Partners in Flight
Bird Conservation Plan
for
The Boreal Hardwood Transition
(Bird Conservation Region 12 — U.S. Portion)

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Version 1.0
March 2009

by

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Suggested citation: Matteson, S., K. Kreitinger, G. Bartelt, G. Butcher, D. Sample, and T. Will. 2009. Partners in Flight Bird Conservation Plan for The Boreal Hardwood Transition (Bird Conservation Region 12 — U.S. Portion). Version 1.0. Partners in Flight. www.partnersinflight.org.

ACKNOWLEDGEMENTS

The following individuals should be mentioned for their review, comments, edits, and for contributing information and/or data: Tom Cooper, Ron Eckstein, Eric Epstein, Dave Ewert, Jane Fitzgerald, David Flaspohler, Ronald Gatti, Diane Granfors, Kimberly Hall, JoAnn Hanowski, Randy Hoffman, Robert Howe, Rex Johnson, Melinda Knutson, Jim Lind, Karl Martin, Gerald Niemi, Eunice Padley, Linda Parker, Andy Paulios, Lee Pfannmuller, Anna Pidgeon, Amber Roth, Mike Tans, and Wayne Thogmartin. Larry McQueen created the Golden-winged Warbler cover artwork.

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EXECUTIVE SUMMARY

Description – The U.S. portion of Bird Conservation Region (BCR) 12, the Boreal Hardwood Transition, extends across portions of northern Minnesota, Wisconsin, and Michigan, including the Upper Peninsula. Extensive deciduous, coniferous, and mixed forests cover the planning unit, comprising more than half its land cover. Grassland and wetland habitats also are well represented, with grassland and agricultural lands especially concentrated in the Lake Superior coastal plain and southern and western fringes of the planning unit. BCR 12 has experienced less urbanization than other regions, but several metropolitan areas do exist within its boundaries, including Duluth and Saginaw. In addition, recent years have seen a significant increase in rural and recreational home building in some counties. Despite low human population, the landscape has been influenced by the exploitation of timber and other natural resources since European settlement. These anthropogenic disturbances have resulted in conversion to farmland, loss of wetlands, forest simplification and an increased dominance of fewer tree species.

Priority Bird Populations and Habitats

Forests
Ruffed Grouse – prefers mosaic of forest ages across landscape; stable population trend
Broad-winged Hawk – prefers large tracts of deciduous forest; uncertain population trend
Whip-poor-will – prefers open to semi-open deciduous forest; moderate population decline
Black-billed Cuckoo – prefers forest edges and shrubby thickets; uncertain population trend
Yellow-bellied Sapsucker – prefers open to semi-open deciduous forest; uncertain population trend
Northern Flicker – prefers open forest and forest edge; moderate population decline
Olive-sided Flycatcher – prefers open to semi-open conifer bogs; severe population decline
Least Flycatcher – prefers large tracts of deciduous forest; moderate population decline
Veery – prefers large tracts of moist forest; moderate population decline
Wood Thrush – prefers large tracts of deciduous forest; uncertain population trend
Golden-winged Warbler – prefers wetland shrub and regenerating deciduous forest; uncertain population trend
Nashville Warbler – prefers regenerating coniferous forest; moderate population increase
Chestnut-sided Warbler – prefers regenerating deciduous forest; uncertain population trend
Black-throated Blue Warbler – prefers large tracts of mature forest; uncertain population trend
Black-throated Green Warbler – prefers large tracts of mature forest; uncertain population trend
Blackburnian Warbler – prefers large tracts of mature forest; moderate population increase

Kirtland's Warbler – prefers large tracts of young jack pine forest; uncertain population trend
Connecticut Warbler – prefers open, park-like coniferous forest; moderate population decline
Mourning Warbler – prefers regenerating forest openings; moderate population decline
Canada Warbler – prefers moist, mixed coniferous forest; moderate population decline
Bay-breasted Warbler – prefers mature coniferous forests; moderate population decline
White-throated Sparrow – prefers regenerating forest openings; moderate population increase
Rose-breasted Grosbeak – prefers edges of deciduous forest; moderate population decline
Purple Finch – prefers moist coniferous stands; moderate population decline

Grasslands and Savannas
Red-headed Woodpecker – prefers oak barrens, oak savannas, deciduous forest edges, and other open lands with scattered mature trees; moderate population decline
Sedge Wren – prefers dense, tall grass or sedges with abundant litter; significant population increase
Brown Thrasher – prefers shrub-grasslands and thickets, shrubby forest edges and hedgerows; severe population decline
Henslow's Sparrow – prefers dense, tall grass with abundant litter and standing residual vegetation; moderate population increase
Field Sparrow – prefers uplands with mid-height grass with scattered shrubs; severe population decline
Bobolink – prefers mid- to tall-height grass with some litter; moderate population decline

Wetlands
Belted Kingfisher- requires steep, earthen banks for nesting; severe population decline
Willow Flycatcher – prefers shrubby areas, usually wet; uncertain population trend
N. Rough-winged Swallow – requires steep, earthen banks for nesting; severe population decline
Bank Swallow – requires steep, earthen banks for nesting; severe population decline
Common Yellowthroat – prefers tall, dense vegetation, typically with shrubs, often in or near wetlands; moderate population decline
Swamp Sparrow – prefers cattail marsh or tall sedge or grass meadows, often with shrubs; moderate population increase
Rusty Blackbird – prefers swampy shorelines/wet forest openings; moderate population decline

Urban/Developed
Chimney Swift – requires suitable nest cavities/abundant invertebrates; severe population decline
Barn Swallow – requires suitable nest substrate/abundant invertebrates; severe populatin decline

Conservation Recommendation and Needs – Major conservation issues and opportunities for the planning unit center on how to best manage northern forests. The primary challenge is how to maintain healthy, viable populations of native birds and other organisms while accommodating the growing demands placed on forest resources. Factors limiting bird populations in the Boreal Hardwood Transition involve landscape-level changes due to logging, housing development, and road building combined with the effects of natural disturbances such as forest fire and white-tailed deer herbivory. Other issues include the threats to migratory stopover habitats and the growing concern of climate change. Related to all of these issues is the state of conservation planning in the region and the limitations that may become apparent due to a lack of ecological information and the coordination necessary to achieve meaningful bird conservation.

Specific conservation recommendations for BCR 12 include:

- Identify causal factors and develop strategies to reverse population declines of Belted Kingfisher, Olive-sided Flycatcher, Brown Thrasher, Northern Rough-winged Swallow, Bank Swallow, and Field Sparrow.
- Identify areas appropriate for grassland-shrub management that will not conflict with other grassland priorities. Build public-private partnerships to conserve and restore grassland-shrub habitats in designated areas.
- Determine range of suitable habitats and identify present breeding sites for Golden-winged Warbler; verify and refine predictive habitat models for this species.
- Promote structural diversity at the landscape scale, including patches of early-, mid-, and late-successional forest in a range of patch sizes.
- Where possible, maximize the amount of forest interior (and minimize disturbance within it) to benefit area-sensitive and forest-interior species.
- Remove unneeded dams, dikes, or levees to reestablish hydrological connections between riparian and floodplain habitats and provide a greater variety of successional habitats.
- Work with local zoning boards to guide housing densities and the legal setback of buildings from shorelines.
- Advise homeowners to limit the use of pesticides and other harmful chemicals in important nesting and foraging areas.

INTRODUCTION

Continental and local declines in numerous bird populations have led to concern for the future of migratory and resident landbirds. Reasons for declines are complex. Habitat loss, degradation, and fragmentation on breeding and wintering grounds and along migratory routes have been implicated for many species. Additional factors may include reproductive problems associated with brood parasitism and nest predation. Scientists and the concerned public agreed that a coordinated, cooperative conservation initiative focusing on nongame landbirds was needed to address the problem of declining species. In 1990, Partners in Flight (PIF) was conceived as a voluntary, international coalition of government agencies, conservation organizations, academic institutions, private industry, and other citizens. The PIF mission is expressed through three related concepts: helping species at risk, keeping common birds common, and voluntary partnerships for birds, habitat, and people.

Goal

The foundation for PIF's long-term strategy for bird conservation is a series of scientifically based Landbird Conservation Plans, of which this document is one. The goal of each PIF Bird Conservation Plan is to ensure long-term maintenance of healthy populations of native landbirds. This document was prepared to facilitate that goal by stimulating a proactive approach to landbird conservation. The conservation plan primarily addresses nongame landbirds, which have been vastly underrepresented in conservation efforts, and many of which are exhibiting significant declines that may be arrested or reversed if appropriate management actions are taken. The PIF approach differs from many existing federal- and state-level listing processes in that it (1) is voluntary and nonregulatory and (2) focuses proactively on relatively common species in areas where conservation actions can be most effective, rather than the frequent local emphasis on rare and peripheral populations.

Process

PIF conservation planning emphasizes effective and efficient management through a four-step process designed to identify and achieve necessary actions for bird conservation:

1. Identify species and habitats most in need of conservation;
2. Describe desired conditions for these habitats based on knowledge of species life history and habitat requirements;
3. Develop biological objectives that can be used as management targets or goals to achieve desired conditions;
4. Recommend conservation actions that can be implemented by various entities at multiple scales to achieve biological objectives.

Throughout the planning process and during the implementation phase, this strategy emphasizes partnerships and actions over large geographic scales. The North American Landbird Conservation Plan has identified Bird Conservation Regions (BCRs) as the basis for implementing bird conservation activities (Rich et al. 2004). BCRs are designed to be distinct ecological regions in North America with similar bird communities, habitats, and resource

management issues. Specific methods used to complete this planning process are described within the plan or in its appendices. Additional details on PIF history, structure, and methodology can be found on the Partners in Flight website at www.partnersinflight.org

Implementation

This landbird conservation strategy is one of many recent efforts to address conservation of natural resources and ecosystems in the Upper Midwest. It is intended to supplement and support other planning and conservation processes (e.g., The Nature Conservancy Ecoregion Plans, State Wildlife Action Plans, Upper Mississippi River and Great Lakes Region Joint Venture conservation strategies, Important Bird Areas program) by describing a conservation strategy for nongame landbirds that are often not addressed or only incidentally addressed in other plans. It also is intended to complement other initiatives such as the North American Waterfowl Management Plan, United States Shorebird Conservation Plan, and North American Waterbird Conservation Plan. Ongoing efforts to integrate with these initiatives during objective setting and implementation stages will help ensure that healthy populations of native bird species continue to exist and that all of our native ecosystems have complete and functional avifaunal communities. In particular, the North American Bird Conservation Initiative (NABCI) provides a geographical and political framework for achieving these ambitious goals across Canada, Mexico, and the United States.

SECTION 1: THE PLANNING UNIT

Physical Features

The Boreal Hardwood Transition encompasses approximately 61 million hectares (150 million acres) of mostly forested lands along the southern edge of the Canadian Shield, extending from the St. Lawrence River in Quebec west across the center of the Great Lakes Basin. Although approximately 64% of BCR 12 occurs within the Canadian provinces of Ontario, Quebec, and Manitoba, the focus of this plan is the U.S. portion of BCR 12 (hereafter BCR 12). This planning unit is approximately 22 million hectares (54 million acres) and extends across portions of northern Minnesota, Wisconsin and Michigan, including the Upper Peninsula (Figure 1). BCR 12 lies within the Laurentian Mixed Forest Province (Bailey et al. 1994, McNab et al. 1994) and coincides with Sections 212H, J, K, L, M, and N of the U.S. Forest Service's National Hierarchical Framework of Ecological Units (Keys et al. 1995) and portions of The Nature Conservancy's Prairie-Forest, Superior Mixed Forest, and Great Lakes Ecoregions.

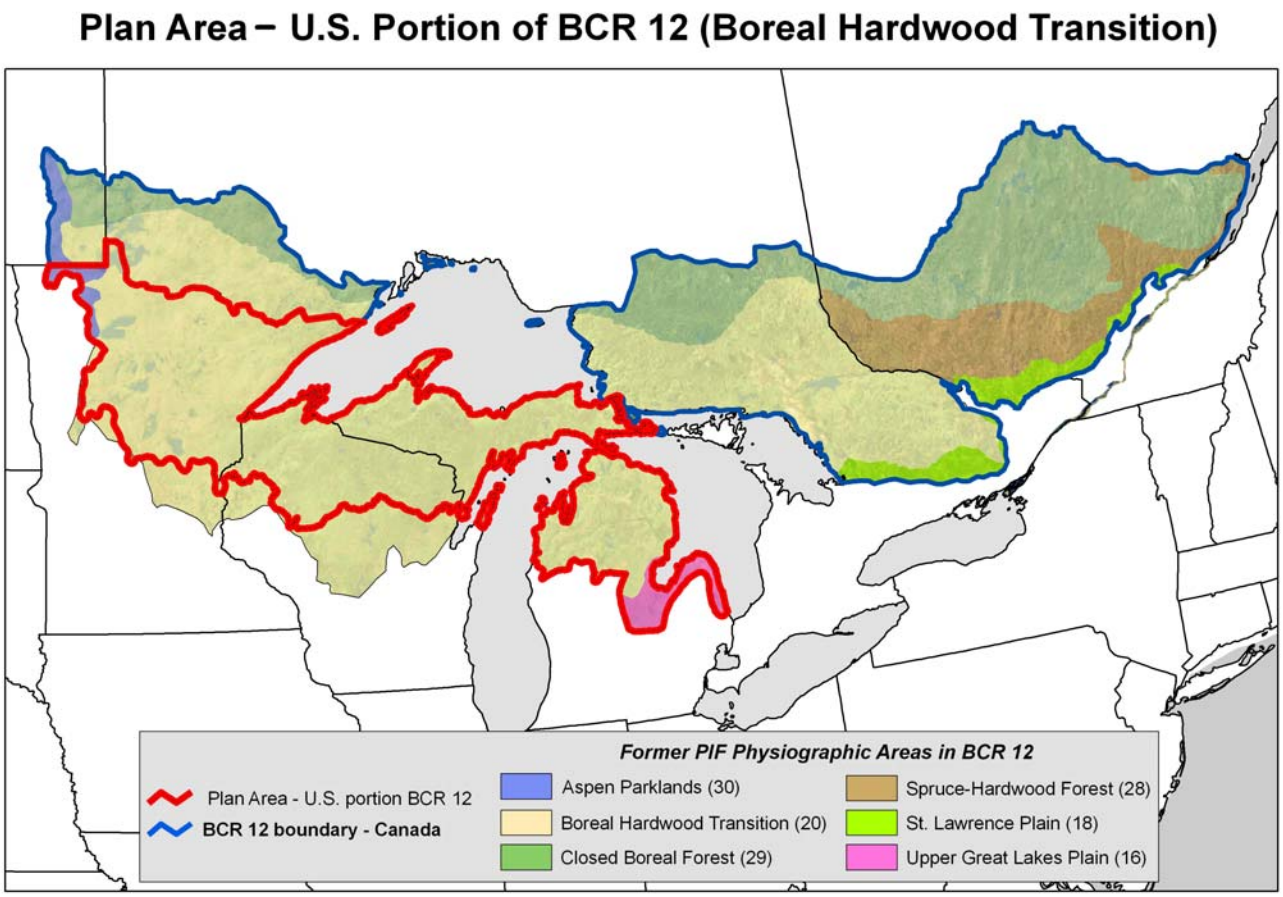

FIGURE 1. THE PLANNING AREA (THE U.S. PORTION OF BCR 12, THE BOREAL HARDWOOD TRANSITION) RELATIVE TO FORMER PARTNERS IN FLIGHT PHYSIOGRAPHIC AREA PLANNING UNITS. THE AREA DELIMITED BY THE BOLD RED BOUNDARY INDICATES THE PLANNING AREA. THE AREA WITHIN THE RED AND BLUE BOUNDARIES INDICATES THE FULL EXTENT OF BCR 12. *PORTIONS OF FORMER PIF PHYSIOGRAPHIC AREAS* NOW INCLUDED WITHIN BCR 12 ARE REPRESENTED BY DIFFERENT COLORS IN THE LEGEND. IN CONTRAST, *THE FULL EXTENT OF FORMER PIF PHYSIOGRAPHIC AREA 20*, ALSO KNOWN AS THE BOREAL HARDWOOD TRANSITION, IS MAPPED (BUFF COLOR). THE PORTIONS OF PIF PHYSIOGRAPHIC AREA 20 OCCURRING OUTSIDE OF BCR 12 ARE NOW INCLUDED IN BCR 23, THE PRAIRIE HARDWOOD TRANSITION. MAP COURTESY OF TOM COOPER.

