrows**, their value improves somewhat when they include residual material (e.g., using no-till methods) and some weeds. Waste grains and weed seeds in these fields can also provide food for Wild Turkey, Ring-necked Pheasant and some wintering songbirds, although none of these represent unique opportunities for this IBA. Cultivated fields also are useful in maintaining sites free of invasive herbs and brush prior to conversion to a more beneficial bird community.

Opening the PT landscape will improve habitat not only for grassland songbirds with rather stringent structural requirements, but also for more wide-ranging species such as the currently uncommon **Northern Bobwhite** and American Kestrel, and for Northern Harrier, which is not yet breeding here but might in the future.

The floodplain forest near the river is large and mature enough for many forest area-dependent species, but due to its relative isolation on the north side of the river, it may never provide for secure populations of **Cerulean Warbler** and **Red-shouldered Hawk**. Yet its complex of wet, wet-mesic and oak-pine forest, and terrace barrens is a significant feature of the IBA. If much of the floodplain forest at the nearby LMR and PIWA is managed toward savanna and barrens communities, and if timber production is not a priority on the PT, then this forested tract may be the best opportunity to develop old-growth forest. This would be useful to many forest Priority Species. However, management decisions would still be necessary, especially regarding if and how to maintain semi-open barrens, white pine, and oak in the tract, and the control of exotics, especially buckthorn and garlic mustard. To lessen the risk of invasion by locust trees and exotic herbs and shrubs, man-made openings near the western end of the tract probably should be planted with appropriate native trees or shrubs.

Little management is needed on the islands for birds. However for the sake of this important **Sandhill Crane** staging area, human disturbance should be minimized as much as possible during migration periods, especially around the larger complexes of sandbars traditionally used as roosts.

LEOPOLD MEMORIAL RESERVE

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

It is helpful for discussion and land management planning to divide the Leopold Memorial Reserve into upland and lowland ecosystems, with the separation at an elevation of approximately 810 ft above sea level.

The upland ecosystem is relatively drier, with well-drained, nutrient-poor soils. Prior to settlement, periodic fires played over the natural mosaic of site conditions, soils and exposures to create a suite of plant communities, such as sand prairies, dry prairies, dry-mesic prairies, oak openings (savannas) and oak woodlands, including ephemeral patches of shrubs and sapling growths. These communities benefited from repeated disturbance, and after settlement they were maintained to various extents by grazing, fire and cutting, while some sites were transformed into woods, agriculture and surrogate grasslands.

The lowland ecosystem also developed primarily on well-drained, nutrient-poor soils but was likely maintained through annual river flooding and groundwater influences. The presence of water, small

differences in elevation, historical changes in the path of the river and, therefore, succession, created a complicated pattern of plant communities. The more recently abandoned channels of the Wisconsin River support wet floodplain forest characterized by silver maple and sometimes river birch. On adjacent but slightly higher ground or river terraces is swamp white oak savanna, oak-pine forest, and mixed hardwoods of swamp white and black oaks, yellowbud hickory, black cherry, green ash, American elm, and hackberry. Higher or at least more recently formed sand terraces support oak barrens. The areas of the reserve that historically were kept open through marsh haying have emergent marsh, wet prairie, and mesic prairie. These areas undisturbed by fire or haying have begun to support more shrub carr. There are a few areas that have open water, supporting submergent plants.

The well-drained, nutrient-poor soils that cover the upland and lowland ecosystem create a “ceiling” with respect to the potential for these communities. For example, these poor soils likely will not support large expanses of wet floodplain forest, as found in the LBRFF or lower reaches of the Wisconsin River.

CURRENT AND POTENTIAL BIRD COMMUNITIES

The floodplain forest complex of LMR includes generalist species typical of southern and central Wisconsin floodplain forest: Great Crested Flycatcher, Northern Cardinal, Baltimore Oriole and Blue-gray Gnatcatcher, with Song Sparrow, House Wren, Warbling Vireo and Common Yellowthroat more abundant among silver maple, and Eastern Wood-Pewee and Ovenbird more so in oak and oak-pine dominated sites. Scattered throughout the floodplain forest are pockets suitable for **Yellow-billed Cuckoo**, **Blue-winged Warbler** and **Wood Thrush**.

A small breeding population of Blue-headed Vireo, rare in southern Wisconsin, occurs in the IBA only in an area of mature oak and white pine in the LMR floodplain. Because it has much higher populations northward in Wisconsin and is not suffering population threats, it is not a Priority Species, yet its presence here nonetheless is significant in that it indicates the affinity of this stand to mature oak-pine forest in the Central Sands.

Small areas of river barrens and floodplain oak savanna are characterized by Song Sparrow and a combination of forest and shrub species such Blue-gray Gnatcatcher, Rose-breasted Grosbeak, Cedar Waxwing, and—the only Priority Species—**Field Sparrow**. If expanded, these communities may attract additional **Red-headed Woodpecker** and **Blue-winged Warbler**.

LMR’s complex of high quality open wetlands supports many species: **Sedge Wrens** in sedge meadow; **Marsh Wren** and **Swamp Sparrow** in marsh; **Willow Flycatcher** and **Swamp Sparrow** in shrub swamps and shrubby sections of meadows. Most of these species, and their diverse and abundant cohorts, would benefit from removal of dense shrubs and trees that fragment these communities.

LMR upland communities are fragmented woodlots, conifer plantations, hedges, prairie plantings, agriculture and oldfields, often with sharp boundaries. Thus they currently support very few Priority Species, most of which require larger tracts or gradual ecotones between woody and nonwoody habitats. For example, woodlots had very few Priority Species, and these occurred mostly at the woods edge or in one tract that had been cut and burned into a habitat dominated by shrub and snag. Restored prairies and surrogate grasslands are too small to attract Priority Species and are dominated instead by common forest edge birds such as Song Sparrow and Chipping Sparrow, with an occasional shrub-loving Priority Species such as **Field Sparrow** and **Vesper Sparrow**. There are good opportunities for Priority Species in grassland and shrub-savanna habitats in this upland landscape if it is restored to a mosaic of shrub, savanna, prairie and surrogate grasslands.

