

# Status of Neotropical Migrant Landbirds in the Midwest: Identifying Species of Management Concern

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**Abstract** — We ranked species of neotropical migrant landbirds by decreasing management concern for their viability in the Midwest. This was part of a coordinated effort by regional working groups of the *Partners In Flight* Program, an interagency program for the conservation of neotropical migratory birds (NTMBs). Species were ranked by seven criteria, developed by working group co-chairs and participants in the *Partners In Flight* Program. The first four criteria were global and do not change with the region being considered; they were global abundance, extent of winter distribution, threats on wintering grounds, and extent of breeding distribution. The last three criteria pertained specifically to the Midwest region, and included threats on the breeding grounds, the importance of the Midwest to the species, and population trends. Breeding Bird Survey (BBS) data were used to score population trends, range maps and BBS density maps were used to estimate the importance of Midwest breeding habitat, and expert opinion to score breeding threats. We identified 110 NTMB species in the Midwest. The species with the highest ranks had previously been identified as federally threatened or endangered, candidates for federal listing as threatened or endangered, or species of special concern by the U.S. Fish and Wildlife Service. The closeness of the scores and the diversity of habitats within which highly ranked species occurred suggest that broad scale problems may be affecting these species on their breeding areas or that common non-breeding threats are affecting them. Alternatively, the results could reflect insensitivity of, or uncertainties in, the ranking system. The large number of highly ranked species in mature forest habitats, grasslands, and shrub-sapling habitats, and the high mean score of species in lowland deciduous and young conifer habitats, suggest these habitats deserve special management attention.

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## INTRODUCTION

The Midwest Working Group on Neotropical Migrant Birds (Working Group) was formed in 1991 as a regional component of the *Partners In Flight* program. The geographic area encompassed by the Working Group includes 14 States and 3 provinces (Figure 1). The Working Group to fosters communication, coordination, and cooperation among public agencies, tribal entities, private conservation organizations, academic institutions, and others interested in conserving

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## METHODS

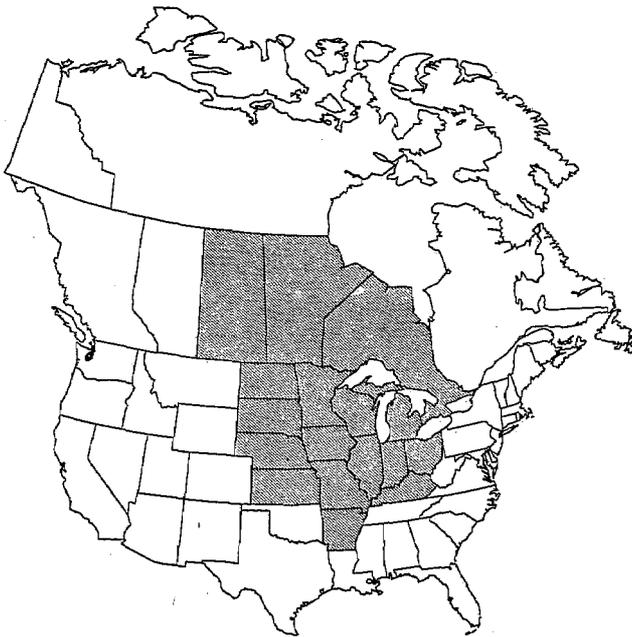


Figure 1.—States and provinces included in the Midwest region of the *Partners In Flight* program.

NTMBs in the Midwest. Committees within the Working Group address issues and activities related to population and habitat monitoring, research, habitat management, and education.

Of the 143 species of landbirds that the *Partners In Flight* program has identified as breeding in North America and wintering south of the United States, 110 (77%) breed in the Midwest region. The Working Group collects and evaluates information related to these species and the habitats upon which they depend. The relative importance of the region to the well-being of these birds varies considerably among species; some occur at the center of their range in the Midwest, others make only minor or transitory use of the region. The abundance, population trends, and limiting factors of these species also differ greatly, with some very common and secure, others common but susceptible to threats, and others rare or declining.

The regional Working Groups developed a standardized procedure to determine the status of NTMBs within each region and to identify those species most in need of management attention (Hunter et al. this proceedings). The primary objective of this effort is to focus monitoring, research, and management activities. We report the initial results of that analysis for the Midwest. We hope that the approach and information presented in this paper ultimately will allow the Working Group to establish more specific objectives and to make appropriate recommendations about how personnel, funds, and other limited resources should be allocated to best conserve neotropical migrant birds in the Midwest. In this paper, we: (1) present a preliminary list of neotropical migrant landbirds in the Midwest prioritized by degree of management concern; (2) present BBS trend data for NTMBs in the Midwest; and (3) identify habitats that are important to those neotropical migrant landbirds most in need of management attention in the Midwest.

