



Partners in Flight
Bird Conservation Plan
for
The Upper Great Lakes Plain



AMERICAN

CONSERVATION

Partners in Flight
Bird Conservation Plan

for

The Upper Great Lakes Plain
(Physiographic Area 16)

by

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Partners in Flight Physiographic Area 16, The Upper Great Lakes Plain

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Partners in Flight
Bird Conservation Plan
For the Upper Great Lakes Plain
(Physiographic Area 16)

(Area - 19,159,100 ha)

Executive Summary

Description – The Upper Great Lakes Plain covers the southern half of Michigan, northwestern Ohio, northern Indiana, northern Illinois, southern Wisconsin, southeastern Minnesota, and northeastern Iowa. Glacial moraines and dissected plateaus are characteristic of the topography. A “driftless area” was not glaciated during the Pleistocene and emerged as a unique area of great biological diversity. Broadleaf forests, oak savannas, and a variety of prairie communities are the natural vegetation types. Today almost half of the area is covered by corn or soybean agriculture and more than a quarter of the area is devoted to pasture, hay, and mixed crops. More than 7% of the area is urbanized, with several large and growing urban areas, including Chicago, Illinois, and Detroit, Michigan.

Priority Bird Populations and Habitats

Grasslands

Henslow’s Sparrow – Requires tall and dense vegetation, with a deep litter layer; will not tolerate heavy or moderate grazing or early or late haying.

Greater Prairie-Chicken – Extirpated from the area, except in Wisconsin, where the population is small but stable. Requires large areas of grass (800 hectares or more), with short grass for leks and tall grass for nests and young.

Dickcissel – Populations vary from year to year, depending on precipitation in the core of its range. Requires medium-height and medium-dense vegetation with a moderate litter layer.

Bobolink – Habitat requirements similar to Dickcissel.

Upland Sandpiper – Prefers short grass with a moderate litter layer; displays from posts.

Short-eared Owl (winter) – Rare breeder in area, but more common in winter;

populations variable from year to year. Requires large areas of tall, dense grass with a deep litter layer.

Savanna-woodlands

Red-headed Woodpecker – Found in a variety of woodland habitats; prefers savannas and open woodlands. Requires dead trees for nesting and roosting.

Shrubs

Golden-winged Warbler – Center of range retreating northward from this area, probably due to competition and hybridization with Blue-winged Warbler. Requires large openings in forests with extensive shrubs and grass; does well in wetlands.

Blue-winged Warbler – Expanding range northwestward into this area; competes and hybridizes with Golden-winged Warbler. Requires large openings in forests with shrubs and grass; prefers uplands to wetlands.

Bell's Vireo – At northeastern edge of range in this area; declining throughout its range.

Field Sparrow – Requires oldfield habitats: grass with emerging shrubs and young trees.

Black-billed Cuckoo – Populations variable, high during caterpillar outbreaks. Requires dense shrubs, with or without trees; prefers riparian areas.

Forests

Cerulean Warbler – At northwestern edge of range in this area. Requires large areas of deciduous forest, with uneven canopy.

Acadian Flycatcher – At northern edge of range in this area. Requires large areas of deciduous forest.

Kentucky Warbler – At northern edge of range in this area; expected to breed only in southwestern Wisconsin and northeastern Iowa. Nests on ground in shrubby portions of large, mature forests.

Prothonotary Warbler – At northern edge of range in this area. Nests in cavities in wet forests.

Wetlands

Black Rail – Status in Midwest unclear; no known breeding population, but scattered spring sightings are reported. Requires wet meadows.

American Black Duck (winter) – Populations in this area have declined

precipitously due to competition and hybridization with Mallards. Prefers wooded swamps for nesting.

Wilson's Phalarope – Near eastern edge of range (except for population in southern Ontario). Requires wet meadows next to ponds, such as prairie potholes.

Conservation recommendations and needs - Geographic areas where opportunities exist to restore large tracts of high-quality grassland, forest, savanna, wetland, and riparian habitats should be identified so conservation efforts can be directed toward them. Monitoring and inventory efforts should be increased for species whose habitat affinities and population trends are unknown. Research is needed to better determine associations between landscape condition and parameters of population growth so conservation efforts can be implemented at the scale most effective in producing a population response.

Policy makers, wildlife agencies, private-lands specialists, and the general public need more information about habitat requirements of priority birds and useful tools to undertake conservation actions. Because 94% of PIF16 is privately owned, the actions of private landowners are critical to the success of conservation initiatives. Private-lands programs should address the economic realities of local communities and provide incentives for practices that produce the habitat structure needed by priority bird species, especially in landscapes where those habitats are in short supply. Partnerships that pool resources and avoid duplication of efforts are encouraged. Outstanding efforts to educate and to conserve habitat should be appropriately recognized by communities and states.

The following specific recommendations address research, monitoring, and outreach needs of high priority species in PIF16:

1. Grassland and forested habitats over a wide range of hydrological conditions, from wet to dry, are needed to sustain the high diversity of bird species found historically in PIF16. Identify large tracts of grassland and mature forest, as well as high quality savanna, shrub, wetland, and riparian forest habitats, and high quality migration habitat as a basis for conservation actions.
2. Promote science-based management of bird habitats; integrate research, modeling, planning, and management efforts.
3. Monitor populations to determine whether population objectives are being met.
4. Increase inventory and monitoring efforts for those species whose trends are unknown.
5. The Bird Conservation Area (BCA) concept sets specific landscape size and configuration prescriptions for habitats based on the needs of high priority species. Evaluate the usefulness of the BCA concept for

- sustaining populations of high priority species and revise prescriptions as our knowledge of population requirements for species advances.
6. Identify and conserve bird population sources in grasslands, forests, savannas, shrubs, and wetland habitats, based on the best available science. Plan research to address gaps in our knowledge.
 7. Develop policy recommendations that address economic incentives for private landowners to manage their land in accordance with bird conservation plans.
 - 8.

the drier, western portion of the region and on sandy soils. Curtis (1959) described the historical landscape of interspersed prairie, oak savanna, and mesic forests occupying southern Wisconsin. Today, the dominant land cover is corn, soybeans, hay, pasture, and mixed crops (see map set attached at end of document or at <http://www.cast.uark.edu/pif/main/midwest/16table.htm>). Scattered forests of oak-hickory and elm-ash-cottonwood are found across the region. Large human population centers include Milwaukee, La Crosse, Madison, and Green Bay, Wisconsin; Chicago and suburban Illinois; Gary and Fort Wayne, Indiana; Flint, Grand Rapids, Detroit, and Lansing, Michigan; and Toledo, Ohio.

Water is abundant in the region; precipitation ranges from 67 to 114 cm (27 to 45 in.) per year (McNab and Avers 1994). The Great Lakes form part of the northern boundary of the region. Smaller lakes also occur in the northern portion where the postglacial soils are poorly drained. The southern portions are dominated by large river systems, including the Chippewa, Mississippi, Wisconsin, Rock, Illinois, Grand, and Maumee.

Of the 19.2 million ha in PIF16, 94% (18.1 million ha) is in private ownership. Federal land comprises 1% of the total land area (Table 1). All of PIF16 falls within Region 3 of the U.S. Fish and Wildlife Service (USFWS) and is the focus of two ecosystem management efforts by the USFWS, the Upper Mississippi River Tallgrass Prairie Ecosystem and the Great Lakes Ecosystem (U.S. Fish and Wildlife Service 1994). Thirteen National Wildlife Refuges (2,700 ha) are located in this region (<http://midwest.fws.gov/>) as well as four properties managed by the National Park Service (17,300 ha; <http://www.nps.gov/htdocs3/hfc/carto/NPSMAP.html>), including the St. Croix National Scenic River, Effigy Mounds National Monument, and the Indiana Dunes National Lakeshore. Two National Scenic Trails meander through the region (<http://www.nps.gov/htdocs3/hfc/carto/TRAILMAP.html>). A 3,600-ha portion of the Manistee National Forest in Michigan is included in our region, and Department of Defense lands total 32,400 ha. State parks and forests occupy about 842,900 ha.