Knowing the extent and ownership of protected lands in the Boreal Hardwood Transition will better facilitate the management of its natural resources. Table 1 outlines the approximately ten million hectares of land in BCR 12 that is under either strict protection (i.e., no commercial extraction and development allowed) or more relaxed levels of protection (i.e., limited types of development may occur). State-owned lands comprise approximately 48% of the total protected areas within the planning unit, with state forest lands well-represented. Federal lands, including national forests, national wildlife refuges, national parks, and wilderness areas, represent approximately 31% of protected areas, but a relatively high percentage (19%) of private lands also are protected in BCR 12.

TABLE 1. **PROTECTED AREA LAND COVER IN U.S. BCR 12. DATA TAKEN FROM THE PROTECTED AREAS DATABASE, VERSION 4.0.**

Description	Area (hectares)	Area (acres)	% of Total
State Forest	3,562,220	8,802,245	33.2
National Forest	2,606,396	6,440,405	24.3
Private - Other	1,948,735	4,815,323	18.1
State - Other	1,137,066	2,809,689	10.6
Wilderness Area	424,902	1,049,934	4.0
Tribal Lands	305,454	754,779	2.8
State Wildlife Area	217,004	536,216	2.0
National Park	128,267	316,948	1.2
State Park	122,477	302,640	1.1
National Wildlife Refuge	70,163	173,373	0.7
Military Reservation	51,455	127,146	0.5
Private - CRP	45,723	112,981	0.4
National Lakeshore	43,556	107,627	0.4
Federal - Other	39,680	98,050	0.4
Wild and Scenic River	22,362	55,256	0.2
Local - Other	7,675	18,966	0.1
Total	**10,733,135**	**26,521,578**	**100.0**

Vegetation

Forests are the dominant vegetation within BCR 12, comprising more than half of its land cover (Table 2). Large tracts of unbroken forest cover still exist, including significant areas of mature second-growth stands. Forest communities are broadly characterized as mixed deciduous and coniferous and reflect a mix of boreal and northern hardwoods. Major forest communities include aspen-birch, maple-mixed hardwood, white-red-jack pine, oak-hickory, and spruce-fir. About 30 tree species occur in the planning unit, though fewer than 10 tree species usually exist in any given community (Finan 2000). Sugar maple, basswood, eastern hemlock, yellow birch, American beech, and white pine commonly occur on medium to rich soils. On poorer soils, various combinations of jack pine, red pine, aspen, paper birch, red maple, Hill's oak, and red oak are dominant. Among wetland forest types, two occur extensively: conifer swamps dominated by black spruce-tamarack or eastern white cedar and hardwood swamps featuring black ash, red maple, and American elm.

Non-forested habitats represent the remaining land cover in the planning unit. Agricultural lands and grassland habitats comprise approximately 12% of total land cover (Table 2). Habitats include grass and legume hay, small grains, pastures, corn and soybeans, specialty crops (e.g., potatoes, beans, and peas), Conservation Reserve Program (CRP) fields, dune lands along the Great Lakes shores, and oldfields. Most of these lands occur in the southern and western fringe of the planning unit where agriculture is now the dominant land use; there are also notable areas of agriculture and open lands in the Lake Superior coastal plain.

Significant pockets of agricultural lands exist elsewhere, however, as openings within the vast forested matrix. Open water and wetlands comprise most of the remaining land cover. Lakes Superior, Michigan, and Huron are prominent ecological features that support extensive coastal marshes and meadows. Other aquatic and wetland types present here include rivers and lakes, deep- and shallow-water marshes, sedge marshes and meadows, bogs, and shrub wetlands.

TABLE 2. AREAS OF VEGETATIVE COVER TYPES IN U.S. BCR 12 FROM THE USGS NATIONAL LAND COVER DATASET. SEE APPENDIX A FOR DEFINITIONS.

Land Cover	**Area (hectares)**	**Area (acres)**	**% of Total**
Deciduous Forest	8,086,202	19,981,440	36.7
Evergreen Forest	2,545,312	6,289,602	11.6
Mixed Forest	1,013,147	2,503,541	4.6
Woody Wetlands	3,863,922	9,547,959	17.5
Shrub/Scrub	390,119	964,005	1.8
Open Water	1,373,126	3,393,065	6.2
Emergent Herbaceous Wetland	1,130,501	2,793,529	5.1
Grassland/Herbaceous	746,180	1,843,851	3.4
Pasture/Hay	719,710	1,778,442	3.3
Cultivated Crops	1,239,318	3,062,421	5.6
Developed	865,056	2137,600	3.9
Barren Land (rock/sand/clay)	67,093	165,790	0.30
Total	**22,039,686**	**54,461,245**	**100.0**

Natural Disturbances

Natural disturbances are important influences on the plant composition and structure of BCR 12. Wildfire and weather events (e.g., tornadoes, ice and snow storms) can temporarily create patches or gaps of early-successional vegetation that provide important habitat for some species. Some natural communities, such as barrens, oak savannas, prairies, and sedge meadows, rely on wildfire to maintain their open aspect and prevent succession to another community type. Insect infestations are a cyclical part of forest ecosystems that can cause tree mortality and thus increase fuel loads for wildfires. High densities of white-tailed deer can reduce or eliminate the conifer component from some forest stands, especially hemlock, Canada yew, and northern white-cedar (Alverson et al. 1988, Mladenoff and Pastor 1993, Alverson et al. 1994, Hamady 2000). Flooding is a significant natural disturbance that can influence the physical and biological characteristics of aquatic and wetland habitats. The scouring action of flood waters and redistribution of sediments replenishes sandbars in riverine systems and creates new side channels, pools, and other microhabitats (Petts and Calow 1996).

History and Land Use

Although a large proportion of the planning unit remains forested, forest composition has changed since European settlement. Widespread logging activities over the past 200 years have resulted in forest simplification and an increased dominance of fewer species. For example, hemlock and white cedar still occupy most of their historic ranges, but hemlock is far less abundant than it was historically and both species are experiencing widespread reproductive failure beyond the seedling stage. Yew likely has a somewhat contracted range today and tends to be restricted to cliffs, deer-free islands, or areas which still receive deep persistent snowcover in winter. Areas in which hemlock, white cedar, and yew are now thriving are very limited in extent, but include several of the Apostle Islands (Lake Superior), parts of the Door Peninsula, and locations within the Menominee Reservation in Wisconsin (E. Epstein, WI DNR, pers. comm.) and Sylvania Wilderness in Michigan's Upper Peninsula. Fire suppression during the twentieth century also favored the succession of fire-sensitive, shade-tolerant deciduous tree species relative to fire-dependent, shade-intolerant conifers (Ontario Partners in Flight 2006). For example, hemlock comprised about 21% of basal area in northern Wisconsin forests historically, with yellow birch and sugar maple the second and third most dominant tree species, respectively (WI DNR 2002c). Today, aspen-birch and maple-basswood forests have replaced many of the former hemlock-dominated stands.

Another outcome of human exploitation has been the homogenization of forest stand ages. At the time of European settlement, more than 85% of forests within the upper Great Lakes were mature or native old-growth forests (Frelich and Lorimer 1991). As lumber production increased during the late nineteenth century, old-growth forests of pine and hemlock were heavily logged and became rare in the region (Curtis 1959, Pastor and Mladenoff 1992). In Wisconsin, stands of old-growth sugar maple, basswood, yellow birch, white ash, and beech were also heavily exploited and are now equally rare (E. Epstein, WI DNR, pers. comm.). What was left, and what largely typifies the Boreal Hardwood Transition today, is a relatively simplified landscape of forested and non-forested patches, with reduced regional plant species diversity (Mladenoff and Pastor 1993, Mladenoff et al. 1997).

Attempts at agriculture followed logging and fires in many parts of the region. In some areas, farming remains the dominant land use today. Although agricultural lands can provide important open habitats for grassland birds, some farming practices are incompatible with most bird nesting cycles. For example, conventional hayfield management poses a significant threat to grassland birds because it often occurs during a critical time of the nesting cycle (Ryan 1986, Perlut et al. 2006). The first harvest of legume and tame hay can occur between late May and late June, which is when most birds are either incubating or feeding young nestlings. Harvest machinery can crush eggs and nestlings, cause adults to abandon nests, and/or expose intact nests to increased predation. In some cases, harvesting hay during the peak nesting period (i.e., late May to early July) can cause complete reproductive failure. When applied properly, however, haying can be an effective management tool for maintaining an open grassland system.

Wetland habitats in BCR 12 have been significantly impacted by drainage, ditching, or filling. Flooding for cranberry bogs and for waterfowl impoundments has impacted many sedge

meadows, particularly in Wisconsin where only 3% of the original sedge meadow acreage remains (Mossman and Sample 1990). Wetlands continue to be lost or degraded due to highway development, although these losses are usually mitigated. Lakes and rivers also are subjected to heavy development pressure. Many lakes are almost completely surrounded by homes and cottages and have little shoreline left with natural vegetation. In addition, the composition, structure, and in some cases, successional trajectories of shoreline vegetation are being influenced by invasive species. As lakeshores become developed, many rivers are increasingly subjected to similar pressures, with the natural shoreline along rivers becoming lost or degraded.

Bird habitat in urban and developed areas is declining in extent and quality due to changes in land use practices. Aerial spraying of insecticides reduces prey resources for urban bird species. Changing construction practices and homeowner modifications are reducing the availability of potential nest sites for some urban nesting birds, especially Chimney Swift. For example, new developments often promote plastic, metal, or composite exhaust shafts that are unsuitable as nest sites.

SECTION 2: AVIFAUNAL ANALYSIS

Species Assessment Factors

The PIF species assessment process assigns each species global scores for six factors: Population Size (PS), Breeding Distribution (BD), Non-breeding Distribution (ND), Threats to Breeding (TB), Threats to Non-breeding (TN), and Population Trend (PT). (See Appendix B for overview). Each score reflects the degree of a species' vulnerability (i.e., risk of significant population decline or rangewide extinction) as a result of that factor, ranging from "1" for low vulnerability to "5" for high vulnerability. The process also considers two measures of area importance: the percentage of global population that occurs within a particular region during the breeding or non-breeding season and the Relative Density (RD) of the species among regions. From these data, simple numerical scores are generated that rank each species in terms of its biological vulnerability and regional status. The process results in global and regional conservation assessments of each bird species that can be used to objectively assign regional and continental conservation priorities among birds. Regional scores are currently available only for the breeding season, however, and thus this document focuses solely on breeding birds of regional importance. Some species that occur in the planning unit during the non-breeding season are irruptive in nature, and thus are addressed by conservation efforts within their core range. For more information on the assessment process, please see Panjabi et al. 2005.

PIF recognizes two categories of species that have continental conservation importance: Continental Concern Species and Continental Stewardship Species. Continental Concern Species are those which are most vulnerable at the continental scale, due to a combination of limited distributions, high threats, and small and declining populations throughout their ranges. Some of these species are already recognized as threatened or endangered at federal levels. Continental Stewardship Species are those that have a high proportion of their global population or range within an ecological planning area.

A) Continental Concern: Species must meet all of the following criteria:

- Listed on Watch List in PIF North American Plan (Rich et al. 2004)
- Occur regularly in significant numbers in the BCR, i.e., Relative Density > 1
- Future conditions are not enhanced by human activities, i.e., Threat Score > 1

B) Continental Stewardship: Species must meet all of the following criteria:

- Listed as a Stewardship Species in PIF North American Plan (Rich et al. 2004)
- High importance of the BCR to the species; i.e., % Population $\geq$ 25% OR Relative Density = 5 and % Population $\geq$ 5%)
- Future conditions are not enhanced by human activities, i.e., Threat Score > 1

Species of continental importance should receive appropriate conservation attention within BCRs where they occur, but these are not the only species that regional planners should consider. Many species of low continental priority may be declining steeply within certain regions or face higher threats than elsewhere. Species that are concentrated within a BCR also merit stewardship, even if they are not Continental Stewardship Species. Therefore, PIF also recognizes two categories of species that are regionally important: Regional Concern Species and Regional Stewardship Species.

C) Regional Concern: Species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High Regional Threats (> 3) or Moderate Regional Threat (3) combined with significant population decline (PT > 3)
- Occurs regularly in significant numbers in the BCR, i.e., Relative Density > 1

D) Regional Stewardship – species must meet all criteria in the season(s) for which it is listed:

- Regional Combined Score > 13
- High importance of the BCR to the species; % Population $\geq$ 25% OR Relative Density = 5 and % Population $\geq$ 5%
- Future conditions are not enhanced by human activities, i.e., Threat Score > 1

Species of Regional Importance

Northern forests in the Great Lakes region contain the highest overall species richness of breeding birds in the U.S. and Canada (Robbins et al. 1986, Price et al. 1995). The ecotone of boreal and deciduous forests, abundance of lakes and wetlands, large-scale vegetative patchiness, and small-scale patches (created by canopy gaps, topographical changes, local aspect, and soil variations) contribute to high bird species richness and abundance in the region (Noon et al. 1979, Temple et al. 1979, Pastor and Brochart 1990, Hamady 2000). There are 178 landbirds identified as having manageable breeding bird populations within the planning unit, many of which migrate into the region for breeding and leave by late summer.