We identified all neotropical migrant landbirds that breed in the Midwest region and ranked species by decreasing management concern based on the mean score of seven criteria (Table 1; see Hunter et al. this proceedings for a thorough description). The first four criteria were global and did not change with the region being considered. These criteria were scored initially by Hunter et al. (this proceedings). The last three criteria - breeding ground threats, importance of region, and population trends - pertained specifically to the Midwest region. Breeding ground threats were scored based on expert opinion and included habitat loss or degradation, cowbird parasitism, predation, contaminants, human disturbance, etc. We used field guide range maps (National Geographic Society 1983, Peterson 1980, Peterson 1990) and contour maps of species abundance developed from BBS data (J. Price, Northern Prairie Wildlife Research Center, U. S. Fish and Wildlife Service, unpublished data) to determine the importance of the Midwest region to each species. The population trend score was primarily based on BBS trend data (Appendix 1; B. Peterjohn, Office of Migratory Bird Management, and J. Sauer, Branch Of Migratory Bird Research, Patuxent Wildlife Research Center, U. S. Fish and Wildlife Service). BBS trends were calculated for the periods 1966-1991 and 1982-1991 by the route regression method (Geissler and Sauer 1990). BBS trends should be interpreted with caution because of possible biases associated with roadside point counts and because the results may not be reliable when the degrees of freedom of the analysis are  $< 14$  or when the average number of detections per route are less than 1.0. The population trend criterion was scored 1-5 based on the direction and significance of long- and short-term declines (Table 1). When BBS data were nonexistent or unreliable, participants' opinions were used to score the population trend criteria. If there were no opinions on a species population trend the species received a score of 3.

We then sent our initial scores to 48 people in the region affiliated with federal or state agencies, universities, and conservation organizations who had some expertise in NTMBs. Twenty-one of these people provided comments (see acknowledgements). We reviewed these comments and came to a consensus on species scores. We then listed species in order of decreasing management concern by ranking them by the mean of the seven criteria.

We identified general habitat associations of all species based on literature review (Griscom and Sprunt 1957, Pettingill and Whitney 1965, Erskine 1977, Harrison 1975, Johnsgard 1979, Clawson 1982, American Ornithologist's Union 1983, Godfrey 1986, Benyus et al. 1992, DeGraaf and Rudis 1988, DeGraaf et al. 1991, Peterjohn and Rice 1991) and personal observations. Habitats were described as: primary (ledges, cliffs, caves, banks, etc.); wetland (sedge meadow, fen, cattail marsh); agricultural-woodland edge (woody fence-rows, shelterbelts, and forest edge in agricultural landscape); grassland (prairie,

hayfield, pasture, cultivated grasses); shrub-sapling (shrub swamp, upland old field, seedling-sapling forest <12-years-old); lowland coniferous forest (semi-open to closed canopy lowland coniferous forest); lowland deciduous forest (bottomland deciduous forest); young deciduous forest (upland deciduous forest 12- to 30-years-old); mature deciduous forest (upland deciduous forest > 30-years-old); young coniferous forest (upland coniferous forest 12- to 30-years-old); mature coniferous forest (upland coniferous forest > 30-years-old); and developed (urban, suburban, rural development). We listed 1 or 2 habitats for each species in decreasing order of importance. We tabulated the number of species per habitat based on the first habitat listed for each species.

## RESULTS AND DISCUSSION

We ranked 110 neotropical migrant landbird species that breed in the Midwest by decreasing management concern (Table 2). Mean species scores ranged from 4.71 to 1.57 (scores of 1-5 were possible). Only 4 species scored >4.00, and 3 species scored <2.00. Of the remaining species, about half scored between 3.00 and 4.00, and half between 2.00 and 3.00 (Table 2). Several of the highest-ranked species on our list, including the Kirtland's, Cerulean, and Golden-winged Warblers, Baird's Sparrow, and Bell's Vireo, have previously been designated as endangered, candidate, or special concern species by the U.S. Fish and Wildlife Service (Office of Migratory Bird Management 1987), giving credence to our ranking system. The Peregrine Falcon, although a Federally-endangered species, was not ranked high in our list because the Midwest is relatively unimportant to the species and its population is doing well.

Species rank based on mean score of the 7 criteria differed from ranks based on magnitude of BBS trends alone. For instance, the ten species showing the largest significant declines (1982-1991) in the Midwest are the Yellow-billed Cuckoo, Bank Swallow, Bobolink, Whip-poor-will, Bell's Vireo, Mississippi Kite, Scissor-tail Flycatcher, Blue-winged Warbler, Nashville Warbler, and Wood Thrush (Appendix 1). Only 5 of these species ranked in the top 20 of our management concern list (Table 2). The differences indicate the importance of the additional criteria in determining management concern.