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

Without conscious management effort, the mosaic of lowland plant communities probably will continue, although woody succession will likely increase. To maintain the diversity of native plant and animal species and communities, and benefit Priority Species, some management is advisable. For example, increasing the amount of oak barrens and oak savanna in the floodplain would be of value to several shrub-savanna species (e.g., **Blue-winged Warbler**, **Field Sparrow**, Eastern Towhee), while maintaining habitat for many of the forest species (e.g., **Yellow-billed Cuckoo**, Yellow-bellied Sapsucker, Eastern Wood-Pewee, Mourning Warbler) that also breed in savannas. The oak barrens are encouraged in areas that are recently formed land near the river, and extremely well-drained. The oak savannas could be expanded on the river terrace above the wet floodplain forest where swamp white oak and black oak are present. Floodplain forest remains a valuable community, and inevitably will persist in wetter sites, even if savanna and barrens restoration is extensive. Some effort should be made to maintain a component of mature white pine-oak in this savanna-forest floodplain.

It is critical to maintain herb-dominated communities, including sedge meadow, wet prairie, wet-mesic prairie, and emergent marsh. Invasive species such as reed canary grass and Canada thistle are important to suppress, prevent from spreading, and hopefully replace with native vegetation in time. Shrub carr is important to maintain, but likely will be sufficiently present without specifically managing for it.

In the uplands, nicely restored prairies are not contiguous, but typically separated by wooded areas. These wooded areas should be evaluated as forests and could be much reduced to create more continuity among restored prairies, savannas and surrogate grasslands. Lines of trees or shrubs that bisect grasslands in the uplands or lowlands should be eliminated or reduced significantly. Wooded slopes at upland-lowland transitions also should be converted to grasslands or much reduced.

Overall the suggested management is for a mosaic of communities that follow site, soil and moisture conditions: floodplain forest, savanna and river barrens north of Levee Road; marsh, sedge meadow, wet prairie and shrub carr in the floodplain south of the road; and grassland, shrub, savanna, oak woodland communities in the uplands, continuous with the open wetland communities of the adjacent floodplain.

VAN WORMER TRACT

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

This 323-acre tract is the smallest of the 6 main areas of the IBA. It has fewer plant communities than PIWA, which surrounds it, although these include some of especially high quality. North of Levee Road is the Van Wormer home and 40 acres of woods which at the time of the 2005 survey had been recently cut, leaving about 30% canopy cover, mainly black oak, and an understory primarily of slash, black raspberry and forest herbs. Immediately south of the road is a plantation of 20-ft tall spruce, with some disturbed soil and small old borrow pits, and a stand of young aspen and shrubs.

The remainder of the tract between here and the interstate includes a high-quality mixture of mature black oak woods, aspen groves, some silver maple-river birch, sedge meadows and shrub swamps and small marshes with very little sign of disturbance or invasive plants. The sedge meadows and marshes have almost no reed canary grass, and support a high diversity of native sedges, grasses, forbs and emergents. The aspen groves tend to have an open understory of sedges, bluejoint grass and sensitive fern.

CURRENT AND POTENTIAL BIRD COMMUNITIES

This tract has no grasslands other than some small meadows of sedges and bluejoint, and thus very few Priority Species representative of this community; a **Field Sparrow** recorded in shrub carr, another in the conifer plantation, and a **Sedge Wren** in a sedge meadow. Found in shrub carr, Other Priority Species are **Swamp Sparrow** and **Willow Flycatcher**. In general, the tract is characterized by fairly common species of wetland forest edge and shrub communities, and overall, the most abundant species were Common Yellowthroat, Song Sparrow, **Swamp Sparrow**, Brown-headed Cowbird and Yellow Warbler. Some Candidate Priority Species occurred in low numbers, e.g., Hooded Merganser, Least Flycatcher and Yellow-throated Vireo. Belted Kingfishers traditionally nest in banks of the borrow pits, as one did in 2005.

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

Native floodplain grassland (including sedge meadow) and native shrub swamp are identified as special opportunity habitats for the VWT. Their potential for Priority Species on this tract is moderate and relies

mostly on opening up some of the wooded areas adjacent to PIWA, increasing the effective size of these habitats. However management should consider and complement the high quality native plant communities here, at least in the southern ¾ of the property. For example, heavy equipment and heavy cutting should be avoided, and beneficial practices might include fire, hand-cutting of brush, and some selective harvest of canopy trees to create black oak barrens. It is important to avoid introducing exotic invasive plants into this tract (e.g. reed canary grass, garlic mustard, etc.).

Management of the floodplain forest north of the road so far complements that of the nearby savanna and barrens restoration on PIWA. Fire or other treatment of understory vegetation here would improve the site's value to bird conservation, expanding the true savanna and barrens. The spruce plantation, while providing cover for deer, turkey and other wildlife, does little to promote breeding habitat for Priority Species. Over time, it could be removed or converted to either grassland or more open oak woods.

PINE ISLAND WILDLIFE AREA

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

This is the largest property on the IBA and is mostly within the floodplain. Extending along its entire 7-mile length runs a levee constructed in the 1890s, and narrow Levee Road. The levee is adjacent to the river except in the western third of the property, where it lies as far away as ½ mile. The levee reduces overland flow of flood waters, yet much of the property is seasonally wet due to rising groundwater. Its 5,700 acres are divided roughly equally among forest, open wetland and open grassland, with a few acres under cultivation. About 15% of the property lies south of I-94, and some of this is within the floodplain of the Baraboo River.

Floodplain forest covers most of the area north of the levee, and smaller, younger tracts occur south of it. Most of this forest north of the levee is within the Pine Island State Natural Area and is in various stages of restoration to swamp white oak savanna and black oak barrens, much of it characterized at the time of the 2006 survey by a semi-open canopy where trees had been cut, and by considerable down woody debris. Substantial silver maple remains in parts of this restoration area, especially in wet places. Pine Island itself is a 260 acre river island, formerly containing a stand of large white pines until it was removed in the early 1900s. Now the island is a high quality swamp white oak savanna and woodland.