According to the PIF species assessment process, 39 species are considered regionally or continentally important for the planning unit (Table 3). Of these 39 species, 24 (62%) are associated primarily or entirely with forests, 7 (18%) with wetland habitats, 6 (15%) with

grassland/savanna habitats, and 2 (5%) with urban and developed areas. Eight species are highly vulnerable both at the continental and regional scale: Red-headed Woodpecker, Olive-sided Flycatcher, Wood Thrush, Kirtland's Warbler, Bay-breasted Warbler, Canada Warbler, Henslow's Sparrow, and Rusty Blackbird. Twelve additional species are of high conservation concern for BCR 12, including Whip-poor-will, Connecticut Warbler, and Bobolink. The remaining species are considered stewardship species because they have a high proportion of their global population or range within BCR 12. For example, 15 species were estimated to have >5% of their global population breeding within the planning unit. Of these, the Kirtland's Warbler and Golden-winged Warbler are most significant, with 100% and 60% of their breeding populations occurring in the U.S. portion of BCR 12, respectively (Table 4). In addition, more than 18% of all Sedge Wrens, 11% of Chestnut-sided Warblers, and 10% of Black-billed Cuckoos are estimated to breed here.

TABLE 3. U.S. BCR 12 PRIORITY LANDBIRDS AND THEIR HABITAT GUILDS. SPECIES ARE SORTED BY CONSERVATION PRIORITY.

Species	**Habitat Guild**	**Continental Concern**	**Regional Concern**	**Continental Stewardship**	**Regional Stewardship**
Red-headed Woodpecker	Barrens	Y	Y	-	-
Olive-sided Flycatcher	Coniferous Forest	Y	Y	-	-
Willow Flycatcher	Shrub-wetland	Y	-	-	-
Wood Thrush	Deciduous Forest	Y	Y	-	-
Golden-winged Warbler	Regenerating Forest	Y	-	-	-
Kirtland's Warbler	Regenerating Forest	Y	Y	Y	Y
Bay-breasted Warbler	Coniferous Forest	Y	Y	-	-
Canada Warbler	Coniferous Forest	Y	Y	Y	Y
Henslow's Sparrow	Open Grassland	Y	Y	-	-
Rusty Blackbird	Shrub-wetland	Y	Y	-	-
Whip-poor-will	Deciduous Forest	-	Y	-	-
Chimney Swift	Urban	-	Y	-	-
Northern Flicker	Deciduous Forest	-	Y	-	-
N. Rough-winged Swallow	Shoreline	-	Y	-	-
Bank Swallow	Shoreline	-	Y	-	-
Barn Swallow	Urban	-	Y	-	-
Veery	Deciduous Forest	-	Y	-	Y
Brown Thrasher	Shrub-grassland	-	Y	-	-
Connecticut Warbler	Coniferous Forest	-	Y	-	-
Field Sparrow	Shrub-grassland	-	Y	-	-
Bobolink	Open Grassland	-	Y	-	-
Purple Finch	Coniferous Forest	-	Y	-	-
Ruffed Grouse	Regenerating Forest	-	-	-	Y
Broad-winged Hawk	Deciduous Forest	-	-	-	Y
Black-billed Cuckoo	Regenerating Forest	-	-	-	Y
Belted Kingfisher	Shoreline	-	-	-	Y
Yellow-bellied Sapsucker	Deciduous Forest	-	-	Y	Y
Least Flycatcher	Deciduous Forest	-	-	-	Y
Sedge Wren	Open Grassland	-	-	-	Y
Nashville Warbler	Regenerating Forest	-	-	Y	-
Chestnut-sided Warbler	Regenerating Forest	-	-	Y	Y
Black-throated Blue Warbler	Deciduous Forest	-	-	-	Y
Black-thr. Green Warbler	Coniferous Forest	-	-	Y	Y

Species	Habitat Guild	Continental Concern	Regional Concern	Continental Stewardship	Regional Stewardship
Blackburnian Warbler	Coniferous Forest	-	-	Y	Y
Mourning Warbler	Regenerating Forest	-	-	Y	Y
Common Yellowthroat	Shrub-wetland	-	-	-	Y
Swamp Sparrow	Open Marsh	-	-	Y	-
White-throated Sparrow	Regenerating Forest	-	-	Y	-
Rose-breasted Grosbeak	Deciduous Forest	-	-	-	Y

The primary source of regional trend information was Breeding Bird Survey (BBS) data from 1966-2002, but specialized sources were used where these were the best available breeding data. Population trend scores indicate vulnerability due to direction and magnitude of changes in population size over the past 30 years. Species declining 50% or more over this period are considered most vulnerable (Panjabi et al. 2005). Of the 39 regionally important species in the planning unit, 11 have uncertain trends (PT=3), either because of highly variable data or poor sample size (Table 4). Of the 28 species adequately sampled by BBS, 22 have experienced population declines over the past 30 years (PT=4 or 5). Species experiencing the steepest declines are Belted Kingfisher, Northern Rough-winged Swallow, Bank Swallow, Barn Swallow, Olive-sided Flycatcher, Brown Thrasher, and Field Sparrow. Five of these species (62%) are obligate-insectivores. In addition, the majority of these imperiled species are associated with two habitat guilds: shorelines and shrub-grasslands (Table 3).

Six species show increasing population trends (PT=1 or 2): Henslow's Sparrow, Sedge Wren, Swamp Sparrow, Nashville Warbler, Blackburnian Warbler, and White-throated Sparrow. Henslow's Sparrow and Sedge Wren prefer tall, dense grassy areas for breeding and thus have likely benefited from the millions of acres planted to grass cover through CRP and other agricultural set-aside programs over the last 20 years (Sample and Mossman 1997, Herkert 2007). Swamp Sparrow, Nashville Warbler, and White-throated Sparrow are generalist species within their habitat guilds - Swamp Sparrow uses a variety of wetland types and Nashville Warbler and White-throated Sparrow use a variety of forest types. Their plasticity in habitat use may make them less vulnerable to habitat change than other species, thereby allowing a stable or increasing population trend.

TABLE 4. POPULATION ESTIMATES AND ASSESSMENT SCORES FOR BREEDING SPECIES OF REGIONAL IMPORTANCE IN U.S. BCR 12. ESTIMATES ARE BASED ON METHODOLOGIES FROM RICH ET AL. 2004 AND ARE DERIVED FROM THE PIF POPULATION ESTIMATES DATABASE (HTTP://RMBO.ORG/PIF_DB/LAPED/). FOR MORE ON POPULATION ESTIMATES, SEE APPENDIX C.

Species	Population Estimate[a]	% Global Population[a]	PS-g[b]	BD-g	TB-r	PT-r	RD-b	RCS
Ruffed Grouse	340,000	4.2	2	2	2	3	5	14
Broad-winged Hawk	130,000	7.1	3	1	2	3	5	14
Black-billed Cuckoo	110,000	10.0	3	2	3	3	5	16
Whip-poor-will	71,000	3.5	3	2	4	4	2	15
Chimney Swift	91,000	0.7	2	1	4	5	2	14
Belted Kingfisher	42,000	1.9	3	1	2	5	5	16
Red-headed Woodpecker	10,600	0.5	3	2	4	4	2	15
Yellow-bellied Sapsucker	590,000	7.3	2	2	2	3	5	14
Northern Flicker	262,000	1.6	2	1	3	4	5	15
Olive-sided Flycatcher	7,200	0.6	3	1	3	5	2	14
Willow Flycatcher	15,600	0.5	3	1	2	3	2	11
Least Flycatcher	610,000	4.4	2	1	2	4	5	14
N. Rough-winged Swallow	38,000	0.4	2	1	3	5	3	14
Bank Swallow	149,000	0.3	2	1	3	5	3	14
Barn Swallow	590,000	0.3	1	1	3	5	4	14
Sedge Wren	1,200,000	18.4	2	3	3	1	5	14
Veery	1,280,000	9.1	2	2	3	4	5	16
Wood Thrush	190,000	1.5	5	5	4	3	2	19
Brown Thrasher	100,000	1.4	2	1	3	5	3	14
Golden-winged Warbler	120,000	59.6	4	4	3	3	5	19
Nashville Warbler	3,000,000	9.1	2	2	2	2	5	13
Chestnut-sided Warbler	1,070,000	11.1	2	2	2	3	5	14
Black-throated Blue Warbler	64,000	3.1	3	3	3	3	5	17
Black-thr. Green Warbler	880,000	8.6	2	2	2	3	5	14
Blackburnian Warbler	400,000	7.1	2	2	3	2	5	14
Kirtland's Warbler	3,600	100	5	5	4	3	5	22
Connecticut Warbler	51,400	4.1	3	3	3	4	4	17
Mourning Warbler	500,000	7.6	2	3	2	4	5	16
Common Yellowthroat	1,360,000	4.5	2	1	2	4	5	14
Bay-breasted Warbler	4,600	0.1	3	3	3	4	4	17
Canada Warbler	88,000	6.7	3	2	3	4	5	17
Field Sparrow	45,000	0.6	2	2	4	5	2	15
Henslow's Sparrow	1,700	2.1	4	3	4	2	2	15
Swamp Sparrow	450,000	4.8	2	2	2	2	5	13
White-throated Sparrow	3,000,000	2.3	1	2	2	2	5	12
Rose-breasted Grosbeak	430,000	9.5	3	2	2	4	5	16
Bobolink	720,000	6.8	2	2	3	4	4	15
Rusty Blackbird	130	0.0	3	1	3	4	3	14
Purple Finch	120,000	4.1	3	2	3	4	4	16

[a] Population estimates and % global population estimates are calculated based on the U.S. portion of BCR 12.
[b] PS-g = Population Size, global; BD-g = Breeding Distribution, global; TB-r = Threats to Breeding, regional; PT-r = Population Trend, regional; RD-b = Relative Density, breeding; RCS = Regional Combined Score

SECTION 3: BIRD CONSERVATION ISSUES AND OPPORTUNITIES

Major conservation issues and opportunities for the planning unit center on how to best manage northern forests. The primary challenge is how to maintain healthy, viable populations of native birds and other organisms while accommodating the growing demands placed on forest resources (Epstein et al. 1999). Factors limiting bird populations in the Boreal Hardwood Transition involve landscape-level changes due to logging, housing development, and road-building combined with the effects of natural disturbances such as forest fire and white-tailed deer herbivory. Other issues include the threats to migratory stopover habitats and the growing concern of climate change (Rich et al. 2004). Related to all of these issues is the state of conservation planning in the region and the limitations that may become apparent due to a lack of ecological information and the coordination necessary to achieve meaningful bird conservation.

Timber Management

Timber management has been an important influence on plant communities of the Boreal Hardwood Transition. During the past 150 years, vegetation change exceeded that of the previous 850 years by 2.4 times (Cole et al. 1998). Clearcutting and slash fires during the late nineteenth century resulted in homogenization of stand ages, elimination of old-growth stands, and a shift in the relative proportion of broad-leaf and conifer trees across the planning unit (Curtis 1959, Pastor and Mladenoff 1992). Hemlock and white pine, in particular, were drastically reduced or eliminated from many forest stands and replaced by deciduous species (Mladenoff and Pastor 1993). Today, the majority of the planning unit supports relatively young- to mid-aged stands with lower stand-level species diversity.

This simplification is an important conservation issue for many bird species. Old forests are usually more spatially heterogeneous than young managed forests, with higher structural complexity, more canopy gaps, and more woody debris to support important prey populations. Thus, the young, second-growth stands that currently dominate the landscape do not provide the complex canopy and forest floor structure that many bird species require. Also, the widespread replacement of conifers with aspen, sugar maple, red maple, basswood, and other deciduous trees likely has adversely impacted conifer-dependent species, such as Blackburnian Warbler and Black-throated Green Warbler (Schulte et al. 2002). However, Pierson and Niemi (2000) found that Blackburnian Warblers in Minnesota occurred in mature aspen stands if a conifer component was retained within and adjacent to the stand (within 500m).

Certain timber management practices can help to diversify the landscape and improve conditions for some declining bird species. Forest management practices, such as extended rotations, that encourage development of old-growth characteristics including large trees, diverse tree species composition, and structural heterogeneity will benefit Blackburnian Warbler, Wood Thrush, and other species preferring older age classes. Lengthening harvest schedules to maintain stands >120 years old is one strategy to promote old-growth features (Cumming and Diamond 2002). Managing for a conifer component within deciduous stands will benefit conifer-dependent species such as Olive-sided Flycatcher and Purple Finch.

Habitat Fragmentation

Fragmentation typically refers to the interruption of large areas of contiguous cover into patches of varying sizes and types. Many human activities contribute to habitat fragmentation, but timber management and residential development are the primary sources in the Boreal Hardwood Transition (Pfanmuller 1993, Robinson et al. 1995, Howe et al. 1996, WI DNR 2002a). In addition, openings have been created in Wisconsin forests as deer habitat, which further fragments the forest. Much of the region supports a low human density, with high recreational use and tourism during summer, winter, and weekends. The very qualities that make this area attractive, however, have led to extensive construction of homes along lakefronts and increasing recreational uses that fragment and change the character of ecologically sensitive areas. Although the effects of fragmentation are less severe in this forest-dominated landscape than in agricultural regions to the south (Robinson et al. 1995), it remains an important conservation concern.

According to Flaspohler (2001), fragmentation can affect birds in at least three ways: 1) fragments can become too small to support populations or even a pair of some species (area sensitivity); 2) fragments may become so isolated from other similar habitat or so surrounded by hostile habitat that birds cannot use them (isolation sensitivity); or 3) fragments may be subject to negative edge effects from predators and brood parasites (edge sensitivity). Each scenario can result in energetic and fitness costs to individual birds, which in turn impacts the health of the breeding population. For example, Flaspohler et al. (2001) found that some forest interior species occurred at lower densities within 50 meters and had lower nest success within 300 m of hard edges generated by clear-cuts. Thus, birds with specialized requirements such as Black-throated Blue Warbler, Blackburnian Warbler, and Wood Thrush may be replaced by generalist bird species such as House Wren, American Robin, American Crow, and Blue Jay in fragmented landscapes (WI DNR 2002a, 2002b).