Table 1. Land ownership in PIF16.

Description	Area (acres)	Area (ha)	% of Total
Other	44,610,446	18,053,600	94.23
National Wildlife Refuge	234,251	94,800	0.49
National Forest	8896	3600	0.02
National Recreation Area	6178	2500	0.01
State Park	219,919	89,000	0.46
Military, government reservation	80,060	32,400	0.17
Indian reservation	70,176	28,400	0.15
Wilderness, wild and scenic river	206,823	83,700	0.44
State Forest	1,862,887	753,900	3.93

Description	Area (acres)	Area (ha)	% of Total
National Monument, National Landmark	42,501	17,200	0.09
Total	47,342,136	19,159,100	100.00

Conservation issues

Most of the presettlement forests and oak savanna grasslands in PIF16 have been converted to agricultural crop lands, primarily corn, soybeans, hay, pasture, and mixed grains (see maps at <http://www.cast.uark.edu/pif/main/midwest/16table.htm>). There have been heavy losses in forest communities, which now occur primarily as remnants in fragmented landscapes and occupy about 14% of the area. Oak savanna and prairie communities have virtually disappeared, except in a few locations where conservation efforts have saved or restored them. Fire suppression and intensive agricultural and urban land use are the primary factors preventing the land from reverting to presettlement conditions. Despite heavy habitat losses, the bird communities are still rich, especially forest and prairie bird communities. Prairie birds in PIF16 may be more abundant now than in presettlement times because of the dramatic conversion of land to agricultural crops, including hay. Wetland bird communities are favored by the moist climate and abundance of water. However, cowbird parasitism and nest predation are potential limiting factors in fragmented habitats (Herkert 1994a, Robinson et al. 1995), but see (Knutson et al. In prep., Gustafson et al. In press).

PIF16 encompasses portions of both the Great Lakes and the Mississippi River. The Great Lakes basin is the largest body of freshwater in the world. The Upper Mississippi River and tributary corridors provide the largest area of contiguous fish and wildlife habitat remaining in the Central United States (Wiener et al. 1998). The Upper Mississippi River National Wildlife and Fish Refuge alone provides breeding and migration habitat for over 290 bird species (Knutson and Klaas 1998). The Mississippi River and its associated tributaries have always provided an important migration route for fish and wildlife. However, because of continuing wetland and forest losses, expansion of urban and agricultural areas, navigation, and channelization of many rivers, the Mississippi River's importance has greatly increased in recent history (Wiener et al. 1998, U.S. Geological Survey 1999). Wetlands of the Great Lakes and the Mississippi River serve a critical role as migration and stopover sites for many species of waterbirds and shorebirds. The concentrations of individuals (Appendix A) found during these brief but critical migration times are a function of the enormous food resources provided by highly productive wetland systems.

Wetland losses in the Midwestern states are estimated to range from 35 to 99% (Noss et al. 1995). Of the 25.8 million ha (64 million acres) of original wetland habitat in Region 3 of the USFWS (eight states: Minnesota, Iowa, Missouri, Wisconsin, Illinois, Indiana, Michigan, and Ohio), only 9.4 million ha remains, a loss of 64% (Mitsch and Gosselink 1993). The rate of wetland destruction has

slowed in the last decade, but sedimentation and pollution of wetlands continues. Even where many wetlands remain, land-use changes have reduced their biodiversity. Small wetlands have been drained into larger ones. The resulting loss of small, shallow wetlands negatively affects native species dependent on these areas and reduces wetland edge habitat critical to the life cycles of many species. Wetlands also play an important role in maintaining ecosystem functions by protecting shorelines, recharging groundwater, cycling nutrients, and storing floodwater.

Nationwide, riparian zones have suffered the worst losses of any type of wetland from the 1970s to the 1980s (1.4 million ha, 3.5 million acres). The area of riparian forest in the North-central U.S. in 1940 was estimated at 6.9 million ha, dropping to 5 million ha in 1980 (-27.5%; Mitsch and Gosselink 1993). Estimates of Midwestern losses of riparian forest vary from 20-90%, depending upon state and investigator (Noss et al. 1995). Functions of riparian forests include shading and temperature regulation of streams, contributions of woody litter, and the provision of other unique habitat values (Knutson et al. 1996, Shaw and Bible 1996).

Vegetative dynamics in a floodplain result from a complex interplay between sediment deposition and flood disturbance over long time scales (Junk et al. 1989, Sparks et al. 1998). Today, most rivers and streams are anthropogenically controlled with channelization, levees, and locks and dams (Sparks et al. 1998). Resultant changes in the annual hydrograph are affecting riparian forest regeneration (Yin et al. 1997, Sparks et al. 1998). Early successional floodplain species are disappearing, and chronically wet conditions do not favor late successional species. With the loss of American elm (*Ulmus americana*) as a canopy tree from Dutch elm disease, silver maple (*Acer saccharinum*) dominates most riparian forests. Tree species diversity in floodplain forests tends to be lower than it was historically (Yin et al. 1997, Knutson and Klaas 1998).

Losses of tallgrass prairie in the Midwest and Great Plains are estimated at roughly 90% west of the Mississippi River and about 99% east of the Mississippi River (Noss et al. 1995). Large blocks of grassland habitats are very rare because of the intensity of farming (Herkert et al. 1996, Best et al. 1997, Ryan et al. 1998b), although the Conservation Reserve Program has temporarily provided additional grassland habitat. As a group, grassland birds are experiencing steeper population declines than any other group (Herkert 1995, Herkert et al. 1996) and are a focus of management concern for the USFWS (U.S. Fish and Wildlife Service 1999).

Drought-adapted oaks and hickories dominate upland forest habitats in the western portion of the region, with maple-basswood in moist locations and on north slopes (Bailey 1995). In the eastern portion of the region, beech-maple forest predominates with oak and hickory found on sites with dry or sandy soils. These forests are considered climax communities for the region and will maintain dominance in the absence of fire. Before European settlement, periodic fires

created oak savannas on poor or dry soils.

Savanna and woodland habitats were once common in the Driftless Area of Minnesota, Iowa, Wisconsin, and Illinois (Kline 1997). More than 99% of the original 11-13 million ha (27.9-32.1 million acres) of savanna-woodland in the Midwest has been converted to cropland or degraded by fire suppression and over-grazing (Nuzzo 1985). This savanna community is now considered endangered, with less than 1% of presettlement land area remaining (Noss et al.

Many Important Bird Areas (IBAs) have been designated in PIF16 (Appendix A). The IBA program was first developed by BirdLife International, Cambridge, United Kingdom (www.birdlife.net), with sites identified on the basis of significant bird concentrations during migration, breeding, or nonbreeding seasons. Records of IBAs of global, continental, or national significance are kept by the American Bird Conservancy in The Plains, Virginia, and will be published soon. Additional state-level IBAs will be identified over the next few years by state chapters of the National Audubon Society. Once sites are identified, however, action should be taken to ensure that they maintain their integrity over time.

There is particularly high potential for conserving and enhancing wildlife habitat values in the Driftless Area. The proportion of the landscape presently forested (30-50%) means that modest conservation efforts could greatly enhance habitat quality for birds. Small changes in land-use practices such as consolidating fragmented forests, planting native prairie species on marginal agricultural land, enlarging existing grasslands, and improved riparian zone management could move the landscape from moderately to very productive for many wildlife species.

Geographic information systems (GIS) and ecoregional descriptions at the Section, Subsection, and Sub-subsection (Albert 1995) levels also can be used to identify areas within PIF16 where grassland, forest, and other landscapes currently are most intact and would benefit most quickly from restoration or other conservation efforts. Subsection units may be of the appropriate size for developing conservation guidelines for specific locales. Restoration planners

Table 2. Adjusted proportion of bird species with significant positive population trends (1966-2000) among selected bird groups in the Driftless Area and the Great Lakes Plain subregions of PIF16. Adapted from Saue

arranged by habitat preference. The importance of this region to birds during migration is beyond the scope of this plan. Waterfowl are not addressed because they are the focus of the North American Waterfowl Management Plan. Breeding shorebirds and nongame waterbirds are considered in this plan when they have a high priority score, although they will also be covered in plans focused on those groups. Species common names follow the Check-list of North American Birds, 7th ed. (American Ornithologists' Union 1998).