The small stands of floodplain forest south of the levee are dominated variously by silver maple, quaking aspen, black oak, swamp white oak, black locust and green ash. American elm was a prominent species in some of these tracts, which have become shrubby since its demise to Dutch elm disease over the past 40 years. The most extensive forest south of the levee is at the west end of the property, where it is continuous northward except for the road and levee's narrow interruption. South of the interstate are

some knolls covered with upland oak woods, and there is some silver maple forest primarily within oxbows of the Baraboo River.

Though almost entirely within the floodplain, open habitats of PIWA are extensive and diverse because of slight variations in topography and soils, and differences in land use history. Small marshes and sedge meadows tend to be of high quality, with diverse plant communities and little invasion by reed canary grass. These grade into drier sedge meadows, shrub swamps and shrubby young woods. On slightly higher, sandy ground are prairie restorations and oldfields with substantial cover of native species. Some large fields—formerly planted to corn and small grains to attract migrant Canada Geese and other waterfowl—have been planted to native vegetation. Southward, closer to the Baraboo River, some fields have richer soils and are characterized by more mesic prairie restorations, reed canary grass, and leased croplands. Altogether, south of the levee, there is a diverse mosaic of habitats ranging from open to slightly and heavily shrub-invaded grassland and marsh, open shrubby woods, and closed-canopy floodplain forest. Some of the grass and shrub-dominated areas are open to dog training and field trials, even during the nesting season.

CURRENT AND POTENTIAL BIRD COMMUNITIES

The vast size and diversity of plant communities on PIWA is attested by the fact that most (60 of 114) species recorded on the formal IBA counts had higher numbers here than on any other area. Notable exceptions include, for example, **Eastern Meadowlark** on the PT, **Red-headed Woodpecker** at LMR and many marsh birds at BRWPA. The diversity and extent of grasslands at PIWA is reflected in large populations of species such as **Sedge Wren**, **Grasshopper Sparrow**, **Field Sparrow**, **Henslow's Sparrow** and **Bobolink**, whose habitat preferences run the gamut from sparse to thick to slightly woody. Species requiring open soil (Horned Lark, **Vesper Sparrow**) are rare at best. It also had the highest numbers of almost all forest and shrub birds, especially those that prefer shrubby growth with some trees or saplings present, e.g., American Woodcock, Alder Flycatcher, Yellow Warbler, **Blue-winged Warbler** and Eastern Towhee.

PIWA's open and slightly shrubby floodplain grasslands and sedge meadows are the area's greatest asset to the IBA. It is the only area, thus far, with large numbers of **Henslow's Sparrow**. As noted above, its vast open aspect and mixture of wet to dry sites provides habitat for high numbers of many grassland and shrubland birds.

Wetlands here are not as extensive as at the BRWPA, yet the list of wetland birds is substantial, including **Blue-winged Teal**, rails, herons and **Marsh Wren**. Although the **Black Terns** found here did not nest in 2005, there is limited habitat that probably is suitable in some years.

PIWA has more habitats with high management opportunities than any other area within the IBA (Tables 16, large X in the cumulative emphasis row of Table 16). These 11 habitats are all within the lowland ecosystem, and include all the open, shrubby and savanna-like floodplain associations, as well as aspen and black oak forest.

PIWA floodplain forests are characterized, in order of decreasing numbers, by Song Sparrow, Eastern Wood-Pewee, Red-eyed Vireo, American Redstart, Ovenbird, **Wood Thrush** and House Wren. Within this forest community, black oak and aspen forests have especially high numbers of **Wood Thrush** and **Veery**. In river terrace and oak barrens the most common birds are Song Sparrow, Blue-Gray Gnatcatcher, House Wren, Brown-headed Cowbird and American Robin. The well developed, native swamp white oak savanna on the Pine Island has similar species predominating as in barrens and forest, but with fewer shrub-loving species such as Song Sparrow and House Wren, and relatively more Eastern Towhee.

Floodplain forest that was recently cut and burned to help return it to savanna and barrens was categorized in the surveys as cutover and burned over and the bird community was dominated by birds that typify shrub and slash, more than birds that typify forest or established savanna. In decreasing order, the most commonly recorded birds were Song Sparrow, Yellow Warbler, Common Yellowthroat, Brown-headed Cowbird, Gray Catbird, House Wren, Eastern Towhee and American Redstart. This community is transitory and with continued management probably will approach that of Pine Island. With the increased extent, and development of a more open-grown tree canopy, the savannas may attract more Priority Species such as **Red-headed Woodpecker**, **Yellow-billed Cuckoo** and **Blue-winged Warbler**.

The 7-mile stretch of river, with its islands and shorelines is a significant feature here, and provides for many non-breeding birds such as gulls, as well as breeders like the Spotted Sandpiper, Northern Rough-winged Swallow and Bald Eagle (which nested just off-river on this property). Its sandbars serve as roosting sites for the IBA's large population of breeding, non-breeding and migrant **Sandhill Crane**.

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

The great size and potential of PIWA comes with equally large challenges. Among them are controlling the perpetual invasion by woody plants and exotics, and managing for a variety of human uses ranging from hunting and dog training, to forestry, hiking and nature study. Our management recommendations, while directed toward maximizing the value of the property and the entire IBA for bird conservation, fit well with most other goals of PIWA for human use and wildlife conservation.

In general, the area's importance for bird conservation lies in its size and the variety of sites with mostly natural, gradual ecotones. Of specific importance are the open, shrubby and savanna-barrens communities that blanket its floodplain. Of secondary importance are its early and late successional

floodplain forests, especially those dominated by aspen or black oak, and perhaps the sections of mature silver maple and swamp white oak forest protected in wet areas north of the levee, within the savanna restoration area.

Primary among our recommendations is to maintain and increase the openness of the property, especially in the central ¾ of the property north of the interstate, while allowing pockets and small stands of shrubby habitats and early successional forest. Consistent with recommendations for other properties, these woody patches should not fragment the open grasslands and wetlands, and may be characteristically ephemeral qualities of the managed, dynamic landscape. Woods, hedges, and thick shrub patches that currently fragment the larger grasslands and marshes should be high priority for removal or thinning.