Species richness of NTMBs in the Midwest is highest in shrub-sapling habitats, mature upland deciduous forests, mature upland coniferous forests, and grasslands (Table 3). These same habitats also had the most highly ranked species (mean score >3.0). While mature forests and grasslands are widely distributed in the Midwest, there is concern regarding fragmentation of these habitats (Robinson et al. this proceedings, Faaborg et al. this proceedings) and for the impacts of forestry (Thompson et al. this proceedings) and agricultural practices (Rodenhouse et al. this proceedings). Birds in shrub-sapling habitats were of high management concern probably because their habitat is more spatially and temporally limited than older forest habitats.

On average, species scores were greatest in lowland deciduous forest, young conifer forest, mature deciduous forest, and grassland; indicating the importance of these habitats to high-priority species (Table 3). Fourteen of the top 25-ranked species occur in these four habitats. Lowland deciduous forest and lowland coniferous forest had low species richness, but on average, the species occurring there were of high management concern (Table 3).

This analysis was performed at a regional level and should be regarded as the first step in a hierarchical approach to conservation of NTMBs (Freemark et al. this proceedings, Hunter et al. this proceedings, Thompson et al. this proceedings). NTMBs' regional status should serve as a context for local management decisions. The approach used in this exercise also should be applied at the state/province or physiographic stratum level (Hunter et al. this proceedings). While many management and monitoring activities are carried out at the State/provincial level, physiographic strata are probably the most meaningful level of analysis because they are ecologically based. Local management decisions should be based on priorities determined at local scales but should complement regional priorities. Clearly, all levels need to be examined, and doing so will be an ongoing task of the Midwest Working Group.

Our analysis was based primarily on BBS for information on population trends. The BBS, however, inadequately sampled 44% of the NTMB species in the Midwest due to small sample sizes or low abundances (Appendix 1). Also, roadside point counts, such as the BBS, are inappropriate for sampling the abundance of some species (see Butcher and Droege 1992). As a result some of our scoring was subjective, and introduced uncertainty into the ranking system. Likewise, assessing threats to species on the breeding grounds was very subjective. These problems point to the need for additional monitoring and research that will allow a better assessment of the status of NTMBs in the Midwest. Until these information gaps are filled, management activities should be implemented cautiously.

Our habitat analysis was based on broad categories assigned by reviewing existing literature on habitat use by NTMBs. Additional analyses are needed to identify finer habitat classifications and habitat components that will allow resource managers to implement appropriate land protection and management strategies.

## CONCLUSIONS

The large number of species (53) with management concern scores > 3.0, the closeness of the scores, and the diversity of habitats used by highly-scored species suggest that broad-scale problems are affecting these species on their breeding areas or that common non-breeding threats are affecting them. Alternatively, the results could reflect insensitivity of, or uncertainties in, the ranking system. We do not encourage the use of this ranking to focus species specific management on a limited number of highly ranked species. Rather, we encourage

ecosystem level management that addresses the needs of the many species of high management concern in the Midwest. The large number of highly ranked species in mature forest habitats, grasslands, and shrub-sapling habitats, and high mean score of NTMBs in lowland deciduous and young coniferous forests, suggest these habitats deserve special management attention. That some of these habitats are relatively abundant in the Midwest (mature deciduous and coniferous forest) implies a need for additional research to identify limiting factors. Factors limiting species in these habitats may be related to habitat degradation (such as edge effects or fragmentation) as opposed to habitat loss. The high percentage of species (44%) inadequately monitored by the BBS also suggests the need for more intensive monitoring to better assess the status of these species in the Midwest.

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Table 1. — Criteria used to rank the level of management concern for neotropical migrant birds in the Midwest region. Each species was assigned a score for each of the 7 criteria listed below and ranked based on the mean of the seven scores. For more details on these criteria see Hunter et al. (This proceedings).

Score      Criteria

**Global Abundance**

- 1 Abundant or demonstrably secure
- 2 Common or apparently secure
- 3 Uncommon to fairly common, including locally common
- 4 Rare to uncommon
- 5 Very rare to rare

**Winter Distribution**

- 1 Southern latitudes of the U.S. through Central America (C.A.) into South America (S.A.), or all S.A.
- 2 Southern U.S. through C.A., or C.A. into S.A.
- 3 Mexico or Caribbean and C.A. or Middle American highlands or Amazon Basin
- 4 Caribbean Basin or Caribbean Slope of Middle America or Pacific Slope of Middle America or Mexican Highlands or Andean Ridge of S.A.
- 5 Bahamas or Guatemala, Honduras, and Nicaragua highlands or Mexican States of Jalisco, Michoacan, and Guerrero or southern Sinoloa and southern Baja California in Mexico.