Table 3. Priority Species during the breeding season by habitat type for the Upper Great Lakes Plain, Physiographic Area #16, from the Partners in Flight Species Prioritization Database 2000.

Species	7 th seq	Habitat	G- RA	G- BD	G- ND	G- TN	TB	AI	PT	x7	Tier	% POP	AI+ PT	TB+ TN	WL status

Species	7 TH seq	Habitat	G- RA	G- BD	G- ND	G- TN	TB	AI	PT	x7	Tier	% POP	AI+ PT	TB+ TN	WL status
Woodpecker															
Baltimore Oriole	2260	SA	3	2	3	2	3	5	2	20		6.69	7	5	
Cerulean Warbler	1828	BF	4	4	4	4	4	2	3	25	I.	0.44	4	8	EHP
Acadian Flycatcher	1294	BF	3	2	4	3	3	2	5	22	I.	0.41	7	6	
Kentucky Warbler	1841	BF	4	3	4	3	3	2	3	22	I.		5	6	MP
Canada Warbler	1866	BF	4	2	3	4	3	2	3	21		0.01	4	7	
Whip-poor-will	819	BF	4	2	3	3	3	2	3	20		1.06	5	6	
Hooded Warbler	1864	BF	3	2	4	3	3	2	3	20		0.02	4	6	
Mourning Warbler	1843	BF	3	3	3	3	2	2	3	19		0.27	5	5	
Wood Thrush	1693	BF	3	2	4	4	3	2	1	19	II.C.	1.47	3	7	MHP
Yellow-throated Vireo	1428	BF	4	2	3	3	3	3	1	19		5.31	4	6	
Blackburnian Warbler	1812	CF	3	2	3	3	3	2	3	19			5	6	
Prothonotary Warbler	1835	RF	4	3	4	3	3	2	3	22	I.	0.12	4	6	MHP
American Woodcock	521	RF	4	2	3	3	3	3	3	21	III.B	2.05	6	6	MHP
La. Waterthrush	1840	RF	4	2	3	4	3	2	3	21	II.C.		5	7	
Peregrine Falcon	324	U	5	1	1	3	4	2	3	19		0.14	4	7	
Whooping Crane	184	WE	5	5	5	5	5	2	5	32	I.	0	7	10	EHP
Piping Plover	445	WE	5	4	4	4	5	2	5	29	I.	0	7	9	EHP

5

G-TN - Global score for threats in the nonbreeding season; 1=population should maintain present level or increase, 2=75-99% should remain, 3=50-74%, 4=25-49%, 5=less than 25% may remain.

Species - Official common name from the AOU Checklist, 7th Edition.

7th seq - A number that allows the list to be sequenced in taxonomic order according to the 7th Edition of the AOU checklist.

G-RA - Global relative abundance, usually based on Breeding Bird Survey data, 1=100+ per BBS route (abundant), 2=30-99.9 (common), 3=10-29.9 (fairly common), 4=1-9.9 (uncommon), 5=less than 1 (rare).

G-BD & G-ND - Global scores for breeding distribution (BD) and wintering distribution (ND) 1=20% or more of North America, 2=10-19.9%, 3=5-9.9%, 4=2.5-4.9%, 5=less than 2.5% (551,500 km²).

G-TN - Global score for threats in the nonbreeding season; 1=population should maintain present level or increase, 2=75-99% should remain, 3=50-74%, 4=25-49%, 5=less than 25% may remain.

TB - Threats to successful breeding in PIF16; 1=population should maintain present level or increase, 2=75-99% should remain, 3=50-74%, 4=25-49%, 5=less than 25% may remain.

AI - Importance of PIF16 for breeding of the species, calculated, if possible, by comparing relative abundance on the Breeding Bird Survey within PIF16 to the species' highest relative abundance in any physiographic area (see G-RA, below) 1=0-0.9% of max., 2=1-9.9%, 3=10-

a b u n d a n c e o c c e s s

We address the needs of high priority species grouped into grassland, shrub, savanna, forest, and wetland habitats. Management recommendations address both umbrella species such as the Greater Prairie-Chicken and the Cerulean Warbler, as well as general habitat requirements of other priority species associated with a habitat type.

Grasslands

Ecology and conservation status

Before European settlement, tallgrass prairie was interspersed within oak savanna, beech-maple (*Fagus* sp. and *Acer* sp.), and maple-basswood (*Acer* sp. and *Tilia* sp.) forests and woodlands (McNab and Avers 1994). Today, roughly 50% of PIF16 is planted in corn and soybeans. Native prairie now covers less than 1% of the land surface, although surrogate grasslands such as pastures and hayfields occupy approximately 25% of the area. Whereas pasture and hayfields provide habitat for some species of grassland birds, the vegetation structure of heavily grazed pastures is not attractive to high priority species (Sample and Mossman 1997), and eggs and nestlings in early-mown hayfields are destroyed when hay is cut and harvested (Rodenhouse et al. 1995, Herkert 1997a). Grasslands that have resulted from the Conservation Reserve Program (CRP), however, may be helping to stabilize declines of priority species such as Henslow's Sparrow (Johnson and Schwartz 1993, Best et al. 1997, Herkert 1997b, Ryan et al. 1998b). Unfortunately, there is no assurance that the CRP program will continue to be offered in the long-term, and much of this land could revert to cropland once existing contracts expire.

Bird habitat requirements

Grasslands: Henslow's Sparrow, Greater Prairie-Chicken, Dickcissel, Bobolink, Upland Sandpiper, Short-eared Owl, Grasshopper Sparrow, Northern Bobwhite, and Northern Harrier

Greater Prairie-Chickens require the largest tracts of grassland of all grassland birds in PIF16, therefore their habitat requirements are the most difficult to attain

1998, Herkert et al. 1999). Northern Harrier is listed as a species of concern in Michigan and W

of 75% grassland and 25% cropland considered optimum. For grassland passerines in Illinois, a 50 ha (125 acres) patch had a 50% probability of containing Bobolinks, whereas 55 ha (138 acres) were needed for Henslow's Sparrows (Herkert 1994b). A meta-analysis of grassland passerine reproductive success in the Midwest (Herkert et al. In prep.) indicated that nest predation rates were lower in prairies >1,000 ha (2,462 acres) in all states and for all species examined. To clarify management unit recommendations for grassland birds, PIF developed the Grassland Bird Conservation Area (GBCA) Model. The GBCA model is now under research (D, Johnson, pers. comm.); results of this research will allow refinement of the model.

Grassland Bird Conservation Area (GBCA) Model

Habitat restoration aimed at reducing grassland fragmentation is needed to boost reproductive success and increase the acreage of suitable habitat for grassland birds. The Partners in Flight Grassland Bird Conservation Area (GBCA) model describes a theoretical landscape where grassland birds can be supported in high abundances and with adequate reproductive success (Sample and Mossman 1997). Research into factors affecting density and reproductive success of grassland-nesting birds in the Midwestern United States (Johnson and Igl 2001, Herkert et al. In prep., Fitzgerald et al. In press) support propositions of the model:

1. Large patches are better than small.
2. Blocks roughly 1000 ha (2,500 acres) or larger have a more positive effect on density and reproductive success than do patches of smaller size.
3. The ratio of grassland, and to a lesser degree woodland, in the landscape surrounding a patch also influences densities and reproductive success of grassland birds.