Natural variation in topography, soils, and other factors should be used to advantage to provide for a diversity of open habitat structures and compositions, including all those that currently exist here. Fire and cutting should be planned and executed carefully. Not all Priority Species respond favorably to frequent fires. For example, **Henslow's Sparrow** and **Sedge Wren** require dense vegetation and accumulated thatch, only achieved with a fire rotation of at least 3-4 years.

Restoring oldfields to native grasslands has advantages, especially for other native plants and animals. However, the existing surrogate grasslands are very valuable for Priority Species breeding, and conversion need not be high priority except where there are issues with invasives (e.g., reed canary grass), or where a particular field is found to provide poor grassland bird habitat. Conversion of cropland may be a higher priority, and directed toward native habitats that will complement those adjacent. Efforts to increase and improve grassland bird habitat are probably best focused in areas where dogs are not being trained during the nesting season.

Management of floodplain forests both north and south of Levee Road should continue, with the goal of restoring semi-open barrens, savanna and woodland where feasible (especially adjacent to open grasslands and marshes), and some patches of aspen and black oak forest. Because of an active burn program and timber harvests, aspen will continue to be maintained throughout the property without direct effort. The potential for forest interior habitat is minimal and better provided at LBRFF, as well as farther downstream along the Lower Wisconsin River, and in the nearby Baraboo Hills. However, many Priority Species of savanna and shrub, as well as some attributed more often to forests (e.g., **Yellow-billed Cuckoo**) also will do well in large tracts of savanna and woodland. **Red-shouldered Hawk** may disappear from the PIWA as a result, or may remain in patches of wet, more heavily canopied savanna-woodland with large trees. To the extent feasible, the few upland woods of the tract also should be opened to savanna or woodland conditions, to the benefit of the significant bird communities in nearby open

habitats. Some consideration may be given to expanding the floodplain forest corridor along the Baraboo River, if this also were to occur in the private lands outside the IBA, between PIWA and BRWPA.

As with the adjacent PT and LMR, the river itself should be managed as feasible to minimize human disturbance at traditional **Sandhill Crane** roosting sites during fall migration.

BARABOO RIVER WATERFOWL PRODUCTION AREA

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

This 846-acre tract was thoroughly ditched, drained and cultivated until 1997, when a Wetlands Reserve Program project was initiated between the NRCS and 6 private landowners. The tracts were eventually purchased and managed by USFWS. Between fall 2001 and 2003, about 300 acres were planted to native grasses and wet prairie vegetation, mostly in the northwestern half of the BRWPA. Shallow wetland scrapes were constructed in one restoration unit. During 2002-2003 a 230-acre impoundment was developed and filled in the southeastern part of the tract. Throughout, ditches were filled, ditch bank trees and shrubs removed, and the banks leveled.

To the west of the BRWPA rise the forested Baraboo Hills, to the north and east, the forested LBRFF, and to the south, mixed agriculture and woodlots. Major 4-lane Interstate highways 90-94 and 39 run along two borders.

In 2006 when the surveys for this report were last done, the grass and prairie plantings were in various stages of development, and with varying success. Some wet areas had been overtaken by reed canary grass, others were still in a weedy, early stage of development, and still others were becoming well established with native grasses, sedges and forbs. Unplanted fields also were in various states, from pure reed canary grass to more diverse mixes of native and exotic grasses and forbs. Some unplanted fields experiencing some shallow flooding near the upper end of the impoundment had developed into native sedge meadow and shallow marsh characterized by coarse sedges, tussock sedge, arrowhead, river and softstem bulrushes, and water plantain. There was slight invasion of some grasslands by quaking aspen, cottonwood and willow. The impoundment contained some open pools and areas dominated by dead standing willow shrubs and scattered dead trees, and much hemi-marsh (approximate 50:50 mixture of open water and emergent vegetation). Common emergents included sedges, river and softstem bulrush, cattail and burreed. The few upland woodlots mostly had been thinned to begin restoration to oak savanna and woodland. At the far south end of the WPA was a mixture of willow shrubs, marsh, wetland scrapes, and prairie restoration.

Along the Baraboo River at the edge of the WPA is floodplain forest dominated by silver maple with some green and white ash, hackberry, river birch and swamp white oak. Although the WPA includes only a fringe of forest on the south side of the river, the extent of forest is greater on the north side, thus the breadth of this corridor varies from about 100 yds. to ¼ mile. On the north side, the 22-acre Baraboo River Floodplain Forest State Natural Area recently was added to the WPA, but for this report we have assigned it to the LBRFF.

CURRENT AND POTENTIAL BIRD COMMUNITIES

Although the bird survey data used for comparisons with other areas of the IBA were collected in 2006, we also ran the same transects and point-counts on the WPA in 2001, before most restoration had begun, and in 2003. The results (Table 20) document some of the effects of these early stages of restoration. In 2001, only one of the fields had been planted (fall 2000), and all were in various stages of weedy succession, mostly with sparse growth and substantial bare soil. As more fields were planted and all fields developed into thicker cover of native or weedy grasses and forbs, the bird communities changed correspondingly.

Table 20. Population trends for selected species as a response to restoration at the BRWPA, 2001-2006.

Species	Number of Individuals Counted, by Year		
	2001	2003	2006
Pied-billed Grebe	0	1	6
Least Bittern	0	0	6
American Coot	0	9	6
Willow Flycatcher	36	16	10
Horned Lark	6	0	0
Sedge Wren	0	7	25
Marsh Wren	0	32	62
Yellow Warbler	39	31	9
Vesper Sparrow	6	1	0
Grasshopper Sparrow	21	37	0
Henslow's Sparrow	0	0	5
Swamp Sparrow	19	22	29
Bobolink	3	54	23
Yellow-headed Blackbird	0	15	26

Thus, grassland species such as Horned Lark, **Vesper Sparrow** and **Grasshopper Sparrow** disappeared, preferring bare soil or sparse vegetation. Others that require thick vegetation and well-developed, dead residual material, like **Sedge Wren** and **Henslow's Sparrow**, appeared and increased. **Bobolink** increased as grassland developed, then declined somewhat in the fields where **Sedge Wren** and **Henslow's Sparrow** appeared, perhaps because the grass had become too thick for them.