**Severity of Threats on Wintering Grounds and Migration Routes (habitat loss, contaminants, human disturbance, predation, etc.)**

- 1 No known threats.
- 2 Minor threats.
- 3 Moderate threats.
- 4 Severe threats.
- 5 Extirpation or extinction likely.

**Breeding Distribution--area of breeding range**

- 1 ≥ 76% of temperate North America
- 2 51-75% of temperate North America
- 3 26-50% of temperate North America
- 4 11-25% of temperate North America
- 5 ≤ 10% of temperate North America

**Severity of Threats on Breeding Grounds in Midwest Region (habitat loss and fragmentation, low nesting success, contaminants, human disturbance, etc.)**

- 1 No known threats.
- 2 Minor threats.
- 3 Moderate threats.
- 4 Severe threats.
- 5 Extirpation or extinction likely.

**Importance of Midwest Region to Species**

- 1 < 1% of population in region.
- 2 1-10% of population in region.
- 3 11-25% of population in region.
- 4 26-50% of population in region.
- 5 > 50% of population in region.

**Population Trend in Midwest Region (based on Breeding Bird Survey<sup>1</sup>)**  
**Long term trend (1966-91)**

	+	+	-	-
short-term trend (1982-91)	+*	1	1	3
		1	2	3
		3	3	4
		4	4	5
		4	4	5

<sup>1</sup> +\* = significant positive trend, + = non-significant positive trend, - = non-significant negative trend, -\* = significant negative trend.

Table 2. — Criteria scores used to rank management concern for Midwest neotropical migrant landbirds. A score of 5 indicates the most concern and 1 the least. Species are listed in order of decreasing management concern based on the mean of the seven criteria. Species with the same mean score are in taxonomic order.

Species	Global abundance	Winter distribution	Winter threats	Breed. distribution	Breed. threats	Area importance	Popn. trend	Mean score	Primary habitat <sup>1</sup>
Kirtland's Warbler	5	5	5	5	5	5	3	4.71	YngCon, Shrub
Bachman's Warbler	5	5	5	5	5	2	5	4.57	LowDec
Cerulean Warbler	4	4	4	4	4	5	5	4.29	MatDec
Golden-winged Warbler	4	4	4	4	3	5	5	4.14	Shrub
Baird's Sparrow	4	4	4	4	3	5	3	3.86	Grass
Swainson's Warbler	4	5	4	4	4	2	4	3.86	LowDec
Mississippi Kite	3	3	3	5	4	3	5	3.71	LowDec, Grass
Wood Thrush	2	4	4	3	4	3	5	3.57	MatDec
Chestnut-sided Warbler	3	5	4	3	2	4	4	3.57	Shrub
Bay-breasted Warbler	2	5	4	3	3	4	4	3.57	MatCon
Dickcissel	2	4	4	3	3	5	4	3.57	Grass
Connecticut Warbler	4	4	3	4	2	5	3	3.57	LowCon
Prothonotary Warbler	3	4	4	3	3	3	5	3.57	LowDec
Blue-winged Warbler	3	4	4	4	2	4	4	3.57	Shrub
Bell's Vireo	3	4	3	3	3	3	5	3.43	Shrub
Acadian Flycatcher	2	4	4	3	3	4	4	3.43	MatDec
Mountain Plover	4	4	3	4	4	1	4	3.43	Grass
Bobolink	2	4	3	3	3	4	5	3.43	Grass
Prairie Warbler	2	4	4	3	3	3	5	3.43	Shrub
Long-billed Curlew	3	4	3	4	4	2	4	3.43	Grass
Nashville Warbler	3	4	3	3	2	5	4	3.43	LowCon, YngDec
Philadelphia Vireo	4	5	4	3	2	4	2	3.43	YngDec
Canada Warbler	2	4	4	3	3	4	4	3.43	MatCon, YngCon
Grasshopper Sparrow	3	3	3	2	4	5	4	3.43	Grass
Clay-colored Sparrow	3	4	2	4	2	5	4	3.43	Shrub
Lark Bunting	2	3	3	4	4	4	3	3.29	Grass
Eastern Wood-Pewee	2	4	3	3	2	4	5	3.29	MatDec
Black-throated Blue Warbler	3	4	4	3	3	3	3	3.29	MatDec
Whip-poor-will	2	3	3	3	3	4	5	3.29	YngDec, MatDec
Yellow-billed Cuckoo	3	3	4	2	2	4	5	3.29	MatDec
Veery	2	3	3	3	3	4	5	3.29	MatDec, YngDec
Cape May Warbler	3	4	4	3	3	4	2	3.29	MatCon
Mourning Warbler	3	4	3	3	2	5	3	3.29	Shrub
Great Crested Flycatcher	2	4	4	3	2	4	4	3.29	MatDec

Table 2. Continued.