To mitigate the effects of forest edges, the maintenance of large (e.g., 2000 ha), contiguous forested areas is recommended wherever possible (Howe et al. 1992) and some authors have recommended much larger ‘cores’ of unfragmented habitat (E. Epstein, WI DNR, pers. comm.). Protection of large areas will help meet the needs of some area-sensitive species, including Least Flycatcher, Wood Thrush, Black-throated Blue Warbler, Mourning Warbler, and Connecticut Warbler. Aggregating individual cuts also will reduce the amount of edge (WI DNR 2002a). Use of core areas of older forest surrounded by buffer areas of less intensively managed forest will provide habitat for forest interior species and species that use older forests. In Wisconsin, allowing forest openings created for deer to revert back to forest will reduce forest fragmentation as well as provide less habitat for an already overabundant deer herd. Public policies that limit the conversion of forests to other land uses will be beneficial to many species in the northern parts of the region.

White-tailed Deer Herbivory

White-tailed deer management must be considered in any discussion of forest management (Finan 2000). The increased prevalence of even-aged successional forests has markedly improved habitat conditions for deer (Mladenoff and Pastor 1993). The spread of housing developments to previously undeveloped areas provide deer with supplemental foods and protection from hunting. In addition, almost two decades of warmer winters have allowed deer herds to increase. Deer herbivory can alter forest composition and structure and thus potentially impact bird populations (Alverson et al. 1988, Alverson et al. 1994). Understory and ground vegetation also can be significantly impacted by overbrowsing, except when protected by snow or comprised of plants distasteful to deer. Browse-resistant species such as balsam fir play an important role in providing vegetation in the 1+ meter height range, which is typically removed by browsing (Hall 2002, *in review*).

The effects of deer herbivory on birds are both direct and indirect: deer are known to prey occasionally on bird nests (Pietz and Granfors 2000) and destroy nesting and foraging habitat by overbrowsing understory species. Hamady (2000) suggests that the loss of Canada yew in mature woods has negatively impacted Black-throated Blue Warbler and other shrub-nesting species. Overbrowsing of hemlock saplings may suppress the conifer component of the forest canopy and thus affect nesting and feeding microhabitats for species such as Blackburnian Warbler and Black-throated Green Warbler. Some species are likely to benefit from overbrowsed conditions, however, especially ground nesting species that prefer an open understory. Thus, understanding deer impacts is best approached using a landscape-scale perspective. Costs and benefits to different species must be evaluated within the context of total habitat impacted by deer, total habitat available, and other stressors on key habitats that may interact with deer effects. Stopping costly forest opening maintenance will provide less habitat for an already overabundant deer herd.

Climate Change

Climate change involves long-term alteration in the characteristic weather conditions of a region, such as changes in precipitation, temperature, and wind (USGS 2008). Bird response to climate change is unpredictable and will vary by species. Certain species may respond to warming temperatures by shifting their distributions pole-ward. Therefore, species restricted to boreal zones or higher latitudes may be especially susceptible to the effects of climate warming (Virkalla et al. 2008), including many of the priority species of BCR 12. Alternatively, some species currently at the northern limit of their range in BCR 12 (e.g., Henslow's Sparrow) may experience an increased presence in the region. Some species may respond to climatic changes by shifting the timing of seasonal events, such as egg laying dates and arrival and departure dates. Phenological changes are of concern because they can force a given bird species' lifecycle out of synchrony with the ecosystems and communities of which it is a part (CRP 2008). Habitat changes will undoubtedly occur as a result of climate change and its associated effects, such as increased survival of forest insects and diseases and increased overwinter survival of deer herds. Because of the uncertainties regarding the impacts of climate change, determining proper conservation action is extremely challenging. Continued research is crucial and a dynamic conservation approach may be required.

Identification and Protection of Stop-over Habitats

BCR 12 is part of a global network of sites that ultimately links breeding grounds as far north as Greenland and the Arctic Ocean to wintering grounds as far south as Argentina's Tierra del Fuego. The shorelines of Lakes Superior, Michigan, and Huron, in particular, are crucial stopover areas for millions of migrating birds within the planning unit. Stopover sites vary from sites used infrequently or during times of stress, sites used more regularly that offer limited resources, and sites used often that provide high quality food and shelter (Dunn 2000, Mehlman et al. 2005). Only recently has attention focused on how to identify, prioritize, and protect many of these important sites. Without this information, there is a strong likelihood that significant resources directed at breeding and wintering ground conservation may be compromised or wasted (Moore 2000).

The Nature Conservancy (TNC), accordingly, is developing conservation strategies for stopover sites in the Great Lakes region through projects in western Lake Erie (TNC 2003), Chicago Wilderness region, and the Lake Ontario watershed in New York. In addition, the University of Minnesota is undertaking complementary research on stopover work along the Lake Superior shoreline of Minnesota, and the State of Wisconsin initiated a 2-year project to identify, prioritize, and protect stopover sites and habitats on Lakes Michigan and Superior shorelines (Matteson 2005). In 2007, the Wisconsin DNR and The Nature Conservancy initiated Phase III (Protection and Acquisition of Priority Stopover Sites) of this project, which will utilize the list of mapped priority stopover sites to engage local, state, and regional parties in conservation planning within the Lakes Michigan and Superior basins.

The degradation of stopover areas poses a significant threat to migratory bird populations through loss of habitat and bird mortality/collisions associated with tall structures. Mortality factors are increasingly associated with human impediments along the migratory route, such as communication towers and illuminated buildings (Rich et al. 2004) or wind turbines. Nocturnal migrants can directly collide with these structures, causing serious injury or death. Some birds also become disoriented by artificial lighting, especially during overcast conditions, and encircle the illuminated space until exhaustion or death. Two priority species for BCR 12, Common Yellowthroat and Bay-breasted Warbler, are particularly susceptible to tower kill collisions. Longcore et al. (2005) estimated annual tower-related mortalities ranging from 225,000 to 2,250,000 for each of these species. Annual losses of this magnitude pose a serious threat to bird populations and need to be addressed. For technical guidance on minimizing communication tower-related deaths, please see http://www.abcbirds.org/conservationissues/threats/towers.html. For more information on preventing other building collisions, please read http://lightsout.audubon.org/ and http://birdsandbuildings.com/.

General Conservation Opportunities

Many opportunities exist to build partnerships for the conservation and management of landbirds and their habitats. Within BCR 12, PIF has the opportunity to integrate bird conservation at several scales. National, state, county, and private industrial forest management plans as well as Managed Forest Law opportunities provide opportunities for managing priority bird species and forest or barrens bird populations. Management of open lands (grasslands, sedge meadows and other open wetland habitats) to benefit birds can be pursued on both public and privately owned sites and landscapes. The Nature Conservancy is identifying significant breeding areas for priority birds within ecological provinces, sections, and ecosystems (Ewert 1999). State wildlife agencies have developed action plans to assess the health of each state's wildlife and habitats, identify their conservation needs, and outline the actions that are needed to conserve them over the long term. The Important Bird Areas (IBA) program identifies significant sites for breeding, migrating, and wintering birds, provides decision-support tools for conservation planners, and promotes funding opportunities for the protection of these important sites. Finally, because 3-5 billion birds breed in Canada and migrate south through the U.S., it is essential to communicate regularly with Canadian counterparts such as Bird Studies Canada, the Canadian Boreal Initiative, the Canadian Wildlife Service, and the Boreal Songbird Initiative. It will only be through a cost-effective, systematic, integrated approach that PIF and similar conservation initiatives will be successful.

Despite these promising prospects, conservation opportunities are limited for some species in BCR 12, such as Henslow's Sparrow, Red-headed Woodpecker, Willow Flycatcher, and to a lesser extent Field Sparrow. All of these species are at or near the edge of their ranges in this region and are likely limited by factors other than conservation activities.

SECTION 4: HABITATS AND OBJECTIVES

FORESTS

Ecology and Conservation Status

Forests of BCR 12 occur along a moisture gradient, from very wet to very dry. Tamarack and black spruce forests represent the wettest end of the moisture gradient and thus are categorized as wet forest. Wet forest may vary from savanna-like muskegs with widely scattered trees or clusters of trees (often stunted) to relatively dense black spruce forests with a 60-70% canopy cover. An abundance of ericaceous "heath" shrubs grows in the understory, such as leatherleaf, Labrador tea, bog rosemary, bog laurel, and others. At the opposite end of the moisture gradient is dry forest, dominated by jack pine, red pine, and Hill's oak. Mesic forest occurs near the center of the moisture gradient and is one of the most extensive forest communities in the planning unit. Sugar maple is dominant or co-dominant in most stands and yellow birch, ironwood, basswood, and white ash also are common tree species. In Michigan and northeastern Wisconsin, beech also occurs in the mesic forest community. Hemlock was the second most important species in mesic forests prior to settlement, but is now much reduced in extent, mostly due to historic logging (Curtis 1959, Robbins 1991) but in some

cases affected by recent logging and poor reproduction (E. Padley, E. Epstein, WI DNR, pers. comm.). After old-growth stands were cut, trees such as quaking and bigtoothed aspens, white birch, and red maple became abundant and still are important in many second-growth mesic forests and other forest communities today (WNDR 2005).

Forest communities occur as a mosaic across the landscape, but several patterns emerge in the distribution of forest vegetation and forest birds in BCR 12. Pure deciduous stands are distributed mainly in Wisconsin and Upper Michigan, and at least two priority species, Black-throated Blue Warbler and Whip-poor-will, become locally abundant there. At the western edge of the planning unit, conifers become more abundant and conifer-dependent birds, such as Blackburnian Warbler, Olive-sided Flycatcher, Connecticut Warbler, and Canada Warbler are increasingly common. Regenerating forests occur at sites disturbed by logging, fires, or windthrow and thus are less predictable in distribution. As a result, bird species associated with these early-successional habitats, such as Chestnut-sided Warbler, Mourning Warbler, and White-throated Sparrow, may be locally abundant in a disturbed area for several years and then disappear as conditions change.

Although very few bird species in the planning unit are restricted to a single forest type, general patterns of habitat preference are known for virtually all of the priority species (Davis 1996, Howe et al. 1996, Epstein et al. 1999, Hanowski et al. 2003). This plan utilizes broad habitat guilds, *deciduous, coniferous,* and *regenerating forests*, as the basis for classifying forest bird communities, but there is much local variation within these forest guilds. For example, forest stands dominated by mature trees (>30 years old) can contain either high canopy closure with little to no understory or a broken canopy with a well-developed understory. Young stands (10-30 years old) can have incomplete canopies with well-developed understories or dense canopies if the stand is regenerating from a clearcut. Regenerating stands (0-10 years) often have a dense shrub layer and well-developed herbaceous layer. Also, natural stands tend to have higher plant diversity and thus be more structurally heterogeneous than plantations. Thus, the categories assigned here are a simplification of the natural variation within forest communities.

Priority Bird Species

For the purposes of describing bird-habitat associations, we have identified assemblages of species that occur in the same general forest type. Although all priority species in this suite are associated with forests, their specific habitat requirements differ in terms of forest structure, stand age, composition, and other forest characteristics (Table 5). Species assigned to a particular forest guild do not necessarily occur together in the same stand or locale.

Deciduous Forest: Broad-winged Hawk, Whip-poor-will, Northern Flicker, Yellow-bellied Sapsucker, Least Flycatcher, Veery, Wood Thrush, Black-throated Blue Warbler, Rose-breasted Grosbeak

Deciduous and mixed deciduous forests in BCR 12 support a diversity of landbird species, including nine (23%) of the priority species. All nine species in this forest guild are present during the breeding season but migrate to southern latitudes during the non-breeding season.

Four species in this guild are of high conservation priority: Wood Thrush has both Continental and Regional Concern status and Whip-poor-will, Northern Flicker, and Veery have Regional Concern status (Table 3). The remaining five species are considered Stewardship Species at the continental or regional scale.

Coniferous Forest: Olive-sided Flycatcher, Black-throated Green Warbler, Blackburnian Warbler, Connecticut Warbler, Canada Warbler, Bay-breasted Warbler, Purple Finch

Seven (18%) of the priority species are dependent or strongly associated with coniferous forests and also are some of the most locally distributed breeding birds in the planning unit. Six species in this forest guild are present during the breeding season but migrate to southern latitudes during the non-breeding season. One species, Purple Finch, also occurs during the non-breeding season. Five species in this guild are of high conservation priority: Olive-sided Flycatcher, Canada Warbler, and Bay-breasted Warbler have both Continental and Regional Concern status and Connecticut Warbler and Purple Finch have Regional Concern status (Table 3). Black-throated Green Warbler and Blackburnian Warbler are considered Stewardship Species because they have a high proportion of their global population or range within BCR 12 (Table 4).

TABLE 5. BREEDING HABITAT NEEDS OF PRIORITY FOREST SPECIES IN U.S. BCR 12.