With the removal of hedges and inundation of some shrubby sites, **Willow Flycatcher** and Yellow Warbler numbers declined. Because of **Swamp Sparrow's** trimodal habitat preference for lowland shrubs, dense warm-season grass, and cattails, its breeding population here was able to shift from hedgerows and other shrubby sites to the newly established grass and marsh habitats.

The filling of the impoundment, and development of excellent hemi-marsh conditions, attracted many wetland species such as Pied-billed Grebe, Least Bittern, American Coot, **Marsh Wren** and Yellow-headed Blackbird. Other species known to breed in or along the impoundment include Wood Duck, Mallard, Hooded Merganser, Osprey, Green Heron and **Black Tern**. Ruddy Duck and Common Moorhen occur regularly during the breeding season and almost certainly nest here as well. Northern Shoveler and Green-winged Teal have been found less regularly during the breeding season, but may breed. Species whose habitats were inundated by the impoundment were mostly common edge birds such as Warbling Vireo and Song Sparrow, for which habitat abounds in the surrounding landscape.

Floodplain forest birds found on the BRWPA generally are common species but include some Priority Species, notably the only **Cerulean Warbler** recorded on surveys outside the LBRFF. The value of this forest corridor depends largely on its connectivity with the LBRFF and Baraboo Hills, and with the extent and quality of the forest both within and adjacent to the BRWPA.

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

Management of the 400-acre grassland in the northwestern part of the BRWPA should continue, with the goal of providing a range of habitat structures suitable for these moist, rich soils. These undoubtedly will be fairly dense grasslands, although structural diversity within and between management units can be encouraged by varying burning or cutting regimes, grass-forb planting ratios, planting schedules, and by the creation of wetland scrapes. The greatest challenge may be to limit reed canary grass invasion.

Remaining hedges should be removed as feasible, except in areas where forests may be expanded to meet them as discussed below. Woody succession is to be expected, especially near woods and at former ditch banks. These patches or scattered individuals of shrubs, seedlings, and occasionally trees, should be an ephemeral and shifting aspect of the grassland landscape, or can be more permanent if contained, but they should not seriously fragment the large grasslands. These shrubby sites can provide essential habitat

for **Willow Flycatcher** and Bell's Vireo (one of which was found here in 2003), and near woods, for **Blue-winged Warbler**. Other suitable shrub patches will likely develop along the edges of the impoundment.

The BRWPA's narrow floodplain forest corridor has value to Priority Species to the extent that it is broadened both within the BRWPA and on adjacent properties, and by the health and extent of the adjacent LBRFF and Baraboo Hills. The significance of this corridor is illustrated by the **Cerulean Warbler** found in it. We suggest widening this corridor within the BRWPA, by reforesting the small adjacent fields that are isolated from the larger grasslands by forested oxbows and ditch banks. These fields primarily are in reed canary grass and will be difficult to restore to native or more diverse surrogate grassland anyway.

LOWER BARABOO RIVER FLOODPLAIN FOREST

It should be noted that the authors' relationship to this area and its landowners is different than in the other principle areas of the IBA. The principle areas represent a "core" for bird conservation because the land is contiguous and publicly owned conservation land or privately owned with landowners engaged in conservation practices or working with the authors prior to the survey. The LBRFF is a large block of forest that is adjacent to these public conservation areas. The IBA program creates an opportunity to recognize land for its capacity to support bird diversity. This area represents an opportunity for the principle partners in the Leopold-Pine Island IBA to engage in conversation with landowners in the LBRFF. Recommendations presented here carry no expectations.

CURRENT ECOSYSTEMS AND PLANT COMMUNITIES

This large area covers at least 4,000 acres of floodplain near the confluence of the Baraboo and Wisconsin Rivers, comprising extensive floodplain forest along the rivers, a mixture of active and formerly ditched and drained agricultural lands, oldfields, advanced woody succession, and managed woodlots with substantial connectivity. It includes a forested corridor of varying breadth upstream as far as the BRWPA.

The floodplain forest is dominated variously by silver maple and more wet-mesic species such as swamp white oak, white and green ash, hackberry and basswood. A 22-acre State Natural Area has especially mature wet-mesic forest. River birch is fairly common along the river courses and the abundant sloughs and oxbows. More work is needed to describe the communities and habitats here.

CURRENT AND POTENTIAL BIRD COMMUNITIES

Although no transects have yet been run across this area, previous canoe surveys along the Baraboo River and its sloughs document a rich breeding bird community (Table 3) characteristic of large, wet floodplain forests. Candidate Priority Species include Hooded Merganser, **Red-shouldered Hawk**, **Yellow-billed Cuckoo**, Eastern Wood-Pewee, Yellow-throated Vireo, Northern Rough-winged Swallow, **Wood Thrush**,

Prothonotary Warbler, Mourning Warbler and Baltimore Oriole. The most abundant birds recorded on surveys along the river were (in order of decreasing numbers): House Wren, Cliff Swallow (from colonies under the three highway bridges), Song Sparrow, Baltimore Oriole, Great Crested Flycatcher, Eastern Wood-Pewee, Red-eyed Vireo and American Robin. There are relatively fewer birds of species such as Ovenbird and **Wood Thrush** that help characterize the drier IBA floodplain forests along the Wisconsin River. Other characteristic southern Wisconsin floodplain forest species are well represented, e.g., Wood Duck, Barred Owl, American Redstart, Red-bellied Woodpecker, Pileated Woodpecker, Brown Creeper, Blue-Gray Gnatcatcher, Warbling Vireo, American Redstart, and a nesting colony of Great Blue Heron.

Yellow-crowned Night-Heron apparently nested here at least into the 1980s and may still. This state-threatened bird rarely is found in the state, usually in the largest complexes of floodplain forest, such as locally along the Lower Wisconsin River.