Species	Global abundance	Winter distribution	Winter threats	Breed. distribution	Breed. threats	Area importance	Popn. trend	Mean score	Primary habitat <sup>1</sup>
Hooded Warbler	3	4	4	3	3	3	3	3.29	MatDec
Worm-eating Warbler	3	4	4	3	3	3	3	3.29	MatDec, YngDec
Olive-sided Flycatcher	3	3	4	2	3	2	5	3.14	MatCon, LowCon
Ovenbird	2	3	3	3	3	5	3	3.14	MatDec
Blackburnian Warbler	3	4	4	3	3	4	1	3.14	MatCon
White-eyed Vireo	2	3	3	3	3	3	5	3.14	Shrub
Upland Sandpiper	3	3	3	3	4	5	1	3.14	Grass
Burrowing Owl	4	3	3	3	3	2	4	3.14	Grass
Kentucky Warbler	2	4	3	3	3	4	3	3.14	Shrub, MatDec
Black-billed Cuckoo	3	4	4	3	2	5	1	3.14	YngDec, MatDec
Rose-breasted Grosbeak	2	3	3	3	2	4	5	3.14	YngDec
Scissor-tailed Flycatcher	2	4	2	4	3	2	5	3.14	Grass
Summer Tanager	2	3	3	3	3	3	4	3.00	MatDec, YngDec
Swainson's Hawk	3	3	3	2	4	2	4	3.00	Grass
Scarlet Tanager	2	4	4	3	3	4	1	3.00	MatDec
Tennessee Warbler	3	4	3	3	2	3	3	3.00	Shrub
Yellow-throated Vireo	3	3	4	3	3	4	1	3.00	MatDec
Louisiana Waterthrush	4	3	3	3	3	3	2	3.00	LowDec
Magnolia Warbler	3	3	4	3	3	4	1	3.00	YngCon
Yellow-breasted Chat	2	3	3	2	3	3	5	3.00	Shrub
Yellow-bellied Flycatcher	2	4	4	3	2	4	2	3.00	LowCon
Black-throated Green Warbler	3	3	3	3	3	4	2	3.00	MatCon
Purple Martin	2	3	3	2	3	4	4	3.00	Develop
Chimney Swift	1	3	3	2	2	4	5	2.86	Develop
Broad-winged Hawk	3	2	3	2	3	4	3	2.86	MatDec
American Redstart	2	2	3	2	3	3	5	2.86	YngDec
Northern Oriole	2	3	3	3	2	4	3	2.86	AgEdge, Develop
Lark Sparrow	3	3	3	2	3	2	4	2.86	Grass
Indigo Bunting	1	3	2	3	2	4	5	2.86	Shrub, AgEdge
Willow Flycatcher	3	3	3	2	3	3	3	2.86	Shrub
Yellow-throated Warbler	3	3	3	3	3	3	2	2.86	MatDec
Blackpoll Warbler	2	4	3	3	3	2	3	2.86	MatCon
Alder Flycatcher	2	4	3	3	2	3	3	2.86	Shrub

Table 2. Continued.

Species	Global abundance	Winter distribution	Winter threats	Breed. distribution	Breed. threats	Area importance	Popn. trend	Mean score	Primary habitat <sup>1</sup>
Gray Catbird	2	3	4	2	2	4	3	2.86	AgEdge, Shrub
Orchard Oriole	2	3	3	3	3	3	3	2.86	AgEdge, Develop
Wilson's Warbler	3	3	2	3	3	3	3	2.86	Shrub
Painted Bunting	3	3	3	4	2	1	3	2.71	Shrub
Grey-cheeked Thrush	3	4	3	3	2	1	3	2.71	MatCon
Orange-crowned Warbler	3	3	2	3	2	3	3	2.71	Shrub
Least Flycatcher	3	3	2	2	2	4	3	2.71	MatDec, YngDec
Yellow-headed Blackbird	2	3	3	3	3	4	1	2.71	Wetl
Black-headed Grosbeak	2	4	3	3	3	2	2	2.71	YngDec
Warbling Vireo	2	3	3	1	2	4	3	2.57	MatDec, Develop
Blue Grosbeak	3	3	2	2	2	3	3	2.57	Shrub
Bank Swallow	3	3	2	1	2	3	4	2.57	Develop, Primary
Cordilleran Flycatcher	2	4	3	3	2	1	3	2.57	MatCon, MatDec
Swainson's Thrush	3	2	3	2	3	3	2	2.57	MatCon
Ruby-throated Hummingbird	2	3	2	2	2	4	3	2.57	MatDec, YngDec
Dusky Flycatcher	2	4	3	3	2	1	3	2.57	Shrub
Western Tanager	2	3	3	3	3	1	3	2.57	MatCon
Northern Waterthrush	2	2	4	2	2	3	3	2.57	LowCon, LowDec
Northern Parula	2	3	3	3	3	3	1	2.57	MatCon, MatDec
Solitary Vireo	3	3	3	3	3	2	1	2.57	MatCon
Merlin	4	2	3	2	2	3	2	2.57	MatCon
Palm Warbler	3	3	2	3	2	4	1	2.57	LowCon
Eastern Kingbird	2	3	3	2	2	3	2	2.43	AgEdge
Peregrine Falcon	4	1	4	2	3	1	2	2.43	Primary, Develop
Lazuli Bunting	2	4	2	3	3	2	1	2.43	Shrub
Chuck-will's-widow	2	3	3	3	2	3	1	2.43	YngDec
Western Kingbird	2	4	3	3	2	2	1	2.43	AgEdge
Blue-gray Gnatcatcher	2	3	2	2	2	3	3	2.43	MatDec, YngDec
White-throated Swift	3	3	2	3	2	1	3	2.43	Primary
Black-and-white Warbler	2	2	3	2	3	4	1	2.43	MatDec, YngDec
MacGillivray's Warbler	3	3	2	3	2	1	3	2.43	Shrub
Western Wood-Pewee	2	4	3	2	2	2	1	2.29	MatCon, MatDec