The BCA model calls for a 4,000 ha (10,000 acre or 16 square mile) management unit at the center of which is an 800 ha (2,000 acre, about 3 square mile) block of grassland referred to as the "core." Where Greater Prairie-Chickens are a focal species, the core should be centered upon one or more leks and managed in tracts >65 ha (160 acres). Rotational burning at 3-5 year intervals and light grazing are acceptable management practices, as long as the grassland structure remains adequate to attract and support the priority species. Management is planned so the preferred structure for the Greater Prairie-Chicken nesting, brood-

roughly 1.4 blocks

Table 5. Microhabitat associations and responses to management for selected high priority grassland species.

Species ^a	Grass cover	Forb cover	Litter cover	Native/cult ^b	Mowed ^c	Grazed ^d	Burned ^e	Area ^f
Greater Prairie-Chicken								

Grassland conservation opportunities

1. Identify large areas of grasslands within PIF16 as targets for conservation and restoration. The greatest opportunities in PIF16 for applied management of open grasslands are in conjunction with existing grasslands on federal, state, or other conservation lands. Examples include reclaimed mine lands and abandoned military lands. Some states are engaged in proactive conservation planning for GBCAs. For example, the Wisconsin DNR has identified potential GBCAs in southwestern Wisconsin and is seeking conservation partners for this effort (D. Sample, pers. comm.).
2. Apply GIS models developed for grassland birds in other ecoregions within PIF16.
3. Recent developments in agricultural management practices such as intensive rotational grazing may also provide opportunities for grassland bird habitat management on private lands (D. Sample, pers. comm.).
4. Work to build public-

Outreach

1. Educate the public about the importance of conserving grassland habitats for grassland birds.
2. Educate land managers about habitat requirements for high priority species.
3. Recognize outstanding efforts to educate and to conserve habitat.
4. Partner with international groups to ensure adequate winter and migration habitat for Neotropical migrants.

Savanna-woodlands

Ecology and conservation status

Before European settlement, fire frequency varied spatially and temporally with fluctuations in climate and population densities of Native Americans (McClain and Elinga 1994), influencing the proportion of woody-to-herbaceous plants in prairie-woodland ecotones (McPherson 1997). Savanna-woodland habitats resulted from trees and shrubs invading prairies during periods of infrequent fire and from prairies invading woodlands during periods of increased fire frequency (Nuzzo 1985, Taft 1997). As a result, the structure of habitats in the ecotone may have ranged from open prairie with a few scattered trees and shrubs to woodlands with intermediate canopy closure. Savannas are defined as areas with a well-developed herbaceous ground cover composed principally of prairie species and tree densities ranging from one per acre to roughly 50% canopy closure. Woodland refers to sites with a comparable understory, but with canopy - 8% cParckard19973 Taft 1997). A Fre Tj 139848 0 TD 00.036 Tc 0 Tw (-) Tj 3.9

Unfortunately, more than 99% of the original 11-13 million ha (27.9-32.1 million acres) of savanna-woodland in the Midwest has been converted to cropland or degraded by fire suppression and over-grazing (Nuzzo 1985). Wide-scale restoration of savanna-woodland habitats would greatly benefit the species that reach their highest densities in those habitats.

Bird habitat requirements

Savanna-woodland: Red-headed Woodpecker, Baltimore Oriole, Long-eared Owl (winter)

Red-headed Woodpecker is the classic savanna bird, preferring areas with relatively large, widely-spaced canopy trees with an open, grassy understory (Brawn 1998, Smith 2000). However, the species can be found in habitats with a variety of canopy cover, from floodplain forest to relatively open golf courses. The Red-headed Woodpecker is a cavity-nesting species, requiring dead and dying trees for nest sites. The wintering Long-eared Owl roosts in dense, woody vegetation of riparian woodlands or isolated tree groves adjacent to open

2. Information is needed about the effects of savanna restorations (usually directed at restoring plant biodiversity) on bird populations.
3. Savanna birds don't appear to be area-sensitive; however, the importance of landscape context (adjacency to urban areas, contiguous forests or grasslands) in savanna restoration and effects on avian community structure and population viability should be examined.
4. Little is known about how bird species use savanna-woodland habitats during migration.
5. Determine winter population trends for Long-eared Owls using Christmas Bird Count data.

Outreach

Outreach efforts directed toward private landowners willing to devote small acreages to conservation are needed to provide sufficient habitat to stabilize regional populations of savanna species. Outreach efforts should encourage private landowners, municipalities, and non-profit groups to create savanna-like habitats in backyard woodlots, urban parks, and other semi-natural sites such as cemeteries while maintaining dead trees and snags. These management options should be evaluated to determine their value for stabilizing savanna-associated bird populations.

Shrubs

Ecology and conservation status

Shrub habitats are early successional habitats that occur on abandoned agricultural land, recently logged forest lands, hedgerows bordering crop fields, powerline rights-of-way, and riparian buffer strips. In the absence of fire or intensive management, shrublands tend to succeed to forests in PIF16. Hedgerows and powerline rights-of-way tend to be stable features of the landscape, whereas the other types of shrublands either quickly convert to forests or are maintained as grasslands or crops (Knick and Rotenberry 2000). Burning may provide managers with a tool for managing shrublands (Aquilani et al. 2000); however, burning will be difficult to implement in long, narrow habitat patches (powerline rights-of-way and hedgerows). Selective cutting and herbicidal treatment of trees may be needed to maintain these types of shrub habitats.

Bird habitat requirements

Grass-shrub: Field Sparrow, Loggerhead Shrike, Northern Bobwhite, American Woodcock, American Tree Sparrow (winter)

Shrub: Bell's Vireo, Brown Thrasher, Willow Flycatcher, Yellow-breasted Chat, Bewick's Wren

Grass and shrub species differ mainly in the height and density of shrub habitats they use. Robinson et al. (1999) found that shrub bird species in Illinois were generally not area sensitive, although Brown Thrashers were twice as abundant in fields >6 ha (15 acres) than in smaller fields. Nests of Brown Thrashers typically were located in hedgerows and shrubs at edges of fields, while Field Sparrows used the interior of fields. Brown-

Shrub-Forest: Golden-winged Warbler, Blue-winged Warbler, Black-billed Cuckoo, Yellow-billed Cuckoo, and White-eyed Vireo

Golden-winged Warblers and Blue-winged Warblers breed exclusively in early successional patches within a larger forested matrix (Confer 1992). The Golden-winged Warbler is listed as a species of very high priority on the Partners in Flight Watchlist and is of higher conservation concern than the Blue-winged Warbler, with which it hybridizes. Both species inhabit openings within the forest with well-developed herbaceous and shrub layers, such as bogs, swamps, recently logged or burned sites, abandoned farmland and windthrows (Confer 1992). Habitat becomes unsuitable approximately 20 years after disturbance. Golden-winged Warblers seem to prefer 10-15 ha (25-40 acre) sites, each supporting several pairs. Territories typically include a forest edge along their perimeter. Both species nest on or close to the ground.

Historically, Golden-winged and Blue-winged Warblers were geographically isolated, but the populations came into contact as abandonment of farmland spread westward, providing an expansion route for the Blue-winged Warbler (Confer 1992). Competition and hybridization with Blue-winged Warblers may be negatively affecting Golden-winged Warbler populations, but more research is needed to better understand the interactions between these closely related species.

In Illinois, Black-billed Cuckoos were found in thickets adjacent to waterways where the surrounding vegetation was predominantly grass, but not at forested sites (Robinson et al. 1999). Other studies have found them in young woodlands (Spencer 1943).

Table 7. Habitat requirements for selected priority shrub species in PIF16.