POTENTIAL PLANT COMMUNITIES - RECOMMENDATIONS FOR MANAGEMENT

This tract differs from others in the IBA in its extensive floodplain forest, which is on richer soils and with many oxbows and sloughs. It defines the southern end of this IBA's transition from the Central Sand Hills to Western Coulee and Ridges Ecological Landscapes. Preliminary surveys suggest a high value for floodplain forest interior specialists and generalists, and that this probably is the most significant feature of the area. Reforestation of tracts now in oldfield or agriculture likely will be advisable, especially to broaden the forested corridor along the river between the block of forest on the delta, and upstream to the BRWPA and Baraboo Hills. However, further study and landowner contact is required before any recommendations can be made. No areas away from the river have yet been surveyed, and there probably is high potential for forest and wetland restoration. Some landowners already are engaged in such projects. Bird surveys were precluded by floods in 2008, and are planned for 2009, through landowner contacts established by WDNR Forester Jim Bernett.

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APPENDIX A

DEFINITIONS OF PLANT COMMUNITIES AND HABITAT ASSOCIATIONS RECORDED WITHIN THE LEOPOLD-PINE IS IBA

Communities and habitat associations are defined by the Wisconsin Natural Heritage Inventory and the Wisconsin Wildlife Action Plan (WDNR 2008) and Wisconsin Breeding Bird Atlas (2001) as augmented by Mossman (unpubl).

Lowland Ecosystem

Floodplain Forest – This lowland hardwood forest community type occurs along large rivers, with a canopy cover > 50%. Canopy dominants vary, but may include silver maple, river birch, green and black ashes, hackberry, swamp white oak, and eastern cottonwood. Periodic floods, particularly in the spring, are the key natural disturbance event to which species of this community are adapted.

Aspen (FLHa) – Lowland forest with dominant aspen (usually quaking), associating with American elm, green ash, river birch, gray or silky dogwood, prickly ash or red raspberry.

Black Oak (FLHb) – Lowland forest type where black oak is the dominant tree species with red maple, black cherry and ilex as associates.

Black Locust Forest (FLHl) – Stands on sandy soils where the dominant tree is black locust. These stands are usually very simplistic in their herbaceous species diversity. Wood nettle and weedy forbs and grasses predominate the herbaceous layer.

Swamp White Oak (FLHw) – Lowland forest type where swamp white oak is the dominant tree species

Silver Maple (FLHs) – Lowland forest type where silver maple is the dominant tree species

Mixed Hardwood/Pine (FLMp) – Lowland forest type where pine is interspersed with hardwoods

Edge (FLHe) – The edges of floodplain forest stands, about 10 m wide.

Open, Shrubby Hardwood or Mixed (SLHMw) – Open-canopied floodplain woods (canopy 25 – 50%) with dense saplings and shrubs, succeeding from more open condition; or understory is responding

to death of American elms from disease, or other death of trees from flooding, etc. Not a result of cutting or burning. There is at least 5% white pine in canopy.

Cutover or Burned Over (SLHc) – Formerly forested lowland sites that have been heavily logged or burned and are now dominated by hardwood shrubs and saplings, sometimes with scattered trees.

Floodplain Savanna (SLHs) – It has less than 50% tree canopy cover. This is the lowland corollary to the more well-known upland oak savanna. Dominated by swamp white oak and often associating with river birch, green ash, black oak, American elm or silver maple. Understory typically contains patches of shrubs and more open areas dominated by grasses, forbs, sedges and rushes. It is likely that annual flooding was the principle disturbance that acted much in the way that fire acted in the uplands, to reduce the dominance of trees. Understory typically contains patches of shrubs and more open areas dominated by grasses, forbs, sedges and rushes that prefer wetter soils and semi-shade. Tree density was probably mitigated by annual flooding and possibly by fire in some areas.

Oak Barrens - This community occurs on outwash plains and broad sandy terraces that flank the Wisconsin River. Black oak is often the dominant tree in this fire-adapted savanna community of xeric sites (in our case, droughty, well-drained sand), but white oak, bur oak, northern pin oak, and occasionally red oak, may also be present. Common understory species include lead plant, black-eyed susan, round-headed bush-clover, goats rue, June grass, little bluestem, flowering spurge, frostweed, false Solomon's-seal, spiderwort, and wild lupine.

River Barrens (SLHb) – Barrens on sandy river terraces with scattered trees of black oak, often with river birch and other elements of the following habitat (SLHt).

Open River Terrace (SLHt) – Sandy terraces along rivers, characterized by open sand, patches of thin to moderate herbaceous cover, and scattered woody cover (e.g., river birch, willow, cottonwood, green ash, silver maple, buttonbush, dogwoods, ninebark, prickly-ash)

Shrub carr (SLHn) – This wetland community is dominated by tall shrubs such as red-osier dogwood, silky dogwood, meadowsweet, and various willows. Canada bluejoint grass is often very common. It also includes what is usually termed a “shrub swamp” community or association, dominated by alder and sometimes bog birch. Associates are similar to those found in tussock-type sedge meadows. This type occupies areas that are transitional between open wetlands such as wet prairie, southern sedge meadow, and forested wetlands such as floodplain forest or southern hardwood swamp. Shrub carr can persist at a given site for a very long time if natural hydrologic cycles are maintained. Shrub carr was often an integral

part of prairie-savanna landscapes, though it also occurred in wetlands within more forested regions. Past drainage and marsh hay mowing likely had a negative effect on Shrub carr. Once fire was controlled and hay mowing was discontinued in lowland meadows, Shrub carr likely increased in extent.

Floodplain Surrogate Grasslands – Natural grasslands or prairies have been greatly reduced and degraded throughout the Midwest, generally from farming, grazing and conversion to woody vegetation with the cessation of fires, but also from urban and suburban development. Most grassland mammals and birds fared somewhat better than native flora and insects, by shifting to surrogate grasslands such as hayfields and pastures. However, with subsequent conversion of pastures and hayfields to more row crop and alfalfa-based agriculture, many grassland birds and mammals have declined dramatically. Over the last 40 years, grassland birds have suffered more serious population declines than have birds of any other habitat group in Wisconsin and Eastern North America in general.

Surrogate grasslands now represent the vast majority of grassland habitat in the state, and some still provide structures similar to those of the native grasslands, thus providing important habitat for grassland birds.

Shrubby Lowland Oldfield (SLHow) – Lowland sites formerly in agriculture or unknown land use, now succeeding to hardwood shrubs or forest, with a substantial component of exotic plant species, especially herbs.