Table 2. Continued.

Species	Global abundance	Winter distribution	Winter threats	Breed. distribution	Breed. threats	Area importance	Popn. trend	Mean score	Primary habitat <sup>1</sup>
Common Nighthawk	2	2	2	1	2	3	4	2.29	Primary, Develop
Common Yellowthroat	1	2	2	1	2	3	5	2.29	Shrub, AgEdge
Cliff Swallow	2	3	2	1	2	3	3	2.29	Develop, Primary
Lincoln's Sparrow	2	2	2	2	2	3	2	2.14	LowCon, Shrub
Northern Rough-winged Swallow	3	3	2	1	2	3	1	2.14	Primary, Develop
Barn Swallow	1	1	2	1	2	4	4	2.14	Primary, Develop
Violet-green Swallow	2	3	3	2	2	1	2	2.14	MatCon, Develop
Red-eyed Vireo	1	3	2	2	2	4	1	2.14	MatDec
Chipping Sparrow	1	2	2	1	2	4	1	1.86	YngCon, YngDec
House Wren	1	1	1	1	2	4	1	1.57	Shrub
Yellow Warbler	1	1	2	1	2	3	1	1.57	Shrub

<sup>1</sup>Habitats defined as: Primary = ledges, cliffs, caves, banks, etc.; Wetl (wetland) = sedge meadow, fen, cattail marsh; AgEdge (agricultural-woody edge) = woody fencerows, windbreaks, and forest edges in agricultural landscape; Grass (grassland) = prairie, hayfield, pasture, cultivated grassland; Shrub (shrub-sapling) = shrub swamp, upland oldfield, seedling-sapling forest; LowCon (lowland coniferous forest) = semi open to closed canopy lowland conifers; LowDec (lowland deciduous forest) = lowland-bottomland deciduous forest; YngDec (young deciduous forest) = poletimber-size upland deciduous forest 12-30 years old; MatDec (mature deciduous forest) = mature, upland deciduous forest > 30 years old; YngCon (young coniferous forest) = poletimber-size upland conifer forest 12-30 years old; MatCon (mature coniferous forest) = mature upland conifer forest > 30 years old; Develop (developed) = urban, suburban, rural development.

**Table 3.—Number of Midwest neotropical migrant landbird species and mean management concern score by species' primary habitat association. The management concern score is the mean score of seven criteria used to rank management concern. A score of 5 indicates the most concern and 1 the least. Habitats are listed in order of decreasing mean concern score. See text for habitat descriptions.**

Habitat	Management concern score				Total spp.	Mean concern score
	1-1.9	2-2.9	3-3.9	4-5		
Lowland deciduous forest	0	0	4	1	5	3.57
Young coniferous forest	1	0	1	1	3	3.19
Mature deciduous forest	0	8	13	1	22	3.18
Grassland	0	5	7	0	12	3.07
Shrub-sapling	2	11	10	1	24	3.02
Mature coniferous forest	0	10	6	0	16	3.00
Young deciduous forest	0	3	4	0	7	3.00
Lowland coniferous forest	0	3	3	0	6	2.88
Developed	0	3	1	0	4	2.75
Wetland	0	1	0	0	1	2.71
Agricultural-woodland edge	0	5	0	0	5	2.69
Primary	0	5	0	0	5	2.29
<b>TOTAL</b>	<b>3</b>	<b>54</b>	<b>49</b>	<b>4</b>	<b>110</b>	

Appendix 1.—Trends in neotropical migrant landbird populations in the Midwest determined from the Breeding Bird Survey. Mean percent annual change was estimated by the route regression method<sup>1</sup>. Blanks indicate no data were available.