Species (Source)	General habitat	Nesting substrate	Foraging substrate
Field Sparrow (Best 1978)	Grasslands with low-medium shrub density (15-35% shrub cover)	Ground or in woody vegetation generally < 1m	Ground or in shrubs
Golden-winged Warbler (Confer 1992)	Shrubby grassland, early successional forest, wet sites	Ground or low shrub	Ground or shrubs
Blue-winged Warbler (Ehrlich et al. 1988)	Shrubby grassland, early successional forest	Ground or low shrub	Ground or shrubs
Willow Flycatcher (Sedgwick 2000)	Willow swamps and thickets	Deciduous shrub 0	GrasTreed thicbs

Species (Source)	General habitat	Nesting substrate	Foraging substrate
Black-billed Cuckoo (Spencer 1943)	Shrub and early successional forests. Populations fluctuate in response to caterpillar outbreaks.	Woodland edges, thickets. Prefers shrub or low tree, dense cover	Trees and shrubs
American Woodcock (Keppie 1994)	Young forests and old fields	Ground	Ground – primarily earthworms

Population objectives and habitat strategies

Golden-winged Warbler (-1.4%/yr; $P < 0.06$), Brown Thrasher (-1.8%/yr; $P < 0.001$), Field Sparrow (-3.0%/yr; $P < 0.001$), and Black-billed Cuckoo (-1.3%/yr; $P < 0.07$) populations have declined significantly in USFWS Region 3 from 1966-2000 (Sauer et al. 2001). Populations of American Tree Sparrows have experienced significant declines across their winter range (Sauer et al. 1996). Loggerhead Shrike populations have declined 8.4%/yr ($P < 0.001$) in USFWS Region 3 from 1966-2000 (Sauer et al. 2001). Bewick's Wren populations have declined 2.8%/yr ($P < 0.32$) in USFWS Region 3 from 1966-2000 (Sauer et al. 2001).

1. Increase Golden-winged Warbler, Brown Thrasher, Field Sparrow, Black-billed Cuckoo, and Bell's Vireo populations by 3%/yr in USFWS Region 3 from 1980-2010, based on BBS data. Increase wintering populations of American Tree Sparrows in PIF16 based on Christmas Bird Count data.
2. Every effort should be made to restore populations of Loggerhead Shrike and Bewick's Wren (eastern subspecies) in PIF16.
3. Monitor populations of other shrub species (Northern Bobwhite, American Woodcock, Willow Flycatcher, Yellow-breasted Chat, Blue-winged Warbler, Yellow-billed Cuckoo, and White-eyed Vireo) to ensure that population trends are stable or increasing through 2010.
4. Restore shrub plant communities in locations where large GBCAs are not economically feasible.

Shrub conservation opportunities

Conservation opportunities exist on abandoned agricultural land or land being restored to forest. Shrubs, as mid-successional communities, do not have long-term stability in one location; the location of shrub communities is dynamic within a landscape mosaic. It is difficult to manage directly for shrub communities as they tend to have little economic value to landowners, unlike grasslands or forests. Shrub communities are heavily dependent upon large-scale land use patterns and economic forces affecting other land use types (agriculture and forestry). Powerline rights-of-way should be managed to support populations of shrub-nesting birds. Conservation efforts for the Northern Bobwhite provide an

opportunity for cooperative efforts with upland gamebird biologists.

Evaluation of assumptions - research and monitoring

1. Research is needed to better define the bird community associated with different shrub habitats and the factors supporting viable populations in these habitats. Predation and cowbird parasitism patterns should be better described. Issues of edge vulnerability should be examined.
2. Additional research is needed on the effects of management practices to sustain shrub communities within a landscape matrix. Agricultural and forest practices (hedgerows, silvicultural practices) should be studied to determine which practice

management. Management issues surrounding forests in PIF16 include: (1) sustainable timber harvest aimed at maintaining appropriate wildlife habitat for sensitive species and (2) effects on the riparian plant community stemming from hydrologic changes induced by locks and dams, channelization, and levees. Tree species diversity in large river floodplain forests tends to be lower than it was historically, possibly due to hydrologic changes (Yin et al. 1997, Knutson and Klaas 1998).

Bird habitat requirements

Broadleaved forest: Cerulean Warbler, Acadian Flycatcher, Kentucky Warbler, Canada Warbler, Whip-poor-will, Hooded Warbler, Mourning Warbler, Wood Thrush, Yellow-throated Warbler, Northern Goshawk (winter), Ruffed Grouse (year-round, priority in winter), Eastern Screech-Owl (year-round, priority in winter)

The Cerulean Warbler is a high priority forest-nesting species with exceptional habitat requirements. It represents an umbrella forest-nesting species in PIF16 because it requires large forest tracts of mature or old-growth forest (Hamel 1992, Hamel 2000b, a, Rosenberg et al. 2000), a resource relatively rare within PIF16. In some physiographic areas a minimum tract size of 1600-1700 ha (4,000-4,200 acres) is needed for occupancy (Hamel 2000b, Rosenberg et al. 2000). Cerulean Warblers may be present in tracts <100 ha (250 acres) (Rosenberg et al. 2000), but many studies indicate that mature, unfragmented forests ranging from hundreds to thousands of hectares are needed to support stable populations.

Little is known about factors affecting reproductive success in this species, including the relationship between tract size and reproductive success. Although the historic center of the Cerulean Warbler range is the upper Ohio River valley, the species has recently expanded its range to occupy (or reoccupy) regions, including PIF16, where appropriate habitat conditions exist (Hamel 2000b). The species is found breeding in bottomland and riverine forests and also in dry ridge-top forests (Rosenberg et al. 2000). Large, mature trees, a multilayered canopy, and canopy gaps from small-scale disturbances also seem to be important habitat features. Therefore, existing large forested tracts within PIF16 should be identified and their habitat value for Cerulean Warblers assessed. Forest restoration efforts for Cerulean Warblers would also benefit a number of other area-sensitive forest-nesting birds, including the Wood Thrush (Roth et al. 1996), Acadian Flycatcher (Bielefeldt and Rosenfield 1997), Kentucky Warbler (McDonald 1998), Canada Warbler (Conway 1999), Hooded Warbler (Evans Ogden and Stutchbury 1994), Mourning Warbler (Pitocchelli 1993), Nashville Warbler (Williams 1996), and Yellow-throated Vireo (Rodewald and James 1996) in upland habitats and Prothonotary Warbler (Petit 1999) and Louisiana Waterthrush (Robinson 1995) in bottomland habitats (Robbins et al. 1989). The Whip-poor-will is not known to be area-sensitive, but its ground nests are vulnerable to predators (Ehrlich et al. 1988).

In addition to the area and spatial arrangement of forest tracts, the size, species composition, and density of trees may be important. Silvicultural practices may play an important role in the value of managed forests for Cerulean Warblers and other forest-dependent species (Rodewald and Smith 1998, Thompson et al. 2000). Recent studies on silvicultural practices such as group-cut vs. clear-cut indicate neither practice supports populations of interior forest birds (King et al. 1998). Selective harvest creates the least amount of edge, but converts a stand from older age classes to younger age classes. Modeling is a useful tool for planning sustainable harvest rates across the landscape to support populations of forest-interior or savanna birds (Axelsson and Ostlund 2001).

Many private woodlands in PIF16 are grazed by domestic livestock, principally cattle. This practice may be detrimental to the reproductive success of forest-nesting birds for several reasons. Heavy grazing reduces understory cover, changes the plant species composition of the forest understory, retards tree regeneration, and causes soil compaction (Popotnik and Giuliano 2000). The effects of these changes primarily affect ground and understory-nesting species (Ammon and Stacey 1997). Cowbird parasitism increases for all vulnerable species when grazing is practiced, as cattle attract cowbirds (Gates and Evans 1998, Goguen and Mathews 1998, Morris and Thompson 1998, Goguen and Mathews 2000).

Cerulean Warbler populations continue to decline precipitously, even though little is known about the specific habitat requirements that support populations. We propose a Cerulean Warbler Conservation Area (CWCA) model, similar to the GBCA for grassland birds, based on existing syntheses of the literature (Hamel 2000b, a). The following guidelines will focus conservation efforts in PIF16 until new research refines our understanding of habitat requirements for Cerulean Warblers and other high priority forest-nesting birds. Overbrowsing by deer can have similar negative impacts on forest-dwelling birds that require dense understory vegetation (Alverson et al. 1988, Alverson et al. 1994).