Species	Habitat Requirements	Stand Association	Stand Age	Patch Size
Ruffed Grouse	Mosaic of forest stand ages across landscape; high understory stem densities	Deciduous and mixed deciduous; aspen, birch, oak-hickory	Prefers young (<15 yr old) stands	No data
Broad-winged Hawk	Large, continuous tracts; near wetland or forest opening	Upland deciduous; oak-aspen; aspen-birch	Mature to Old	> 100 ha
Whip-poor-will	Open and semi-open forests; sparse understory	Upland deciduous; oak; oak-pine	Variable	No data
Black-billed Cuckoo	Forest edges and shrubby thickets; follows tent caterpillar outbreaks	Deciduous and mixed deciduous; aspen, alder and willow thickets	Variable	> 10 ha
Yellow-bellied Sapsucker	Open and semi-open forests; mature cavity trees	Upland and lowland deciduous; aspen-birch, cottonwood, maple, ash	Mature to Old	No data
Northern Flicker	Open forests and forest edges; scattered snags	Upland deciduous/ mixed deciduous	Variable	No data
Least Flycatcher	Large, continuous tracts; well-developed understory	Upland deciduous; oak, maple, birch, ash	Variable	No data
Olive-sided Flycatcher	Open and semi-open conifer bogs; scattered large trees	Lowland coniferous; spruce, tamarack, fir	Variable	No data
Veery	Large tracts of moist forests; dense understory	Upland deciduous; aspen-birch, oak	Variable	> 20 ha

Species	**Habitat Requirements**	**Stand Association**	**Stand Age**	**Patch Size**
Wood Thrush	Large, continuous tracts; well-developed litter layer	Upland deciduous; maple-basswood, birch	Mature to Old	> 100 ha
Golden-winged Warbler	Forest edges and openings with dense patches of herbs and shrubs; often near water	Deciduous; alder and willow thickets, aspen-birch	Prefers young (<10 yr old) stands	No data
Nashville Warbler	Early- to mid-successional coniferous forests; well-developed ground cover	Coniferous; spruce-tamarack, white cedar, jack pine, balsam fir	Variable	No data
Chestnut-sided Warbler	Regenerating forest openings; thick shrub understory	Deciduous; aspen, oak, alder thicket	Variable	No data
Black-throated Blue Warbler	Large, continuous tracts; dense, shrub understory	Upland deciduous/ mixed deciduous	Mature to Old	> 100 ha
Black-throated Green Warbler	Large, continuous tracts; structurally diverse stands	Mixed coniferous; aspen-pine, fir-spruce, hemlock-hardwood	Mature to Old	> 30 ha
Blackburnian Warbler	Large, continuous tracts; structurally diverse stands	Mixed coniferous; hemlock, white pine, spruce, balsam fir	Mature to Old	> 50 ha
Kirtland's Warbler	Large, continuous stands of young jack pine; tree height 1.5-5 meters	Coniferous; jack pine	Prefers young (<15 yr old) stands	> 200 ha
Connecticut Warbler	Open, park-like forests; dense ericaceous understory	Lowland and mixed coniferous; spruce-tamarack, jack pine	Mature to Old	No data
Mourning Warbler	Regenerating forest openings within large tracts; thick shrub layer	Mixed forests; aspen-birch, oak, alder thicket	Variable	> 65 ha
Canada Warbler	Moist, mixed coniferous forests; dense understory	Mixed coniferous; spruce, hemlock, fir	Variable	prefers > 400 ha
Bay-breasted Warbler	Dense, mature coniferous stands; often near water	Lowland and mixed coniferous; spruce-fir, hemlock, white pine	Mature to Old	No data
White-throated Sparrow	Regenerating forest openings with dense understory	Lowland coniferous and mixed coniferous; balsam fir, spruce	Variable	No data
Rose-breasted Grosbeak	Forest edges and mixed forest types;	Upland deciduous/ mixed deciduous	Immature to Mature	No data
Purple Finch	Moist coniferous and mixed coniferous forests; often near edge of bog	Mixed coniferous; fir, hemlock, spruce, white pine, white cedar	Variable	No data

Regenerating Forest: Ruffed Grouse, Black-billed Cuckoo, Golden-winged Warbler, Nashville Warbler, Chestnut-sided Warbler, Kirtland's Warbler, Mourning Warbler, White-throated Sparrow

Eight (21%) of the priority species are associated with regenerating forest habitats. Other priority species that use non-forest shrub/successional habitats are covered in the Wetlands and Grasslands sections. This forest guild contains some of the most abundant breeding birds in the planning unit, with populations of three priority species exceeding one million individuals (Table 4). Seven species in this forest guild are present during the breeding season but migrate to southern latitudes during the non-breeding season. One species, Ruffed Grouse, also occurs during the non-breeding season. Kirtland's Warbler is of the highest conservation priority because its entire breeding range is restricted to this BCR. Golden-winged Warbler also is of high conservation priority and is listed as a Continental Concern Species (Table 3). The remaining priority species are considered Stewardship Species at the continental or regional scale.

Population Objectives and Habitat Strategies

Of the 14 priority forest species in BCR 12 for which trend data are available, 11 (79%) are declining and only 3 (21%) are increasing (Table 4). No clear pattern emerges from analysis of forest guilds, as population declines are occurring equally amongst deciduous and coniferous forest birds. The lack of correlation between forest guild and population status is not surprising since large variations in habitat requirements exist within these guilds. The following table (Table 6) provides population estimates and objectives for all priority forest birds in BCR 12 (see Appendix C for definitions). Management or other on-the-ground conservation actions are needed to reverse significant population declines or sustain vulnerable populations for 10 priority forest species. Long-term planning is needed to maintain sustainable populations of 14 priority forest species.

TABLE 6. POPULATION OBJECTIVES AND CONSERVATION ACTIONS FOR PRIORITY FOREST SPECIES IN U.S. BCR 12. ESTIMATES ARE BASED ON METHODOLOGIES FROM RICH ET AL. 2004 AND ARE DERIVED FROM THE PIF POPULATION ESTIMATES DATABASE (HTTP://RMBO.ORG/PIF_DB/LAPED/). SEE APPENDIX C REGARDING ESTIMATED POPULATION SIZE TARGETS.

Species	U.S. BCR 12 Population Size	Population Objective	Target Population Size	Conservation Action
Ruffed Grouse	340,000	Maintain	340,000	Long-term Planning and Responsibility
Broad-winged Hawk	130,000	Maintain	130,000	Long-term Planning and Responsibility
Whip-poor-will	71,000	Increase 50%	106,500	Management
Black-billed Cuckoo	110,000	Maintain	110,000	Long-term Planning and Responsibility
Yellow-bellied Sapsucker	590,000	Increase 10%	649,000	Long-term Planning and Responsibility
Northern Flicker	262,000	Increase 50%	393,000	Management

Species	U.S. BCR 12 Population Size	Population Objective	Target Population Size	Conservation Action
Olive-sided Flycatcher	7,200	Increase 100%	14,400	Management
Least Flycatcher	610,000	Increase 50%	915,000	Management
Veery	1,280,000	Increase 50%	1,920,000	Long-term Planning and Responsibility
Wood Thrush	190,000	Increase 20%	228,000	Management
Golden-winged Warbler	120,000	Maintain	120,000	Long-term Planning and Responsibility
Nashville Warbler	3,000,000	Maintain	3,000,000	Long-term Planning and Responsibility
Chestnut-sided Warbler	1,070,000	Maintain	1,070,000	Long-term Planning and Responsibility
Black-throated Blue Warbler	64,000	Maintain	64,000	Long-term Planning and Responsibility
Black-throated Green Warbler	880,000	Increase 10%	968,000	Long-term Planning and Responsibility
Blackburnian Warbler	400,000	Maintain	400,000	Long-term Planning and Responsibility
Kirtland's Warbler	3,600	Increase 20%	4,320	Management
Connecticut Warbler	51,400	Increase 50%	77,100	Management
Mourning Warbler	500,000	Increase 50%	750,000	Long-term Planning and Responsibility
Canada Warbler	88,000	Increase 50%	132,000	Management
Bay-breasted Warbler	4,600	Increase 50%	6,900	Management
White-throated Sparrow	3,000,000	Maintain	3,000,000	Long-term Planning and Responsibility
Rose-breasted Grosbeak	430,000	Increase 50%	645,000	Long-term Planning and Responsibility
Purple Finch	120,000	Increase 50%	180,000	Management

Forest Bird Conservation Area Strategy

Landscape-level planning for forest birds is a dynamic process that considers the size, shape, composition, and juxtaposition of forest communities with the ecological and habitat requirements of bird species over time (Green 1995). This plan proposes to establish multiple **Forest Bird Conservation Areas** (FBCAs) within BCR 12 that are large enough to maintain or restore components of the historic landscape that are important to birds. The overall objective in establishing FBCAs is to provide a framework for the long-term conservation of forest birds by applying general strategies known to benefit both bird generalists and specialists: 1) maintain large contiguous forest tracts and manage in large blocks; 2) restore connectivity between large tracts; 3) minimize isolation of forest patches; 4) maintain a well-

developed and diverse understory; 5) encourage a variety of seral stages and more forest interior for area-sensitive species; and 6) limit narrow, linear tracts to reduce the ratio of edge to interior in managed areas (Robbins 1979, Rosenberg et al. 1999). Another important component of the FBCA framework is to establish an old-growth core reserve area (surrounded by a buffer zone where no silvicultural activities occur) to benefit forest-interior species and other priority species (Leopold 1938, Robbins et al. 1989a).

Managing one large reserve often is more effective than managing several small areas because of the range of habitat conditions required by priority species (Temple 1988, Wilcove et al. 1986). Several conservation planning efforts have suggested minimum sizes for core forest areas. Robbins et al. (1989a) and the Maryland PIF program (Maryland PIF 1997) recommend a minimum tract size of 3000 hectares (7400 acres) to benefit forest-interior birds of eastern North America. The Michigan chapter of The Nature Conservancy recommends >4000 hectares (10,000 acres) of mature continuous forest to benefit priority bird species and minimize the effects of predators and cowbirds (D. Ewert, The Nature Conservancy, pers. comm.). Accordingly, this plan calls for multiple 4500 hectares (11,000 acres) FBCA management units in the region, each with an old-growth core of 3000 hectares (7400 acres). Where FBCA management units cannot be designated, satellite **Forest Bird Management Areas** (FBMAs) should be established. In general, 1000 contiguous hectares (2500 acres) of forest will meet the habitat area requirements of many priority forest birds (Robbins 1979).

Working across agencies and with the public, FBCAs and FBMAs will be identified and a plan will be written for each that determines the extent of adequate representation of habitats and priority species, and identifies the types of management regimes currently employed. Agreements can then be made among agencies and organizations on who will be responsible for management on their respective properties. Outstanding opportunities for implementing conservation measures, including the establishment of FBCAs and FBMAs, occur at the following:

<u>Michigan</u>

- Ottawa, Hiawatha, and Huron-Manistee National Forests
- Pictured Rocks National Lakeshore
- Porcupine Mountains Wilderness State Park
- Seney National Wildlife Refuge
- Sleeping Bear Dunes National Lakeshore
- Sylvania Wilderness Area

<u>Wisconsin</u>

- Apostle Islands National Lakeshore
- Chequamegon-Nicolet National Forests
- Door Peninsula-Grand Traverse Islands
- Northwestern Barrens Complex – Namekagon, Solon Springs, Moquah
- Northern Highland-American Legion State Forest
- St. Croix National Scenic Riverway

<u>Minnesota</u>

- Beltrami Island State Forest

- Boundary Waters Canoe Area
- Chippewa and Superior National Forests
- Isle Royale National Park
- Itasca State Park
- Voyageurs National Park

Management Guidelines

Managing forest habitats for breeding birds will be a dynamic process involving the cooperation of multiple public and private interests. Stand size and composition, vegetative structure, landscape context, and other ecological characteristics must all be factored into management decisions to ensure a diverse avifauna. Many forest birds will potentially benefit from WI DNR (2002b) silvicultural recommendations if they are implemented to: 1) increase structural diversity within stands (i.e., large trees, large cavity trees, large snags, large downed woody debris, variable gap sizes); 2) increase the representation of large patches of older, uneven-aged forest; and 3) increase the representation of older trees and stands and later developmental stages (i.e., old forest and old growth). There also is considerable need for long-term conservation of early-successional landscapes for Ruffed Grouse, Golden-winged Warbler, and many other species.

These recommendations can be accomplished through a variety of methods. Actively restoring hemlock and perhaps even Canada yew to appropriate forest stands and preventing high densities of white-tailed deer will help to increase diversity. Increased retention of conifers within managed mixed hardwood stands in the region will promote habitat for many conifer-dependent species. Protecting the hydrology of spruce-fir lowlands and allowing a natural disturbance cycle within this forest community will provide a mosaic of habitat conditions and seral stages across the planning unit. Also, the continued use of fire in jack pine forests is encouraged for maintaining or increasing Kirtland's Warbler habitat, which also will benefit Connecticut Warbler, Nashville Warbler, Whip-poor-will, and other priority bird species.

We recommend that all parties responsible for managing private, county, state, tribal, or national forest lands develop and implement management strategies that benefit the largest number of PIF priority birds. It is beyond the scope of this plan to provide specific silvicultural prescriptions tailored to each state and ecological landscape. Also, adequate silvicultural recommendations are predicated, at least in part, on further research to delineate the relationships between small-scale habitat characteristics and landscape features and their effects on forest bird populations. For certain species near the edge of their ranges in BCR 12 (e.g., Olive-sided Flycatcher, Connecticut Warbler, and Bay-breasted Warbler), it may be difficult to impossible to achieve population goals through habitat management, as factors other than management issues are likely responsible for their current distribution in the BCR.

- Maintain multiple old-growth stands >1000 ha across the landscape to benefit Black-throated Green Warbler, Bay-breasted Warbler, and other priority species (Robbins 1979, Robbins et al. 1989a, Rosenberg et al. 1999, Thompson et al. 1995).

- Preserve large tracts of mature coniferous and mixed forest edge contiguous to large inland lakes, including the Great Lakes.
- Where possible, maximize the amount of forest interior (and minimize disturbance within it) to benefit area-sensitive and forest-interior species. Openings, including roads and power lines, should be concentrated along existing edges (Faaborg et al. 1995).
- Maintain a minimum 70% canopy cover in mature (>100 years old) mixed forests. Encourage good sapling development at these sites to provide nesting and foraging sites for Veeries, Black-throated Blue Warblers, and Wood Thrushes.
- Promote structural diversity (vertical and horizontal) at the landscape scale, including patches of early-, mid-, and late-successional forest in a range of patch sizes (Thompson et al. 1995).
- Maintain and increase the amount of dead woody material in forests, including standing snags, and fallen coarse and fine woody debris to provide food sources, perching sites, and cavity nest sites.
- Control white-tailed deer populations to minimize adverse impacts of overbrowsing and increase vertical foliage diversity (Faaborg et al. 1995).
- Restore Canada yew.
- If managing for early-successional species, increase regeneration cuts or shorten rotations in even-aged aspen systems (Thompson et al. 1995).
- If managing for canopy-gleaning and cavity-nesting species, lengthen rotation ages in even-aged systems, increase the proportion of large trees in uneven-aged systems, and retain some snags and live residual trees in regeneration cuts (Thompson et al. 1995).
- Favor yellow birch, which supports high invertebrate populations, over sugar maple in selection harvests to benefit foliage-gleaning birds such as Black-throated Blue Warbler (Holmes and Robinson 1981, DeGraff 1987).
- Maintain scattered conifers in hardwood stands, as they are used extensively by species such as Blackburnian Warbler and Black-throated Green Warbler (DeGraff 1987).
- Maintain a hardwood component in regenerating conifer plantations (Thompson et al. 1995).

Research and Monitoring Needs

Ongoing, systematic monitoring programs are in place for the Nicolet-Chequamegon, Superior, Chippewa, Ottawa, and Hiawatha National Forests. The North American Breeding Bird Survey has a well-organized sample of routes conducted by skilled observers. Michigan and Wisconsin have each completed comprehensive atlases of breeding birds (Brewer et al. 1991, Cutright et al. 2006) and planning is underway for the Minnesota atlas. The birding communities in all three states are very active and communication among birders has increased in recent years via the internet and organized events. Although a reasonably good baseline of information exists, data are still lacking for a number of species. In general, bird conservation planning in the BCR is limited by a lack of detailed knowledge on local bird ecology, especially bird response to various silvicultural treatments, and coordinated bird research and management activities.