Species	Mean % annual change 1966-91	No. of rts. <sup>2</sup>	Mean % annual change 1982-91	No. of rts. <sup>2</sup>	Mean birds/r t. 1982-91	Trend reliable <sup>3</sup>
Mississippi Kite	-1.34	10	-4.11**	7	0.4	no
Broad-winged Hawk	0.98	41	-2.70	32	0.2	no
Swainson's Hawk	-0.05	33	-0.60	31	1.0	yes
Merlin	1.72	16	0.83	14	0.1	no
Peregrine Falcon	-1.58***	4				no
Mountain Plover						no
Upland Sandpiper	3.40***	59	4.11***	52	4.2	yes
Long-billed Curlew	-3.26	11	-6.21	9	1.5	yes
Black-billed Cuckoo	0.64	69	4.78**	65	0.8	no
Yellow-billed Cuckoo	-1.22**	65	-5.62***	61	2.8	yes
Burrowing owl	-0.33	14	-3.37	12	0.5	no
Common Nighthawk	1.49*	67	-3.17*	64	0.8	no
Chuck-will's-widow	0.55	19	3.40*	17	1.1	yes
Whip-poor-will	-0.62	48	-4.23***	42	0.3	no
Chimney Swift	-0.62	62	-2.98***	61	5.8	yes
White-throated Swift	2.48	2	0.63	2	0.9	no
Ruby-throated Hummingbird	-0.15	56	0.60	53	0.3	no
Scissor-tailed Flycatcher	-2.87***	14	-3.58**	12	1.0	yes
Great-crested Flycatcher	-0.01	67	-0.95	67	2.7	yes
Olive-sided Flycatcher	-2.96**	18	-1.73	14	0.5	no
Eastern wood-pewee	-1.35**	65	-0.94	63	2.6	yes
Western wood-pewee	1.06*	14	4.45**	14	0.4	no
Yellow-bellied Flycatcher	3.09	9	6.24	8	0.5	no
Cordilleran Flycatcher	3.14**	1	1.74	1	10.4	no

## Appendix 1. Continued.

Acadian Flycatcher	-0.76	41	-0.85	31	0.9	no
Alder Flycatcher	8.24***	33	-1.65	28	5.6	yes
Willow Flycatcher	3.60***	59	-0.40	52	0.8	no
Least Flycatcher	-1.16	54	0.76	43	4.7	yes
Dusky Flycatcher						no
Western Kingbird	1.46**	37	1.58	34	8.3	yes
Eastern Kingbird	0.45	72	0.62	72	7.8	yes
Purple Martin	-0.41	65	-1.06	64	3.0	yes
Violet-green Swallow	2.39	5	4.59	3	0.5	no
Northern Rough-winged Swallow	2.85***	72	3.25	67	1.7	yes
Bank Swallow	0.30	65	-5.15**	62	3.0	yes
Cliff Swallow	0.93	65	-2.47	64	14.9	yes
Barn Swallow	0.75	72	-2.69***	72	21.6	yes
House Wren	1.74***	71	2.43***	69	7.5	yes
Blue-gray Gnatcatcher	-1.19	44	1.32	44	1.8	yes
Veery	-1.39**	40	-2.31***	32	4.6	yes
Gray-cheeked Thrush						no
Swainson's Thrush	2.06	16	2.29	12	11.6	yes
Wood Thrush	-1.87*	53	-2.14**	48	1.9	yes
Gray Catbird	-0.40	71	0.01	68	2.7	yes
White-eyed Vireo	-1.26**	35	0.00	32	1.6	yes
Bell's Vireo	-1.30	32	-4.15**	25	0.3	no
Solitary Vireo	1.74	20	7.14*	17	0.6	no
Yellow-throated Vireo	1.05	57	3.69***	50	0.5	no
Warbling Vireo	0.64	69	-0.75	68	2.3	yes
Philadelphia Vireo	1.35	14	3.05	9	0.5	no
Red-eyed Vireo	1.21**	71	1.85***	69	12.1	yes
Bachman's Warbler						no
Blue-winged Warbler	0.63	32	-3.26**	29	0.3	no
Golden-winged Warbler	-1.68**	19	-0.91	15	0.3	no

Appendix 1. Continued.