Cerulean Warbler Conservation Area (CWCA) Model

We estimate that sustainable breeding populations of Cerulean Warblers in PIF16 require >700 ha (1730 acres) core blocks of mature, mesic hardwood forest, with low edge-to-area ratio (Robbins et al. 1989, Hamel 2000b) within an approximately 4,000 ha (10,000 acre) matrix. The surrounding matrix should be >50% forested, with >25% mature forests and <15% hostile habitat (cowbird feeding sites such as short-grass, intensive animal grazing or feed lots) (Thompson 1994). Within the core block, at least 25% of the canopy trees should be mature trees >20 m in height and 25-55 cm diameter at breast height (dbh) with canopy cover from 65-85% (Hamel 1992, Robbins et al. 1992, Oliarnyk and Robertson 1996, Robbins et al. 1998). Management should emphasize long rotations, and strategies that produce a varied 3-dimensional stand with extensive development of vertical diversity and canopy gaps (Hamel 2000b). In addition, observers note that Cerulean Warblers have better nesting success with an open forest understory (Oliarnyk and Robertson 1996). Uneven-aged management and old-growth or wilderness management are most likely to achieve these goals. An alternative, higher quality prescription, from the perspective of the Cerulean

Warbler, may be achievable in some heavily forested subsections of PIF16. This alternative model calls for a landscape matrix of 8,000 ha (20,000 acres) where >70% of the land is forested and managed according the principles outlined above (Hamel 2000b). Woodlots within CWCAs should not be grazed by domestic livestock, and deer populations should be kept at a minimum .

Restoration of CWCAs will also benefit a number of other area-sensitive forest and riparian associated bird species. Therefore, additional considerations for these species are appropriate. For example, sufficient numbers of large canopy trees should remain to create large snags for woodpecker populations. Maintain >20 cavity trees X rotation age per 40 ha

Coniferous forest: Blackburnian Warbler

PIF16 falls on the southern edge of summer range for the Blackburnian Warbler (Morse 1994, Patten and Burger 1998). The species prefers hemlock forests and threats to the species in PIF16 are primarily from deforestation.

Population objectives and habitat strategies

Forest bird species populations have generally increased in Region 3 of the USFWS from 1966–2000 (Sauer et al. 2001). However, total population levels are presumably well below pre-European settlement levels because of extensive forest losses to agriculture and urban development prior to the beginning of the Breeding Bird Survey in 1966. Nest success of forest birds in the Driftless Area was found to be relatively high and cowbird parasitism low (Knutson et al. In prep., Gustafson et al. In press). Based on population trends, present habitat conditions seem to be sustaining populations of many forest-nesting birds within PIF16, despite forest fragmentation.

PIF16 comprises the NW portion of the Cerulean Warbler range in the US. Populations of the Cerulean Warbler have been declining at 5.7%/yr ($P < 0.01$) from 1966-2000 within USFWS Region 3 (Sauer et al. 2001).

1. Increase Cerulean Warbler populations by 3%/yr in USFWS Region 3 from 1980-2010, based on BBS data.
2. Monitor populations of forest-nesting species (Acad8 Tw -13.92

- conservation.
7. Minimize deer population levels in woodlands targeted for songbird conservation.

Forest conservation opportunities

1. The best opportunities for large, contiguous forest conservation for Cerulean Warblers and other interior forest-nesting species exist in association with current public land managed for wilderness, recreation, or wildlife conservation. The specific breeding habitat requirements for the Cerulean Warbler put its needs in conflict with short-rotation and even-aged timber production, but are consistent with selection cuts that leave some mature trees. Large blocks of forest habitat, potentially meeting the above criteria, should be identified in PIF16 and CWCA's established wherever feasible. Parts of the Driftless Area (the Yellow River State Forest in Iowa, Wyalusing State Park, and South Kettle Moraine in Wisconsin, and the Whitewater Wildlife Management Area, Minnesota), and Alleghen State Game Area, Fort Custer, and Waterloo Recreation Area in southwestern Michigan should be considered for restoration as CWCA's.
2. In the water-rich PIF16, the potential for restoration of wide riparian forest corridors presents major opportunities to benefit forest songbirds because of multiple bird habitat values and because riparian restoration also addresses wider societal concerns regarding flooding and water quality.
3. Opportunities for forest restoration on private land exist within many state forest management programs and within the USDA Natural Resources Conservation Service (NRCS) riparian buffer program

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- may also influence habitat quality in the future. Identifying and monitoring the large-scale factors that limit regional populations of forest-nesting birds is necessary, even for species with currently stable populations.
3. Model forest habitat quality using GIS to enhance science-based management of bird habitats in PIF16. Identify large tracts of forest habitats in PIF16 as a basis for conservation planning, including all forest tracts >4000 ha (10,000 acres), all ecoregional subsections with >50% forest cover, and high quality riparian corridors.
 4. Research factors contributing to forest and riparian bird population stability, including associations between landscape factors and indices of reproductive success and the effectiveness of the CWCA model in sustaining populations of high priority species.
 5. Identify cost-effective methods for identifying bird population sources in forested habitats.

Outreach

1. Develop policy recommendations that address economic incentives for private landowners to e9o3i66dWi96lp Tw (2tlenef0 T06Tw (scale f58 Tw (1.)D 0.06orester

Reserve Program have helped restore and preserve wetlands (Steiner et al. 1994).

Loss and degradation of wetlands are limiting factors for many wetland birds (Brown and Dinsmore 1986, 1991, Fairbairn and Dinsmore 2001). Wetlands >10 ha (25 acres) in size accommodate most wetland-dependent bird species. Because preferred vegetation type and water levels vary by species, incorporating both shallow and deep-water emergent habitats into the overall land management plan is often an appropriate management strategy (Naugle et al. 2001). Complexes of wetlands support more species than isolated wetlands, making them a high priority for conservation (Fairbairn and Dinsmore 2001, Naugle et al. 2001). Water level management can be used to accommodate the needs of species requiring different types of wetlands. Wetland restorations have been successful in providing more breeding and migration habitat for wetland species.

Wetland habitats important to birds in PIF16 include:

1. Wet meadows, often dominated by sedges, whose soils tend to remain saturated or are very shallowly flooded.
2. Emergent wetlands, characterized by perennial rooted herbaceous vegetation. The term hemi-marsh is used to describe emergent wetlands with approximately 50% of the area in open water and 50% wetland vegetation. Dominant vegetation in emergent wetlands includes cattails (*Typha*), bulrushes (*Scirpus*), and sedges (*Carex*), bulrushes (veand5.oypo76E4oe the) soils tmain

wetland habitats (Timoney 1999). The Whooping Crane is the target of federal and state agency efforts to establish a second continental migratory population at

Riparian: Peregrine Falcon, Bald Eagle (winter)

Peregrine Falcon and Bald Eagle populations are recovering from the effects of DDT poisoning that occurred during the 1950s and 1960s (Ehrlich et al. 1988, Kirk and Hyslop 1998, Buehler 2000). Sources of DDT and DDE have largely been eliminated or reduced so that they are not affecting reproductive success for these species (but see Henny et al. 1982). Bald eagle populations along the Mississippi River have experienced steady increases, as evidenced by nest counts (E. Nelson, pers. comm.). Bald Eagles congregate in large numbers around open water with adequate fish prey during winter (Buehler 2000). The locks and dams of the Mississippi River and other large rivers provide open water throughout the winter in PIF16. Peregrine Falcons are successfully nesting on buildings in urban areas in many parts of PIF16. In 2000 the first nesting attempt in several decades was made on a historic cliff nesting site along the Mississippi River near La Crosse, Wisconsin (M. Knutson, pers. obs.).

Swamp (forested) wetlands: American Black Duck, Hooded Merganser

American Black Ducks breed in a wide range of forested wetlands (Longcore 2000). Black Duck populations have been affected by intense hunting pressure, interactions with Mallard populations, and habitat loss. Hunting restrictions and habitat restoration are believed to be the most effective management actions. Hooded Mergansers nest in tree cavities in forested wetlands (Dugger et al. 1994). This species is vulnerable to habitat loss through river channelization and deforestation and possibly the effects of acid rain.