- Conduct breeding ecology studies of species for which little is known, such as Nashville Warbler, Black-throated Green Warbler, Blackburnian Warbler, Connecticut Warbler, Rose-breasted Grosbeak, and Purple Finch.
- Determine range of suitable habitats and identify present breeding sites for Golden-winged Warbler; verify and refine predictive habitat models for this species.
- Identify causal factors and develop strategies to reverse population declines for Olive-sided Flycatcher.
- Develop and implement targeted surveys for rare or uncommon species that are not well-covered by standardized monitoring programs, such as Broad-winged Hawk and Olive-sided Flycatcher.
- Standardize breeding bird atlas and other monitoring methods across the states.
- Examine the effects of different silvicultural practices on occurrence, breeding density, and productivity on select priority species.
- Examine the impacts of increasing populations of forest generalist species, such as Blue-winged Warbler and American Robin.
- Determine the impacts of rural housing on bird populations and nest success.
- Identify and protect source areas for imperiled species.
- Identify landscape-scale factors required by forest birds and where on the landscape to manage for them given current land cover and land use.

Outreach

There are many outstanding outreach materials already available, including Birds and Forests: a management and conservation guide (Green 1995), Michigan Breeding Bird Atlas (Brewer et al. 1991), Atlas of the Breeding Birds of Wisconsin (Cutright et al. 2006), and Wisconsin Birdlife (Robbins 1991). Several active internet sites provide important information about birds in the region, including Wisconsin Society for Ornithology (http://www.wsobirds.org/) and Forest Birds of the Western Great Lakes (http://www.nrri.umn.edu/mnbirds/default.htm). These resources reach a limited audience, however, and further outreach initiatives are needed to inform those responsible for forest-use decisions.

- Develop brochures, posters, and interpretative displays to educate the public on the importance of BCR 12 to bird populations.
- Educate private forest owners about management practices that are beneficial to forest birds.
- Educate silviculturists and land managers about habitat requirements for high priority species.
- Partner with utility companies to manage rights-of-ways for shrub-nesting birds.
- Work collaboratively with forest management planning efforts to ensure that bird conservation needs are addressed.
- Partner with international groups to protect critical habitat along migratory routes and on the non-breeding grounds.
- Encourage bird watchers to participate in organized monitoring programs, large-scale studies, and conservation efforts.
- Incorporate bird conservation messages into classroom curricula.

GRASSLANDS AND SAVANNAS

Ecology and Conservation Status

Historically, grasslands in the predominantly forested region were limited to oak and pine barrens, savannas, open wetland communities, some native grasslands, large sedge meadow complexes, and recently or frequently burned forests. Other minor grassland communities also occurred in this region, such as bracken grasslands (Curtis 1959), dune lands along the Great Lakes shore, and alvar - small and sparse deciduous and coniferous trees scattered among grasses and shoreline plants (Epstein et al. 2002). During the nineteenth and twentieth centuries, widespread logging across the planning unit converted significant amounts of forest land to agriculture. These agricultural lands, which include hay, pastures, small grains, row crops, specialty crops, and CRP fields, form the majority of grassland habitats in the region today. In the southern and western portions of the planning unit, in particular, agriculture is the dominant land use and forested habitats are often reduced to isolated fragments; the same is true for significant areas in the Lake Superior coastal plain.

This plan utilizes broad habitat guilds, *open grassland*, *shrub-grassland*, and *barrens* as the basis for classifying grassland bird communities. Without regular but relatively infrequent disturbance, these habitat guilds will succeed to a woodland system. Wildfire, windthrow, timber management such as clear-cutting and salvage logging, and grazing and hay mowing are the primary mechanisms for maintaining grassland habitats in BCR 12. Disturbance intervals equal to or greater than five years tend to favor increases in shrub cover, abundance, and species richness, whereas more frequent disturbances will maintain grass-dominated communities (Sample and Mossman 1997, Heisler et al. 2003). Wildfire, in particular, is important for maintaining the open aspect of pine and oak barrens (Kost et al. 2007).

Bird Habitat Requirements

Priority grassland species are grouped into the following suites based on similarity of habitat preferences. Refer to Sample and Mossman (1997) for further information on habitat requirements and response to management practices for many of the priority species.

Open Grassland: Sedge Wren, Henslow's Sparrow, Bobolink

Three (8%) of the priority species are associated with open grasslands of moderate to tall height. All of the priority species in this guild are migratory, occurring regularly in the planning unit during the breeding season only. Henslow's Sparrow has both Continental and Regional Concern status, Bobolink has Regional Concern status, and Sedge Wren is listed as a Stewardship Species (Table 3). Although all priority species in this guild are associated with relatively tall, grass-dominated habitats, their specific habitat requirements differ in terms of vegetative structure (Table 7). For example, Henslow's Sparrow and Sedge Wren prefer a dense litter layer and significant standing residual vegetation, whereas Bobolink prefers a low to moderate litter layer and does not require standing residual vegetation. Several studies suggest that Henslow's Sparrow and Bobolink are area-sensitive (Johnson and Temple 1986, Zimmerman 1988, Herkert 1994, Sample and Mossman 1997) but Sedge Wren does not

appear to require large blocks of grassland or sedge meadow. Each species readily uses native prairie patches and CRP fields of appropriate height, and Bobolink and Sedge Wren occasionally inhabit agricultural fields, such as hay, lightly grazed pastures, and abandoned fields (Sample and Mossman 1997).

TABLE 7. BREEDING HABITAT NEEDS OF PRIORITY GRASSLAND SPECIES IN U.S. BCR 12.

Species	Habitat Requirements	Litter Layer	Woody Cover	Patch Size*
Red-headed Woodpecker	Oak barrens; open deciduous forests or forest edge, other open upland sites with scattered mature trees	No data	High stand decadence around nest site	> 20 ha
Sedge Wren	Dense stands of tall grass or sedge; abundant litter	High	0-5%	> 15 ha
Brown Thrasher	Variety of brushy habitats	Variable	5-30%	> 15 ha
Henslow's Sparrow	Dense stands of tall grass; abundant litter and standing residual vegetation	High	0-5%	> 20 ha
Field Sparrow	Grass fields of moderate height with scattered shrubs; usually uplands	High	5-30%	> 15 ha
Bobolink	Grass fields of moderate to tall height; moderate litter layer	Medium	0-5%	> 20 ha

*Minimum patch sizes have been increased due to the landscape context of grassland habitats within the planning unit; many grasslands in BCR 12 occur within a forested matrix. Patch size can be smaller in non-forested landscapes where surrounding fields include other grasslands.

Shrub-Grassland: Brown Thrasher, Field Sparrow

Two (5%) of the priority species are associated with woody cover, typically shrubs or saplings, often in an open or grassland context. Brown Thrasher and Field Sparrow are both migratory and only occur in the planning unit during the breeding season. Both species also have experienced significant population declines in the past 30 years and thus have Regional Concern status (Table 3). Brown Thrashers and Field Sparrows inhabit a wide variety of shrubby habitats, including barrens, brushy forest edges, farmland hedgerows, shrubby fencerows, recently clear-cut forest, and shrubby oldfields. Field Sparrows prefer moderate to tall grass height, moderate litter layer, shrub cover of 5-35%, and do not appear to be area sensitive (Dechant et al. 1999). Brown Thrashers prefer dense litter layer, fields >6 hectares, and canopy cover of 10-30% (Cavitt and Haas 2000); they sometimes occur in sites with higher shrub density (e.g., shrub thickets) than Field Sparrows.

Barrens: Red-headed Woodpecker

One (3%) of the priority species is associated with barrens habitats. Red-headed Woodpecker is present during the breeding season and is both a Regional Concern and Continental Concern Species (Table 3). Historically a characteristic bird of oak savannas, the Red-headed Woodpecker occurs on barrens with an oak component in the planning unit. It also uses a wide variety of other habitats, including isolated open woodlots, woodlot edges, floodplain

forests, suburban parks, golf courses, and some residential areas. Forest succession and maturation may have adversely impacted this species in some areas of BCR 12. Competition for nest cavities, especially with European Starling, is another cause for concern.

Population Objectives and Habitat Strategies

Of the six priority grassland species in BCR 12 for which trend data are available, four (67%) are declining and two (33%) are increasing (Table 4). All species within the shrub-grassland guild are declining, perhaps suggesting inadequate disturbance within the planning unit to maintain this habitat type. Disturbance that is too frequent or intense may remove the woody component required by these species. Conversely, suppressing disturbances will result in open habitats succeeding to woodlands, which also is not suitable for these species. Two of the species that are increasing, Henslow's Sparrow and Sedge Wren, prefer tall, dense grassy areas for breeding and thus have likely benefited from the millions of acres planted to grass cover through CRP and other agricultural set-aside programs over the last 20 years, almost entirely to the south of BCR 12 (Sample and Mossman 1997, Herkert 2007). The following table (Table 8) provides population estimates and objectives for all priority grassland birds in BCR 12 (see Appendix C for definitions). Immediate Action is needed to prevent Field Sparrow from being extirpated over broad portions of its range. Management or other on-the-ground conservation actions are needed to reverse significant population declines or sustain vulnerable populations for Red-headed Woodpecker, Brown Thrasher, and Henslow's Sparrow. Long-term planning is needed to maintain sustainable populations of Sedge Wren and Bobolink.

TABLE 8. POPULATION OBJECTIVES AND CONSERVATION ACTIONS FOR PRIORITY GRASSLAND SPECIES IN U.S. BCR 12. ESTIMATES ARE BASED ON METHODOLOGIES FROM RICH ET AL. 2004 AND ARE DERIVED FROM THE PIF POPULATION ESTIMATES DATABASE (HTTP://RMBO.ORG/PIF_DB/LAPED/). SEE APPENDIX C REGARDING ESTIMATED POPULATION SIZE TARGETS.

Species	U.S. BCR 12 Population Size	Population Objective	Target Population Size	Conservation Action
Red-headed Woodpecker	10,600	Increase 50%	15,900	Management
Sedge Wren	1,200,000	Maintain	1,200,000	Long-term Planning and Responsibility
Brown Thrasher	100,000	Increase 100%	200,000	Management
Henslow's Sparrow	1,700	Increase 20%	2,040	Management
Field Sparrow	45,000	Increase 100%	90,000	Immediate Action
Bobolink	430,000	Increase 50%	645,000	Long-term Planning and Responsibility

Management Guidelines

Potential conflicts between forest and grassland habitat management need to be addressed and resolved in BCR 12. While there is justification for grassland management in formerly fire-maintained open lands and in extensive agricultural areas, there are cases of current grassland habitat located in largely forested landscapes where reforestation may achieve more conservation objectives than grassland management (Sample and Mossman 1997). There are considerable opportunities to restore grassland habitats, however, including many areas of former pine and oak barrens. Many of these barrens habitats occur on large blocks of public land and thus may increase the chances of population viability, as more individuals are able to occupy a large site and large populations are more likely to persist over time (Herkert et al. 1996). Also, large blocks can reduce the edge-related effects of increased nest predation and parasitism associated with small, fragmented fields. Certain forest management techniques, such as clear-cuts, prescribed fire, or salvage logging, also may enhance habitat for priority grassland species. For example, by placing large clear-cuts of short-rotation, even-aged stands adjacent to other open grassland or barrens habitats, the effective size of the grassland habitat is increased.

For certain species near the edge of their ranges in BCR 12 (e.g., Henslow's Sparrow, Red-headed Woodpecker, and to a lesser extent Field Sparrow), it may be difficult to impossible to achieve population goals through habitat management, as factors other than management issues are likely responsible for their current distribution in the BCR.

- Focus management and protection priorities on grasslands that are large, diverse, support rare species, contain minimal woody cover, and are embedded in landscapes with large amounts of open grassland or barrens (McCoy 2000, Ribic and Sample 2001, Bakker et al. 2002). Aim to manage landscapes of grasslands, barrens or sedge meadows at a scale of more than 4050 hectares.
- Evaluate the feasibility of creating Grassland Bird Conservation Areas (GBCAs) in suitable landscapes identified through the recommended research activity below (see Fitzgerald et al. 1998). GBCAs are ~4000 ha in size, with a central core grassland block of 800 ha surrounded by an open habitat matrix that includes an additional 800 to 1200 ha of scattered grassland parcels.
- Restorations aimed at area-sensitive species such as Henslow's Sparrow should be at least 50 ha and preferably more than 100 ha in area if the sites are isolated (Hoffman and Sample 1988, Herkert et al. 1993, Renfrew and Ribic 2008).
- Identify areas appropriate for grassland-shrub management that will not conflict with other grassland priorities. Build public-private partnerships to conserve and restore grassland-shrub habitats in designated areas. Landscape-scale projects should be able to accommodate areas of shrub-grassland within a grassland matrix.
- Manage powerline corridors, abandoned agricultural fields, and other areas with existing shrub cover to support shrub-grassland species. Reduce corridors for nest predator movement by planting and managing for woody vegetation in irregular patterns rather than hard, linear edges.
- Use prescribed fire in conjunction with cutting and/or herbicides and grazing to prevent excessive woody encroachment. Burns scheduled outside the breeding season

- either early spring (March-April) or fall (September-November) – are generally best for birds (Sample and Mossman 1997).

- Before using prescribed burning for grassland management, determine habitat objectives:
    - If managing for grassland birds preferring no residual vegetation or woody cover requirement, conduct short (1-2 years) burn rotations.
    - If managing for grassland birds that require a litter or shrub component, conduct longer rotations (>3-5 years).
    - For large sites, consider only burning portions of the property in a given year to diversify both the vegetation structure and bird community.
- Identify excess or idled farm fields, fields that may not be critical for agricultural production, and fields that are usually too wet for production to form the base of a grassland conservation effort on individual farms. Preferably these areas are adjacent to one another to create a single, large refuge area (Undersander et al. 2000, Ochterski 2006).
- Consider the rotational grazing of pastures in place of heavy, continuous grazing. Set aside one third of a pasture area as an ungrazed and unmowed refuge from May 15 - July 1 and rotationally graze the remaining grassland area. After July 1, the refuge area can be mowed and incorporated into the rotational grazing schedule (Temple et al. 1999).
- Mow habitat parcels managed for grassland bird conservation after August 10. For parcels where there management goals include both grassland bird *and* forage production, encourage mowing after July 15 (July 1 at the earliest).
- Mow hayfields from the field center outward to provide cover that allows fledgling birds to escape to the edge of the field. Flushing bars should be mounted on harvesting equipment to minimize bird mortality during mowing operations (NRCS 1999, Ochterski 2006).
- Locate idle nesting cover (i.e., old fields, set-aside lands, strip cover) adjacent to hayfields to provide alternate habitat for species that renest after mowing-induced failure of first nest attempts (Sample and Mossman 1997, NRCS 1999).