Floodplain Hardwood Hedge (SLHh) – Lowland hedgerows composed of hardwood trees, saplings, or shrubs, located between active or former agricultural fields or other open habitats.

Floodplain Oldfield (OLU) – The dominant vegetation is herbaceous with a substantial component of exotic species, which have not or will not, be cropped in the current year and less than 25% open water. Includes abandoned agricultural lands with less than 25% woody cover, agricultural set-aside fields dominated by grasses, legumes, or weedy forbs, and grasses planted for wildlife.

Reed Canary Grass (OLUr) – Fields or meadows with over 50% cover of reed canary grass.

Southern Sedge Meadow and Wet to Wet-Mesic Prairie (OLN) – This is a group of three communities recognized by most ecologists: southern (Wisconsin) sedge meadow, wet prairie, and wet-mesic prairie. They are combined here and in the WBBA habitat scheme because breeding bird communities do not vary markedly between these communities (Sample and Mossman 1997). They respond more strongly to the structure, extent and surroundings of individual native grassland individual tracts. Here we describe each of these plant communities:

Southern sedge meadow is widespread in southern Wisconsin. It is an herbaceous wetland community most typically dominated by tussock sedge and Canada bluejoint grass. Common associates of relatively undisturbed sedge meadows are other sedges (e.g., *Carex diandra*, *C. sartwellii*), marsh bellflower, marsh wild-timothy, water horehound, panicked aster, swamp aster, blue flag, spotted Joe-Pye weed, marsh fern, and swamp milkweed.

Wet Prairie is a rather variable tall grassland community that shares characteristics of prairies, southern sedge meadow, calcareous fen and even emergent aquatic communities. The wet prairies' more wetland-like character can mean that sometimes very few obligate prairie species are present. In wet prairie the dominant graminoids may include Canada bluejoint grass, cordgrass, and marsh wild-timothy, plus several sedge species including lake sedge, water sedge, and woolly sedge. Many of the herbs are shared with the wet-mesic prairies, but the following species are often prevalent: New England aster, swamp thistle, northern bedstraw, yellow stargrass, cowbane, tall meadow-rue, golden alexander, and mountain-mint.

Wet-mesic Prairie is dominated by tall grasses, including big bluestem, Canada bluejoint grass, cordgrass, and Canada wild-rye. The forb component is diverse and includes azure aster, Eastern shooting-star, sawtooth sunflower, prairie blazing-star, prairie phlox, prairie coneflower, prairie docks, late and stiff goldenrods, and culver's-root.

Emergent Marsh (OLWm) – These wetlands have substantial standing water and at least 25% cover of emergent, herbaceous plants. Dominants may include cattails, bulrushes (particularly *Scirpus acutus*, *S. fluviatilis*, and *S. validus*), coarse sedges, bur-reeds, giant reed, pickerel-weed, water-plantains, arrowheads, the larger species of spikerush (such as *Eleocharis smallii*), and wild rice.

River (OLWr) – This represents the Wisconsin and Baraboo Rivers, where there is less than 25% cover of emergents, less than 25% cover of woody vegetation, and greater than 25% cover open water (not closely overhung by vegetation); also, the immediate shores and open sandbars of these rivers.

Upland Ecosystem

Southern Oak Forest – This includes the NHI's southern dry and southern dry-mesic forest communities, as well as oak woodland. Oaks are the dominant species in this upland forest community of dry sites. White oak and black oak are dominant, often with admixtures of northern red and bur oaks and black cherry. In the well-developed shrub layer, brambles (*Rubus* spp.), gray dogwood, and American hazelnut are common. Frequent herbaceous species are wild geranium, false Solomon's-seal, hog-peanut, and rough-leaved sunflower.

This community type intergrades to oak woodland, which has similar canopy composition but a more open forest floor due to relatively frequent ground fires and possibly also due to grazing by elk, bison, or deer prior to EuroAmerican settlement. Oak woodland is represented in just a few sites on the IBA, and we have lumped it with oak forest for this study. Oak woodland differs from oak savanna in the limb architecture of its trees (which are not characterized by wide, spreading crowns over short thick boles), and greater crown closure (with an approximate range of 50% to as much as 95%). As presently understood, the latter attribute is not simply the result of the canopy closure that affected most savannas following the implementation of wildfire suppression policies earlier in the twentieth century. As soon as fire suppression policies were widely implemented in southern Wisconsin, the rapid proliferation of shrubs and saplings would have quickly altered stand structure, causing the open understories of the oak woodland communities to disappear. Dominant trees included white oak, bur oak, and black oak, sometimes mixed with red oak and shagbark hickory. We distinguished the following habitat associations within the oak forest community type in the IBA:

Southern Oak Forest (FUHo) – Upland hardwood forests dominated by oaks or hickories.

Edge (FUHe) – Upland hardwood forest edges.

Cutover or Burned Over (SUHc) – Formerly forested upland sites that have been heavily logged or burned and are now dominated by hardwood shrubs, saplings, or scattered trees.

Central Sands Pine-Oak Forest (FUMp) – This forest community is composed of pines and hardwoods and found primarily within the Central Sands ecoregion. With soils that are coarse-textured, sandy and found on landforms that include glacial outwash, soil moisture conditions vary from dry to borderline dry-mesic. The canopy co-dominants vary, but in older, relatively undisturbed stands they may include white and red pines and various oaks.

Oak and Mixed Oak-Conifer Savanna (SUHMn) – This is an oak-dominated savanna community in which there is less than 50% tree canopy coverage. Historically, oak savannas were very abundant and occurred on wet-mesic to dry sites. Today, very few examples of this type exist. 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. Bur, white, and black oaks are dominant in mature stands, typically as large, open-grown trees with distinctive limb architecture. In some areas, white pine, red cedar or shagbark hickory are also present. American hazelnut is a common understory shrub. The herb layer is similar to those found in oak forests and prairies, with many of the same grasses and forbs present.

Conifer Plantations (FUCp) – Upland plantations of pine or spruce, with trees at least 20 ft tall.

Upland Surrogate Grasslands – See discussion for Lowland Surrogate Grasslands.