Sand beaches: Piping Plover, American White Pelican

Preservation of existing beaches along the Great Lakes is important for the federally endangered Piping Plover, currently absent as a nester in this region (Haig 1992). Protecting large areas of sandy, undisturbed habitat is required if the plover is to return as a nester. Mudflats are needed as migration feeding areas during April–May and August–September. Suitable undisturbed breeding habitat seems to be the limiting factor for this endangered species (Buehler et al. 1991).

Table 9. Habitat requirements for selected priority wetland bird species in PIF16.

Species (Source)	Nesting Habitat	Foraging Areas	Migration Habitat
Trumpeter Swan (Mitchell 1994)	Hemi-marsh with muskrat or beaver houses, area > 5 ha (12 acres).	Hemi-marsh, area > 5 ha (12 acres).	Emergent marshes and area croplands, February–May, September–November. Needs large areas to take off.

Species (Source)	Nesting Habitat	Foraging Areas	Migration Habitat
Black Tern (Novak 1992, Shuford 1999)	Hemi-marsh situation - cattail, bulrush, water lilies selected; water depth at nest 0.5 - 1.2 m; > 10 ha (25 acres) requirement	Over open water in wetlands >20 cm deep	Open water foraging areas >3 ha (7 acres) and undisturbed roosting sandbars/beaches; May-June; August-September
King Rail (Meanley 1992)	Heavily vegetated interior marshes; water depth moist soil up to 22 cm water depth.	Usually found in heavy cover	Wetlands; April-May; August-September

- 2002; consistently add to the flock in subsequent years.
2. Establish a nesting population of Piping Plovers in PIF16 by 2005. Maintain and protect remaining lakeshore beaches as Piping Plover nesting areas.
 3. Increase Trumpeter Swan by 3%/yr in USFWS Region 3 from 1980-2010.
 4. Search for Black Rail populations in PIF16 and enhance and protect habitat if found.
 5. Monitor populations of other wetland species (Wilson's Phalarope, Forster's Tern, Sedge Wren, Marsh Wren, Northern Rough-winged Swallow, Redhead, Swamp Sparrow, American Black Duck, Hooded Merganser, Golden-winged Warbler, Black-billed Cuckoo, American White Pelican) to ensure that population trends are stable or increasing through 2010.
 6. Increase wetland area by 10% in all states in PIF16 by 2010.
 7. Identify and maintain shallow wetlands as rail migration habitat during April-May and August-September.
 8. Identify and maintain deepwater wetlands >20 ha (50 acres) in size for migrating American White Pelican, Trumpeter Swans, and Bald Eagles during March to May and August to November.

Wetland conservation opportunities

Private-public partnerships should be employed to increase the area of existing wetland complexes. The North American Waterfowl Management Plan (NAWMP) and Ducks Unlimited (DU) have been successful in protecting and restoring wetland habitats, primarily for waterfowl; however, many other wetland birds also benefit from these efforts. NAWMP and DU efforts in PIF16 are coordinated through the Upper Mississippi River and Great Lakes Region Joint Venture, with headquarters in U.S. Fish and Wildlife Service's Region 3 office in Minneapolis, Minnesota.

The U.S. Shorebird Conservation Plan (www.manomet.org/USSCP) has international, national, and regional goals focusing on stabilizing populations of all shorebird species. The North American Waterbird Conservation Plan (www.nacwcp.org) is dedicated to planning for sustainable populations, distributions, and habitats of waterbirds throughout North America, including breeding, migratory, and wintering ranges. The Partners in Flight community will be working with these other initiatives under the auspices of the North American Bird Conservation Initiative (NABCI). The purpose of NABCI is to integrate habitat conservation efforts to support sustainable populations of all priority wetland avifauna in PIF16.

Evaluation of assumptions - research and monitoring

1. Adequately assess the status and distribution of Black and King Rails

throughout PIF16.

2. Research factors contributing to wetland bird population viability, including basic biology and life history requirements of secretive marsh birds, especially rails, and associations between landscape factors and indices of density and reproductive success.
3. Identify large wetland complexes in PIF16 as a basis for conservation planning (all ecoregional subsections with >20% wetland cover). Identify stop-over migration habitats for wetland birds to ensure that key links in the migration chain are not broken.

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Appendix A. Important Bird Areas^a in the Upper Great Lakes Plain (PIF16).

Name	State	Designation ^b	Justification
Illinois Beach State Park	IL	N	Ducks and Geese (>10,000)
Dugger Wildlife Area/Minnehaha State Fish and Wildlife Area	IN	G	>320 nesting Henslow's Sparrows (> 1% of population), example of reclaimed mine land
Gibson Lake	IN	G	>1% Interior Least Terns
Jasper-Pulaski Fish and Wildlife Area	IN	G	> 32,000 Greater Sandhill Cranes in migration
Jefferson Proving Ground	IN	G	> 942 nesting Henslow's Sparrows, 55,264 acres
Indiana Shoreline of Lake Michigan	IN	G	Waterfowl, migration stopover for Piping Plover
Muscatuck National Wildlife Refuge	IN	C	Canada Geese (St. James Bay pop.) migration and wintering habitat
Erie Marsh	MI	G	Forster's Tern and Black-bellied Plover migration stopover
Fish Point Wildlife Area	MI	G	>5,000 Tundra Swans, >30,000 other waterfowl
Muskegon Wastewater System	MI	G	>50,000 waterfowl
Nananquing Point Wildlife Area	MI	C	Diving ducks (Lesser Scaup, Canvasback) during migration
Shiawassee National Wildlife Refuge	MI	G	> 48,000 waterfowl, 8,984 acres
Walkinshaw Wetlands	MI	G	>3% of Greater Sandhill Crane population
Bernard W. Baker Sanctuary	MI	G	>1,000 Sandhill Cranes during fall migration
Karn Plant	MI	G	>20,000 Common Mergansers
Lake Erie Metropark	MI	G	Hawk migration
Metrobeach Metropark	MI	G	>19,000 Canvasback in winter
Pt. Mouillee	MI	G	Migrating ducks, terns, shorebirds
St. Clair River and Lake St. Clair	MI	G	>10,000 wintering Redheads, >14,000 Canvasback in migration
Cedar Point National Wildlife Refuge	OH	GNL	>25,000 waterfowl
Killibuck Marsh Wildlife Area	OH	G	>26,000 waterfowl
Magee Marsh State Wildlife Area	OH	GNL	Migrants, adjoins Ottawa National Wildlife Refuge
Metzger Marsh Wildlife Area	OH	GNL	>50,000 shorebirds, >50,000 ducks
Ottawa National Wildlife Refuge	OH	G	>100,000 waterfowl, 8,316 acres of marsh, shorebird fall migration
West Sister Island	OH	CNL	Heron/egret rookery said to be largest in Great Lakes
East Lake (Lake Erie)	OH	G	>20,000 Bonaparte's Gulls, > 50,000 Red-breasted Mergansers
Headlands Beach State Park and Fairport Harbor	OH	G	>10,000 Bonaparte's Gulls, 700-1,600 Common Terns, >75,000 Red-breasted Mergansers
Mouth of Huron River Lakeshore Metropark (.35 -11 nergansers)	OH	G	>40,000 Bonaparte's Gulls

Name	State	Designation ^b	Justification
Lorain (lake off Lorain)	OH	G	>17,000 Red-breasted Mergansers, >600 Caspian Terns, >600 Common Terns, >50,000 Ring-billed Gulls, >5,000 Bonaparte's Gulls
Medusa Marsh	OH	G	>2500 Pectoral Sandpiper
Horicon National Wildlife Refuge	WI	G	>100,000 waterfowl, shorebird migration, RAMSAR site (globally important wetland), 12,911 acres
Menominee County	WI		Breeding warblers
Northern Kettle Moraine State Forest	WI	SNL	Large concentrations of passerines
Upper Mississippi River National Wildlife and Fish Refuge and Trempealeau National Wildlife Refuge	WI, MN, IA, IL	G	> 16,900 Tundra Swan, > 136,000 Canvasbacks, >96,700 Lesser Scaup, >270,000 waterfowl during migration, >5,700 pairs Great Blue Heron, concentrations of nesting Neotropical migrants, 78,500 ha (200,000 acres) of wetlands

^aDesignated by the American Bird Conservancy (C. Chipley, pers. comm.).