Research and Monitoring Needs

The following actions should be taken to further the conservation of grassland birds in the BCR 12. These actions will also ensure adequate monitoring of populations to assess the effectiveness of management activities over time.

- Develop and implement targeted surveys for rare or uncommon species that are not well-covered by standardized monitoring programs, such as Red-headed Woodpecker and Henslow's Sparrow.
- Identify causal factors and develop strategies to reverse population declines for Brown Thrasher and Field Sparrow.
- Identify the best landscapes and sites for grassland bird management in the planning unit – particularly in Minnesota and Michigan – using available data, expertise, and GIS layers (see Corace et al. 1999). Refine similar work that has been done in

Wisconsin (Sample and Mossman 1997, WI DNR 2005).

- Identify the best opportunities (based on location, size, and landscape composition) for establishing Grassland Bird Conservation Areas (Fitzgerald et al. 1998) required to stabilize or increase grassland bird populations across the planning unit. Create a prioritized list of these GBCA opportunities.
- Investigate avian use and productivity on active and abandoned farmland (e.g., hay, pasture, small grains, oldfields, and other idle grassland) in the planning unit. In cases where grassland areas are small or isolated openings within forested landscapes, evaluate whether these openings should be maintained as grassland or restored to forest.
- Examine whether forestry practices such as short rotation and even-aged clear-cutting support viable populations of grassland birds. How quickly and for how long are these habitats useful for grassland birds? How far apart can these clear-cuts be in a forested landscape and yet still be productive for grassland birds?

Outreach

There are many outreach materials available for grassland management, including Managing Habitat for Grassland Birds (Sample and Mossman 1997) and Grassland Birds: fostering habitats using rotational grazing (Undersander et al. 2000). Several other sources provide important life history information about grassland birds, including Northern Prairie Wildlife Research Center web site (http://www.npwrc.usgs.gov/resource/literatr/grasbird/index.htm/) and the habitat articles published in the Passenger Pigeon journal from 1988-1991. More resources are needed, however, to relate the importance of grassland habitats in BCR 12.

- Develop brochures, posters, and interpretative displays to educate the public on the importance of open grassland, shrub-grassland, and barrens habitats to bird populations.
- Educate land managers about habitat requirements for high priority species.
- Educate private landowners and land managers on the vital role of fire in maintaining these habitats.
- Partner with utility companies to manage rights-of-ways for shrub-nesting birds.
- Work collaboratively with the timber industry to locate large clear-cuts adjacent to relatively open lands or barrens to increase effective size of non-forest habitat.
- Partner with international groups to protect critical habitat along migratory routes and on the non-breeding grounds.
- Encourage bird watchers to participate in organized monitoring programs, large-scale studies, and conservation efforts.
- Incorporate bird conservation messages into classroom curricula.

WETLANDS

Ecology and Conservation Status

Prior to European settlement, wetlands were abundant and widespread throughout the planning unit, and they provided significant habitat for a variety of breeding birds. Numerous aquatic and wetland types existed across the complex, glacial landscape, including rivers and lakes, deep- and shallow-water marshes, sedge marshes and meadows, bogs, and shrub wetlands. In addition, coastal marshes and meadows existed along the Great Lakes. Many of these wetland types still exist in the planning unit today, but are reduced in extent and degraded in quality (Mossman and Sample 1990). Rivers were greatly altered during the large-scale logging that occurred in the late nineteenth century. Many were dammed and used for transporting logs, which scoured and changed stream bottoms and shorelines as well as deposited tree bark on the stream bottoms. More recently, rivers and streams have been channelized, diverted, or impounded for industrial and municipal water supply, irrigation, transportation, hydropower, recreation, and waste disposal. These hydrological alterations may impact the entire watershed and thus result in landscape-level changes to riparian vegetation, instream cover, substrate composition, and water temperature. Shoreline development also affects many wetland-associated species by altering substrate composition and removing important habitat components such as coarse woody debris, native grass and shrubs, and emergent and floating vegetation (Woodford and Meyer 2003).

This plan uses broad habitat guilds, *open marsh*, *shrub-wetland*, and *shoreline* as the basis for classifying wetland bird communities. Open marsh includes both shallow- and deep-water marshes that support emergent vegetation, such as cattails, bulrush, and sedges, but few woody plants. Shrub-wetlands have > 5% shrub cover and often are transitional between open marshes and forested wetlands. Shorelines include exposed clay, sand, and gravel banks found along the region's lakes, rivers, and streams. Forested wetlands are treated in the Forests section. Although other wetland types (e.g., bog, sedge meadow, hardwood swamp) occur within BCR 12, many priority wetland bird species require a specific component found only in their assigned guild. For example, Bank Swallow, Northern Rough-winged Swallow, and Belted Kingfisher forage extensively throughout these three habitat guilds, but require shorelines for excavating nesting burrows.

Bird Habitat Requirements

Open Marsh: Swamp Sparrow

One (3%) of the priority species is associated with open marsh habitat. Swamp Sparrow is a Continental Stewardship Species (Table 3) and inhabits a wide variety of open wetland types. It can occur in emergent marshes, sedge meadows, bogs, and less frequently in conifer swamps during the breeding season (Table 9), but migrates to southern latitudes during the non-breeding season.

Shrub-Wetland: Willow Flycatcher, Common Yellowthroat, Rusty Blackbird

Three (8%) of the priority species are associated with shrub-wetland habitats. Common Yellowthroat is considered a Regional Stewardship Species, Rusty Blackbird is a Continental and Regional Concern Species, and Willow Flycatcher is a Continental Concern Species (Table 3). Willow Flycatcher and Common Yellowthroat are present during the breeding season only; Rusty Blackbird is a rare breeding species but a regular migrant within the planning unit. Willow Flycatchers often nest in willow, dogwood, or elderberry shrubs adjacent to a watercourse (Sedgwick 2000). Rusty Blackbirds nest in alder-willow bogs, muskeg swamps, beaver ponds, and streams, and typically forage on the ground along wetland edges by probing in mud and vegetation (Avery 1995). Common Yellowthroats nest in a wide variety of shrubby, moist areas (Cutright et al. 2006).

Shoreline: Belted Kingfisher, Northern Rough-winged Swallow, Bank Swallow

Three (8%) of the priority species are associated with shoreline habitats. All three species are present during the breeding season and Belted Kingfisher is occasionally present during the non-breeding season. Northern Rough-winged Swallow and Bank Swallow are Regional Concern Species and Belted Kingfisher is considered a Regional Stewardship Species (Table 3). Belted Kingfisher, Northern Rough-winged Swallow, and Bank Swallow each excavate burrows in vertical, earthen banks along the shorelines of waterways.

TABLE 9. BREEDING HABITAT NEEDS OF PRIORITY WETLAND SPECIES IN U.S. BCR 12.

Species	Habitat Requirements	Nesting Substrate	Patch Size
Belted Kingfisher	Riparian areas with clear, running waters	Earthen bank along waterway	Variable
Willow Flycatcher	Shrubby areas; often adjacent to standing or running water	Shrub or thicket near water	No data
Northern Rough-winged Swallow	Small streams with steep, exposed banks	Earthen bank along waterway	No data
Bank Swallow	Small streams with steep, exposed banks	Earthen bank along waterway	No data
Common Yellowthroat	Tall, dense vegetation, typically with shrubs, and often in or near wetlands	Ground or elevated in sedges or reeds	No data
Swamp Sparrow	Cattail marshes or tall sedge or grass meadows, often with shrubs	Ground or elevated in grasses or reeds	No data
Rusty Blackbird	Swampy shores along waterways; wet forest openings	Trees, shrubs, or stumps near water	No data

Population Objectives and Habitat Strategies

Of the six priority wetland species in BCR 12 for which trend data are available, five (83%) are declining and one (17%) is increasing (Table 4). The three species experiencing the steepest declines, Belted Kingfisher, Northern Rough-winged Swallow, and Bank Swallow, all require earthen banks for nesting. Residential development along shorelines and flood control projects may be reducing the amount of suitable nesting habitat and thus limiting

these species. Rusty Blackbird has shown chronic long-term and acute short-term declines but the reasons are poorly understood. Despite being a habitat generalist, the Common Yellowthroat also has experienced long-term population declines. Swamp Sparrow is the only priority wetland species whose population has increased over the past 30 years. The following table (Table 10) provides population estimates and objectives for all priority wetland birds in BCR 12 (see Appendix C for definitions). Management or other on-the-ground conservation actions are needed to reverse significant population declines or sustain vulnerable populations for Northern Rough-winged Swallow, Bank Swallow, and Rusty Blackbird. Long-term planning is needed to maintain sustainable populations of Belted Kingfisher, Willow Flycatcher, Common Yellowthroat, and Swamp Sparrow.

TABLE 10. POPULATION OBJECTIVES AND CONSERVATION ACTIONS FOR PRIORITY WETLAND SPECIES IN U.S. BCR 12. ESTIMATES ARE BASED ON METHODOLOGIES FROM RICH ET AL. 2004 AND ARE DERIVED FROM THE PIF POPULATION ESTIMATES DATABASE (HTTP://RMBO.ORG/PIF_DB/LAPED/). SEE APPENDIX C REGARDING ESTIMATED POPULATION SIZE TARGETS.

Species	U.S. BCR 12 Population Size	Population Objective	Target Population Size	Conservation Action
Belted Kingfisher	42,000	Increase 50%	63,000	Long-term Planning and Responsibility
Willow Flycatcher	15,600	Maintain	15,600	Long-term Planning and Responsibility
Northern Rough-winged Swallow	38,000	Increase 100%	76,000	Management
Bank Swallow	149,000	Increase 100%	298,000	Management
Common Yellowthroat	1,360,000	Increase 50%	2,040,000	Long-term Planning and Responsibility
Swamp Sparrow	450,000	Maintain	450,000	Long-term Planning and Responsibility
Rusty Blackbird	130	Increase 50%	195	Management

Management Guidelines

Although wetlands represent a small proportion of cover types in the planning unit, they provide important breeding, foraging, and migration habitats for priority bird species. Restoring natural habitats along lake and river shorelines is needed. From a landscape perspective, protection and management of the following wetland types will benefit priority bird species in the region: 1) sedge meadows; 2) cattail and bulrush marshes adjacent to deep and shallow lakes; 3) wild rice lakes and marshes; 4) woody streams and beaver ponds, and 5) open bogs. Of even greater importance is the protection and management of extensive landscape-scale complexes (<4050 ha – in some cases much larger) of northern sedge meadow and open bog scattered across this BCR.

For certain species near the edge of their ranges in BCR 12 (e.g., Rusty Blackbird), it may be difficult to impossible to achieve population goals through habitat management, as factors

other than management issues are likely responsible for their current distribution in the BCR.

- Restore and protect wetland complexes that increase overall wetland connectivity and provide important post-breeding foraging habitat for priority species. Conduct restorations that integrate lake, stream, and wetland components within a watershed whenever possible.
- Maintain wetland function and biodiversity by minimizing impervious surfaces, limiting development, and reducing soil loss and nutrient delivery within watersheds.
- Manage for a variety of wetland sizes and habitat conditions (e.g., emergent cover, water level) to support a diverse suite of species.
- Encourage wetland management, protection, and restoration efforts on private lands through existing federal and state programs and by educating private landowners on wetland stewardship.
- Enforce existing nonpoint source pollution regulations to protect emergent marshes from the increased sedimentation caused by development.
- In marshes dominated by dense, monotypic stands of nuisance aquatic plants such as hybrid cattail, common reed, purple loosestrife, and reed canary grass, diversify site conditions by using appropriate management techniques such as using a marsh master to create higher and lower elevations and a resultant mosaic of marsh vegetation.
- Before manipulating water levels in impoundments, determine management objectives:
    - If managing for nesting species, minimize water fluctuations during the breeding season (April-August) and maintain a 50:50 ratio of emergent vegetation interspersed with open water in some units to establish hemi-marsh conditions (Linde 1969).
    - If managing for fall migrants, shallowly flood management units in late June and proceed with slow drawdown from July through October (Helmers 1992).
    - If managing for spring migrants, flood units approximately one month before first heavy frost in fall and maintain conditions through early spring. Draw down slowly from late March to late May. Use vegetative disking where appropriate in fall and early winter to create an invertebrate forage base (Helmers 1992).
    - If invasive species are present, further management may be needed to prevent them from spreading after the drawdown.
- To benefit burrow-nesting species such as Bank Swallow, Northern Rough-winged Swallow, and Belted Kingfisher, use “soft-engineering” approaches to bank stabilization and repair rather than “hard engineering” approaches such as dams, levees, channelization, and riprap (NRC 1992).
- Remove unneeded dams, dikes, or levees to reestablish hydrological connections between riparian and floodplain habitats and provide a greater variety of successional habitats (NRC 1992).
- Convert portions of mowed lawn to native plant species and increase the amount of coarse woody debris along developed shorelines to provide escape cover and habitat complexity (Newbrey et al. 2002, Elias and Meyer 2003).
- Weigh the benefits of maintaining a sedge meadow against any benefits of flooding it

for waterfowl habitat.
- Enforce current 'no net loss' wetland laws and mitigation requirements.

Research and Monitoring Needs

The following actions should be taken to further the conservation of wetland birds in the BCR 12. These actions will also ensure adequate monitoring of populations to assess the effectiveness of management activities over time.

- Conduct breeding ecology studies of species for which little is known, such as Northern Rough-winged Swallow, Common Yellowthroat, and Rusty Blackbird.
- Develop and implement targeted surveys for rare or uncommon species that are not well-covered by standardized monitoring programs, such as Belted Kingfisher and Rusty Blackbird.
- Identify causal factors and develop strategies to reverse population declines for Belted Kingfisher, Northern Rough-winged Swallow, Bank Swallow, and Rusty Blackbird.
- Assess natural wetland habitat abundance, condition, and trends across the planning unit to prioritize conservation opportunities.
- Evaluate wetland bird response (e.g., productivity, abundance, diversity) to several different management techniques:
    a. Cat-tail control
    b. Mowing
    c. Water level management
    d. Burning
    e. Chemical control of invasive plants
    f. Impacts of landscape-scale management
- Determine the impacts of lake and river shoreline development on priority wetland birds.
- Determine the effects of commercial "mossing," commercial wild rice production, mining of peat, and cranberry bog development on sedge- and bog-nesting birds.