Shrubby Oldfield (SUHo) – Upland sites formerly in agriculture or unknown land use, now succeeding to hardwood shrubs or trees, with at least 25% woody cover and a substantial component of exotic plant species, especially herbs.

Hardwood Hedge (SUHh) – Upland hedgerows composed of hardwood trees, saplings, or shrubs, located between active or former agricultural fields or other open habitats.

Young Pine Plantation (SUCp) – Upland sites that have been planted to coniferous species, usually pines or spruces, and which are less than 20 ft tall.

Upland Oldfield (OUU) – Open habitats with substantial component of exotic species, which have not been, or will not be, cropped in the current year. Includes abandoned agricultural lands with less than 25% woody cover, agricultural set-aside fields dominated by grasses, legumes, or weedy forbs, and grasses planted for wildlife.

Upland and Lowland Grass Hay (OLUAg) – Hay with less than 50% legume component, and which has or will probably be harvested. For this report we have lumped upland and lowland hay.

Upland and Lowland Cultivated (OLUAc) – Habitats that have been recently disturbed through cultivation within the current year, and are characterized by bare soil and plants less than 8" tall. We have lumped upland and lowland sites for this report.

Row Crops (OLUAr) – Corn, soybeans, potatoes, or other row crops, greater than 8 inches tall.

Sand, Dry, Dry-mesic, Mesic Prairie (OUN) – These open habitats dominated by native rather than exotic plant species include several traditionally recognized plant communities. These are:

Sand prairie is a dry native grassland community dominated by grasses such as little bluestem, June grass, panic grasses, and poverty-oat grass. Common herbaceous associates are sand cress, field sage-wort, western ragweed, several sedges (e.g., *Carex muhlenbergii*, *Cyperus filiculmis*, and *Cyperus schweinitzii*), flowering spurge, frostweed, round-headed bush-clover, western sunflower, false-heather, long-bearded hawkweed, stiff goldenrod, horsebalm, and spiderwort. Drought-adapted fungi, lichens, and mosses are significant components of sand prairie communities.

Dry prairie usually occurs on steep south or west facing slopes or at the summits of river bluffs with sandstone or dolomite bedrock near the surface. Short to medium-sized prairie grasses such as little

bluestem, side-oats grama, hairy grama, and prairie dropseed are the dominants in this community. Common shrubs and forbs include lead plant, silky aster, flowering spurge, purple prairie-clover, cylindrical blazing-star, and gray goldenrod.

Dry-mesic prairie was common historically, in parts of southern Wisconsin, occurring on slightly less droughty sites than dry prairie. Today, this community type is rare because of conversion to agricultural uses or the encroachment of woody vegetation due to the lack of wildfire. Dry-mesic prairie has many of the same grasses as dry prairie, but taller species such as big bluestem and Indian-grass dominate. Needle grass and prairie drop-seed may also be present. The herb component is more diverse than in dry prairies, as it may include many species that occur in both dry and mesic prairies. Composites and legumes are particularly well-represented in relatively undisturbed stands. Soils are often somewhat sandy, either loamy sands or sandy loams. The landscape associations that can support this type include terraces on the margins of large river valleys, sandy outwash deposits and gravelly moraines.

Mesic prairie was common historically but is extremely rare today. It occurs on rich, moist, well-drained sites, usually on level or gently rolling glacial topography. The dominant plant is big bluestem. The grasses little bluestem, Indian grass, needle grass, prairie dropseed, and switch grass are also frequent. The forb layer is diverse in the number, size, and physiognomy of the species. Common taxa include the prairie docks, lead plant, heath and smooth asters, prairie coreopsis, prairie sunflower, rattlesnake-master, flowering spurge, bee-balm, prairie coneflower, and spiderwort.

APPENDIX B

INDIVIDUAL BIRD SPECIES MAPS FOR ALL SPECIES FOUND IN THE LEOPOLD-PINE ISLAND IBA SURVEY IN 2005.

Alder Flycatcher	Eastern Phoebe	Red-shouldered Hawk
American Coot	Eastern Towhee	Red-tailed Hawk
American Crow	Eastern Wood-Pewee	Red-winged Blackbird
American Goldfinch	Field Sparrow	Ring-billed Gull
American Redstart	Grasshopper Sparrow	Rose-breasted Grosbeak
American Robin	Gray Catbird	Ruby-throated Hummingbird
American Woodcock	Great Blue Heron	Sandhill Crane
Bald Eagle	Great Crested Flycatcher	Savannah Sparrow
Baltimore Oriole	Green Heron	Scarlet Tanager
Barn Swallow	Hairy Woodpecker	Sedge Wren
Barred Owl	Henslow's Sparrow	Song Sparrow
Belted Kingfisher	Hooded Merganser	Spotted Sandpiper
Black Tern	Horned Lark	Swamp Sparrow
Black-and-White Warbler	House Finch	Tree Swallow
Black-billed Cuckoo	House Wren	Tufted Titmouse
Black-capped Chickadee	Indigo Bunting	Veery
Blue Jay	Killdeer	Vesper Sparrow
Blue-gray Gnatcatcher	Least Bittern	Virginia Rail
Blue-headed Vireo	Least Flycatcher	Warbling Vireo
Blue-winged Teal	Mallard	White-breasted Nuthatch
Blue-winged Warbler	Marsh Wren	Wild Turkey
Bobolink	Mourning Dove	Willow Flycatcher
Brown Thrasher	Mourning Warbler	Wood Duck
Brown-headed Cowbird	Northern Cardinal	Wood Thrush
Cedar Waxwing	Northern Flicker	Yellow Warbler
Chipping Sparrow	Northern Rough-winged Swallow	Yellow-bellied Sapsucker
Clay-colored Sparrow	Orchard Oriole	Yellow-billed Cuckoo
Cliff Swallow	Osprey	Yellow-headed Blackbird
Common Grackle	Ovenbird	Yellow-throated Vireo
Common Yellowthroat	Pied-billed Grebe	
Dickcissel	Pileated Woodpecker	
Downy Woodpecker	Red-bellied Woodpecker	
Eastern Bluebird	Red-breasted Nuthatch	
Eastern Kingbird	Red-eyed Vireo	
Eastern Meadowlark	Red-headed Woodpecker	