^bG=Global, C=Continental, N=National, and L=Local significance.

Appendix B. Bird species listed as threatened, endangered, or special concern by states in the Upper Great Lakes Plain (PIF16) during 2001^a.

Common Name	# of States	IA	IL	IN	MI	MN	OH	WI	16 B Score ^b	16 W Score ^c
Piping Plover	7	E	E	E	E	E	E	E	29	-
Henslow's Sparrow	7	T	E	E	T	E	SC	T	28	-
Short-eared Owl	7	E	E	E	E	SC	SC	SC	19	23
King Rail	7	E	E	E	E	E	E	SC	19	-
Bald Eagle	7	E	T	E	T	SC	E	SC/FL	17	19
Peregrine Falcon	7	E	E	E	E	T	E	E	18	17
Northern Harrier	6	E	E	E	SC		E	SC	19	19
Barn Owl	6	E	E	E	E		E	E	18	18
Red-shouldered Hawk	6	E	T	SC	T	SC		T	16	15
Cerulean Warbler	5			SC	SC	SC	SC	T	25	-
Trumpeter Swan	5			E	T	T	E	E	24	24
Black Tern	5	SC	E	E	SC		E		20	-
Forster's Tern	5	SC	E		SC	SC		E	19	-
Loggerhead Shrike	5		T	E		T	E	E	17	19
Black-crowned Night-Heron	5		E	E	SC		T	SC	16	13
Osprey	5		E	E	T		E	T	15	-
Common Tern	5		E		T	T	E	E	13	-
Upland Sandpiper	4		E	E			T	SC	22	-
Wilson's Phalarope	4		E		SC	T		SC	22	-
Long-eared Owl	4	T			T		SC	SC	17	21
Hooded Warbler	4			SC	SC	SC		T	20	-
American Bittern	4		E	E	SC		E		18	-
Bewick's Wren	4		E	E			E	E	18	-
Least Bittern	4		T	E	T		E		18	-
Yellow-crowned Nt-Heron	4		E	E			E	T	17	-
Common Moorhen	4		T		SC	SC	SC		15	-
Greater Prairie-Chicken	3		E			SC		T	26	26
Louisiana Waterthrush	3				SC	SC		SC	21	-
Sandhill Crane	3		T	E			E		20	-
Marsh Wren	3			E	SC		SC		19	17
Northern Goshawk	3				SC		SC	SC	18	19
Least Tern	3	E	E	E					17	-
Yellow-headed Blackbird	3		E	E	SC				17	-
Snowy Egret	3		E				E	E	13	-
Kirtland's Warbler	3			E	E		E		-	m
Yellow Rail	3				T	SC		T	-	m

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Common Name	# of States	IA	IL	IN	MI	MN	OH	WI	16 B Score ^b	16 W Score ^c
Sharp-shinned Hawk	2			SC			SC		17	14
Western Meadowlark	2			SC	SC				17	-
Cooper's Hawk	2				SC			SC	16	15
Lark Sparrow	2						E	SC	16	-
Merlin	2				T			SC	-	16
Great Egret	2			SC				T	14	-
Cattle Egret	2						T	SC	9	-
Caspian Tern	2				T			E	-	m
Little Blue Heron	2		E				E		-	m
Nelson's Sharp-t Sparrow	2					SC		SC	-	m
Bachman's Sparrow	2			E			SC		-	-
Mississippi Kite	2		E	SC					-	-
Sharp-tailed Grouse	2				SC			SC	-	-
Spruce Grouse	2				SC			T	-	-
Black Rail	1		E						26	-
Bell's Vireo	1							T	23	-
Kentucky Warbler	1							T	22	-
Prothonotary Warbler	1				SC				22	-
Redhead	1							SC	19	21
Canada Warbler	1						E		21	-
Swainson's Hawk	1		E						20	-
Grasshopper Sparrow	1				SC				19	-
Prairie Warbler	1				E				19	-
Canvasback	1							SC	-	19
Brown Creeper	1		T						15	18
Red-necked Grebe	1							E	18	-
Yellow-breasted Chat	1							SC	18	-
Lesser Scaup	1							SC	-	18
Common Snipe	1						SC		14	17
Purple Martin	1						SC		17	-
Horned Grebe	1					T			-	17
Northern Saw-whet Owl	1						SC		16	16
Pied-billed Grebe	1		T						16	13
Yellow-bellied Sapsucker	1						E		16	-
Common Goldeneye	1							SC	-	16
Dark-eyed Junco	1						E		-	16
Black-and-white Warbler	1			SC					15	-
Broad-winged Hawk	1			SC					14	-
Northern Waterthrush	1						E		14	-
Winter Wren	1						E		14	-
Evening Grosbeak	1							SC	-	14
Hermit Thrush	1						E		-	13
Double-crested Cormorant	1						SC		13	-
Sora	1						SC		12	-
Pine Siskin	1							SC	11	10
Common Loon	1				T				-	M
Swainson's Thrush	1							SC	-	M
Tennessee Warbler	1							SC	-	M
Franklin's Gull	1					SC			-	m
Le Conte's Sparrow	1							SC	-	m
Little Gull	1							SC	-	m
Marbled Godwit	1					SC			-	m

Common Name	# of States	IA	IL	IN	MI	MN	OH	WI	16 B Score ^b	16 W Score ^{cc}
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Appendix C: Partners in Flight species assessment and criteria for priority ranking.

The Partners in Flight species assessment was first developed in 1991 and has been continually reviewed and refined in the years following its inception (Beissinger et al. 2000, Carter et al. 2000). The system ranks each species of North American breeding bird based upon six measures of conservation vulnerability and one measure of conservation responsibility (importance of area). These vulnerability factors include (1) relative abundance, (2) size of breeding range, (3) size of nonbreeding range, (4) threats to the species in breeding areas, (5) threats to the species in nonbreeding areas, and (6) population trend. Each species is given a score of 1-5 in each category, with 1 indicating the least amount of vulnerability and 5 the most. Scores in each category are then summed to produce a composite score with a potential range from 7-35. Species with high overall scores are considered most vulnerable to extinction (though many are not listed as threatened or endangered) and need careful monitoring across their ranges.

One of the most influential factors for determining species of conservation priority is the species' population trend. It is important to focus active management in those areas where declines can be stabilized or reversed. Species whose populations are declining range-wide may or may not be declining in a given planning unit. Area Importance scores identify areas where a high proportion of the population is found. Relative abundance scores in the PIF prioritization scheme are independent of the size of the planning unit, but percentage of population is not. Thus, relative abundance could be the same in a 100,000 and 200,000 sq. kilometer planning unit, but the percentage of the population would be twice as great in the latter.

After calculating a total composite score within the planning unit for each species, the following criteria identify priority species. Species are listed according to the first criteria they meet, although they may qualify under several criteria:

- I. The species' total score is ≥ 22 and it occurs in the region in manageable numbers (i.e., $AI > 1$).
- Ila. The species' total score is 19-21, with the sum of Area Importance (AI) and Population Trend (PT) ≥ 8 . Thus, species with moderate total scores and moderate relative abundances in the planning unit are included only if their population trends are declining significantly. A species with high relative abundance in the area is included if its population trend is unknown or declining.
- Ilb. The species' total score is 19-21, and the percentage of its total population breeding in the planning unit is $> 8\%$. Planning units with large proportions of the population have more influence on a species' global population than do areas with smaller numbers of individuals.

- IIc. The species' total score is 19-21, and threats during the breeding and nonbreeding seasons (TB + TN)>5, or the local TB or TN=5.
- III. The species is a PIF "Watch List" species with an N25B or TN=5.