Outreach

There are many outreach materials available for wetland management, including Wetland Restoration Handbook for Wisconsin Landowners (Thompson and Luthin 2004) and Techniques for Wetland Management (Linde 1969). Several other sources provide important life history information about wetland birds, including Northern Prairie Wildlife Research Center web site (http://www.npwrc.usgs.gov/resource/literatr/wetbird/index.htm/) and the habitat articles published in the Passenger Pigeon journal from 1988-1991. More resources are needed, however, to relate the importance of wetland habitats in BCR 12.

- Prevent the introduction of additional exotic species and slow the spread of existing aquatic invasive through improved regulation and education. Such measures are best planned and implemented on a watershed scale.
- Educate and provide incentives for private landowners to preserve natural shoreline

vegetation. Zoning laws currently protect streams but not streamside vegetation.
- Work cooperatively with lake management districts, lake associations, and other natural resource agencies to minimize recreational disturbances at important wetland sites.
- Work with the "mossing" industry to prevent further degradation of bogs and therefore protect important bird nesting areas.
- Work with local zoning boards to guide housing densities and the legal setback of buildings from shorelines.
- Work with local governments to establish no-wake zones or limited entry areas during the floating-leaf stage of wild rice beds.
- Promote greater stewardship and appreciation for wild rice through public education programs and by advocating sustainable human harvest.

URBAN LANDSCAPES

Bird Habitat Requirements

Developed/Urban: Chimney Swift, Barn Swallow

Two (5%) of the priority species are associated with urban or developed landscapes. Chimney Swift and Barn Swallow have experienced steep population declines in the last 30 years and thus have Regional Concern status (Table 3). Both species are present in a wide variety of habitats during the breeding season, but migrate to southern latitudes during the non-breeding season. Both species also have adapted to urban environments and man-made nesting structures (Table 11). Chimney Swifts, for example, have adapted to nesting in chimneys, silos, deep wells, open barns, and the walls of abandoned buildings and similar structures (Janssen 1987, Brewer et al. 1991, Robbins 1991, Cink and Collins 2002). Barn Swallows often place their nests under a horizontal ledge or overhang, such as those found on docks, barns, houses, and bridges (Davis and Davis 2006).

TABLE 11. BREEDING HABITAT NEEDS OF PRIORITY URBAN SPECIES IN U.S. BCR 12.

Species	Habitat Requirements	Historical Nesting Substrate	Current Nesting Substrate
Chimney Swift	Adequate nest cavities and invertebrate prey	Large hollow trees, tree cavities, caves	Chimneys, silos, deep wells, abandoned buildings
Barn Swallow	Adequate nesting substrates and open areas for foraging	Caves, rock crevices, tree hollows	Docks, barns, houses, bridges

Population Objectives and Habitat Strategies

Both species in the developed/urban guild are experiencing steep population declines (Table 4). Although each of these species has adapted to urban areas and man-made nesting structures, human actions may be contributing to their significant declines (Brown and Brown 1999, Cink and Collins 2002). Aerial spraying of insecticides reduces prey resources and may be one limiting factor. This will likely worsen in future years as land use practices in rural

areas intensify. Changing construction practices are undoubtedly reducing the availability of potential nest sites for Chimney Swift. Homeowner modifications may be reducing the number of chimneys available and new developments often promote plastic, metal, or composite exhaust shafts that are unsuitable as nest sites. Chimney sweeps and exterminators also contribute to nest loss and direct mortalities of adults (Cink and Collins 2002). The following table (Table 12) provides population estimates and objectives for Chimney Swifts and Barn Swallows (see Appendix C for definitions). Immediate Action is needed to prevent Chimney Swift from being extirpated over broad portions of its range. Management or other on-the-ground conservation actions is needed to reverse the significant population decline of Barn Swallow.

TABLE 12. POPULATION OBJECTIVES AND CONSERVATION ACTIONS FOR PRIORITY URBAN SPECIES IN U.S. BCR 12. ESTIMATES ARE BASED ON METHODOLOGIES FROM RICH ET AL. 2004 AND ARE DERIVED FROM THE PIF POPULATION ESTIMATES DATABASE (HTTP://RMBO.ORG/PIF_DB/LAPED/). SEE APPENDIX C REGARDING ESTIMATED POPULATION SIZE TARGETS.

Species	U.S. BCR 12 Population Size	Population Objective	Target Population Size	Conservation Action
Chimney Swift	91,000	Increase 100%	182,000	Immediate Action
Barn Swallow	590,000	Increase 100%	1,180,000	Management

Management Guidelines

There are several actions that homeowners can take to further Chimney Swift and Barns Swallow conservation efforts:

- Limit the use of pesticides and other harmful chemicals in important nesting and foraging areas.
- Protect artificial nesting sites on buildings, bridges, and other overhanging structures, especially when adjacent to open agricultural and wetland habitats.
- Use swift- and swallow-friendly chimney materials in new constructions or restoration projects, which include stone, firebrick, concrete, or masonry flue tiles with mortared joints.
- Schedule annual cleanings to remove creosote buildup from fireplace chimneys and improve the adherence of Chimney Swift nests.
- Conduct chimney cleanings at the termination of winter use but prior to the Chimney Swift nesting season – mid-March is ideal.
- Masonry chimneys should not be capped to allow for Chimney Swift access; however, metal chimneys are unsuitable for Chimney Swift use and should always be capped to prevent their injury or death.
- If chimney capping is unavoidable because of insurance or safety reasons, consider removing the cap in the spring prior to the swifts' arrival and replacing it in the fall or using caps with opening on the sides.

- Close dampers and fire doors on chimneys with active nests. Keep closed for the duration of the nesting period.

Research and Monitoring Needs

- Conduct a breeding ecology study of Chimney Swift that evaluates patterns of dispersal from natal sites, survivorship of first-year birds, and lifetime reproductive success (Cink and Collins 2002).
- Develop and implement targeted surveys for Chimney Swift and Barn Swallow.
- Identify causal factors and develop strategies to reverse population declines for Chimney Swift and Barn Swallow.
- Assess location and abundance of important nest sites and migratory roost sites for Chimney Swift (Kyle and Kyle 2004).
- Evaluate whether nest site competition with House Sparrows is a limiting factor for Barn Swallows in BCR 12.

Outreach

More effort is needed to educate professional chimney cleaners on the conservation of Chimney Swifts. Destroying nests is unnecessary, illegal, and easily preventable with some simple outreach efforts. Suggestions for professional cleaners who encounter nests during a service call include:

- Provide informational handouts to homeowners on the Chimney Swift nesting cycle.
- Close damper or otherwise seal bottom of the flue to minimize begging noises.
- Reschedule cleaning for a later date: >6 weeks for nests with eggs, >4 weeks for nests with young.
- At actual cleaning, schedule another cleaning for following spring prior to the swifts' arrival (Kyle and Kyle 2004).

Other outreach actions that will benefit both Chimney Swift and Barn Swallow include:

- Educate homeowners on the importance of using building materials that are compatible with these species' nesting requirements (i.e., brick, stone, concrete) and limit use of vinyl or metal.
- Advise homeowners to limit the use of pesticides and other harmful chemicals in important nesting and foraging areas (Brown and Brown 1999).

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APPENDIX A. LAND COVER CLASS DEFINITIONS

Open Water - Areas of open water, generally with <25% cover of vegetation or soil.

Developed – Ranges from areas with a mixture of some constructed materials and high vegetative cover (i.e., lawn grasses) to highly developed areas where people reside or work in high numbers. Percent total cover of impervious surfaces ranges from 20-100%.

Barren Land (Rock/Sand/Clay) - Barren areas of bedrock, scarps, slides, glacial debris, sand dunes, strip mines, gravel pits and other accumulations of earthen material. Generally, vegetation accounts for <15% of total cover.

Deciduous Forest - Areas dominated by trees generally greater than 5 meters tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal change.

Evergreen Forest - Areas dominated by trees generally greater than 5 m tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.

Mixed Forest - Areas dominated by trees generally >5 m tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are >75% of total tree cover.

Shrub/Scrub - Areas dominated by shrubs; <5 m tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions.

Grassland/Herbaceous - Areas dominated by grammanoid or herbaceous vegetation, generally >80% of total vegetation. These areas are not subject to intensive management such as tilling, but can be utilized for grazing.

Pasture/Hay - Areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for >20% of total vegetation.

Cultivated Crops - Areas used for the production of annual crops, such as corn and soybeans, and also perennial woody crops such as orchards. Crop vegetation accounts for >20% of total vegetation. This class also includes all land being actively tilled.

Woody Wetlands - Areas where forest or shrubland vegetation accounts for >20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.

Emergent Herbaceous Wetlands - Areas where perennial herbaceous vegetation accounts for >80% of vegetative cover and the soil is periodically saturated with water.

APPENDIX B. PIF SPECIES ASSESSMENT FACTORS

- *Population Size* (PS) indicates vulnerability due to the total number of adult individuals in the global population.
- *Breeding Distribution* (BD) indicates vulnerability due to the geographic extent of a species' breeding range on a global scale.
- *Non-breeding Distribution* (ND) indicates vulnerability due to the geographic extent of a species' non-breeding range on a global scale.
- *Threats to Breeding* (TB) indicates vulnerability due to the effects of current and probable future extrinsic conditions that threaten the ability of populations to survive and successfully reproduce in breeding areas within North America.
- *Threats to Non-breeding* (TN) indicates vulnerability due to the effects of current and probable future extrinsic conditions that threaten the ability of North American breeding populations to survive over the non-breeding season.
- *Population Trend* (PT) indicates vulnerability due to the direction and magnitude of changes in population size within North America over the past 30 years.

APPENDIX C. POPULATION OBJECTIVES AND TARGETS

In setting population objectives for priority landbirds in BCR 12, this plan has adopted the same criteria used for setting continental-scale population objectives in the PIF North American Landbird Conservation Plan (Rich et al. 2004). For species that have undergone severe declines of 50% or more over a 30-year period (Population Trend = 5), PIF has set a continental objective of doubling the current population over the next 30 years. For species that have undergone moderate declines of 15-50% over a 30-year period (Population Trend = 4), the objective is to increase the population by 50% over the next 30 years. For species with an unknown or uncertain trend (Population Trend = 3), the objective is to maintain or increase current populations while increasing the knowledge base of population status. For species with stable or increasing populations, the objective is to maintain current population numbers.

Indications of the relative level and immediacy of conservation action also are included for each priority species. Immediate Action is needed either to reverse or stabilize significant, long-term population declines of species with small populations, or to protect species with the smallest populations for which trends are poorly known. Immediate and focused attention to the needs of these "IM species" represents the highest conservation priority for landbirds. Management is needed to reverse significant, long-term declines or sustain vulnerable populations. Although many of these "MA species" are still relatively widespread, actions are necessary to prevent these species from becoming in danger of regional or range-wide extirpation in the future. Long-term Planning and Responsibility is needed to maintain sustainable populations. This action applies to species with relatively stable or increasing populations regardless of population size, or relatively abundant species for which population trends are poorly known.

Note that population objectives are based solely on 30-year population trends as assessed by the Breeding Bird Survey (BBS) or other surveys, without regard to the other assessment factor scores. Action categories, on the other hand, also take into account vulnerability associated with population size, range, and threat scores. The trend-based population objective—like all population objectives—represents a subjective, value-based decision. The authors of Rich et al. (2004) proposed population objectives based on trends assessed from the onset of the BBS (1966) because they believed that the modern time frame (vs. pre-1900 or pre-European settlement, for example) provided realistic conservation opportunities and because relatively accurate range-wide data were available for most species during that period.

Using Population Objectives, Regional Population Size, and Regional Population Targets to Set Habitat and Conservation Objectives

Rich et al. (2004) offered continental, range-wide population size estimates for all North American landbirds in response to widespread partner desire for consistent numbers that would provide a basis for setting population-based habitat goals for conservation action. The methodology as outlined in Appendix B of Rich et al. (2004) was based primarily on Rosenberg and Blancher (2005) and was subsequently critically reviewed by Thogmartin et al. (2006). The population estimates are believed to be accurate within an order of magnitude

for most species at the global or continental scale. At less broad regional or local scales, such as a state's portion of a Bird Conservation Region, the population estimates may be less reflective of reality due to the density of qualifying BBS routes present within the region. For example, detections of a rare or sparsely-distributed species on a particular route leads to overestimation; failures to detect a species on sparsely-distributed routes would lead to underestimation of a species known to be present in the region. Thus estimates interpolated over smaller regions should be interpreted sensibly.

The target population size provided in Tables 6, 8, 10, and 12 is the product of the population objective (double, increase by 50%, etc.) and a species' estimated population size within the U.S. portion of BCR 12. These population estimates and targets may seem unrealistic for species that are relatively widespread or relatively rare within the planning region. They should be used as *rough guidelines to begin conversations about how much quality habitat might be needed to reverse continental population declines.* In many cases, more intensive regional habitat-based surveys would generate different numbers. PIF's overall goal in producing these population targets was not to defend the numbers themselves but rather to emphasize the importance of (1) linking habitat conservation with actual bird species density and/or productivity and (2) arresting declines at the range-wide or continental scale by contributing conservation actions at local and regional scales.

Doubling a species population size does not necessarily imply doubling the amount of habitat in which it can be found; in many cases, population targets will be approached by increasing species productivity through specific management practices in currently available habitat. Explicit species population objectives are a prerequisite to strategic and efficient conservation because they focus and clarify habitat and management objectives. On the other hand, the setting of realistic population objectives is an iterative process between what is possible at local partnership scales and what is necessary at range-wide scales to maintain both the species diversity and the spectacle of birds. The importance of maintaining the links between continental and regional planners and local implementers cannot be overstated. Regional planners can help channel energy and resources to the particular landscapes where species conservation can be accomplished most efficiently; local conservationists and land managers, on the other hand, can provide the information necessary to evaluate the effectiveness of regional conservation strategies.

Articulation of population objectives and implementation of habitat and management objectives to achieve regional population targets are activities that are meaningful only within the broader context of strategic biological planning, conservation design, conservation delivery, monitoring and evaluation, and assumption-based research. These elements are inherently linked and part of a cycle; if they are not connected, the wheel of conservation ceases to turn efficiently (cf. Will et al. 2005). In a nutshell, purposeful modeling provides the link between bird population objectives and habitat; purposeful monitoring provides the adaptive link between conservation action and biological planning; and strategic landscape design integrates multiple single-species objectives with conservation opportunity to achieve conservation for all birds at regional and continental scales.