Tennessee Warbler	2.56	16	-3.41	12	6.0	yes
Orange-crowned Warbler	3.83	3	-3.24	3	0.2	no
Nashville Warbler	0.52	19	-3.24**	15	8.1	yes
Northern Parula	1.11	42	3.07*	36	0.4	no
Yellow Warbler	1.10**	71	0.96	69	3.5	yes
Chestnut-sided Warbler	-0.56	27	-0.31	24	5.9	yes
Magnolia Warbler	3.13*	12	4.01	11	4.8	yes
Cape-May Warbler	5.94*	11	2.09	10	0.9	no
Black-throated blue Warbler	1.01	8	1.60	8	0.4	no
Black-throated Green Warbler	1.00	21	0.57	16	3.1	yes
Blackburnian Warbler	0.11	13	7.68***	12	2.5	yes
Yellow-throated Warbler	1.03	24	3.71	22	0.3	no
Kirtlands Warbler						no
Prairie Warbler	-2.85***	26	-2.62	19	1.1	yes
Palm Warbler	6.74***	7	1.04	5	0.1	no
Bay-breasted Warbler	-0.24	8	-0.30	6	1.3	yes
Blackpoll Warbler	-2.46**	5				no
Cerulean Warbler	-2.32***	30	-0.61	28	0.2	no
Black-&-white Warbler	2.61*	45	2.53**	40	1.6	yes
American Redstart	-2.82**	60	-2.79	49	2.4	yes
Prothonotary Warbler	-0.79	21	-2.27*	18	0.3	no
Worm-eating Warbler	-2.36	20	5.76	15	0.2	no
Swainson's Warbler	-0.39	4	-0.61	2	0.0	no
Ovenbird	0.24	60	-0.19	56	7.6	yes
Northern Waterthrush	-0.60	18	0.60	18	0.8	no
Louisiana Waterthrush	0.77	31	0.45	27	0.1	no
Kentucky Warbler	-0.88	30	0.69	26	1.2	yes
Connecticut Warbler	1.64	14	-2.76	14	0.5	no
Mourning Warbler	0.13	23	-1.63	22	6.2	yes
MacGillivray's Warbler						

Appendix 1. Continued.

Common Yellowthroat	-0.45	71	-2.96***	71	10.6	yes
Hooded Warbler	-2.02	21	0.03	16	0.1	no
Wilson's Warbler	0.76	6	-6.51	6	0.5	no
Canada Warbler	-1.22	13	-0.73	13	1.0	yes
Yellow-breasted Chat	-2.18***	53	-1.68*	46	2.6	yes
Summer Tanager	-0.41	28	-1.34	25	2.0	yes
Scarlet Tanager	0.55	54	1.98*	48	0.8	no
Western Tanager	-1.69	2	-2.99***	1	7.4	no
Rose-breasted Grosbeak	-0.67	61	-1.82*	55	2.4	yes
Black-headed Grosbeak	1.18	11	3.09	6	0.3	no
Blue Grosbeak	1.69*	36	-1.19	35	1.6	yes
Lazuli Bunting	5.44**	10	14.36**	5	0.8	no
Indigo Bunting	-0.53	68	-2.44***	62	10.7	yes
Painted Bunting	-6.52***	9	15.07**	7	0.4	no
Dickcissel	-2.15***	60	1.00	57	17.4	yes
Chipping Sparrow	1.03*	71	1.67**	69	9.0	yes
Clay-colored Sparrow	-1.21*	36	0.63	30	7.8	yes
Lark Sparrow	-2.09**	51	0.81	44	1.2	yes
Lark Bunting	-4.70**	24	6.29*	17	38.3	yes
Baird's Sparrow	-1.37	14	1.26	13	1.9	yes
Grasshopper Sparrow	-6.10***	71	0.03	67	6.4	yes
Lincoln's Sparrow	4.39	14	5.07	12	1.8	yes
Bobolink	-1.33**	60	-4.70***	59	6.8	yes
Yellow-headed Blackbird	3.77**	41	1.51	36	18.6	yes
Brown-headed Cowbird <sup>5</sup>	-0.22	72	1.75**	72	24.0	yes
Orchard Oriole	-0.66	63	0.34	61	2.1	yes
Northern Oriole	0.49	70	-0.28	69	4.3	yes

<sup>1</sup> Provided by B. Peterjohn and J. Sauer, Office of Migratory Bird Management and the Branch Of Migratory Bird Research, Patuxent Wildlife Research Center, U. S. Fish and Wildlife Service.

<sup>2</sup> Number of BBS routes species was present on.

<sup>3</sup> Trend not reliable if d.f. in analysis were <14 or mean abundance was <1.0 birds/rt.

<sup>4</sup> Statistical significance of the trend (\*= p <0.1, \*\*= p <0.05, \*\*\*= p <0.01).

<sup>5</sup> Not a neotropical migrant, but included because of its impact as a brood parasite of neotropical migrants.