How Much Management Emphasis Should Neotropical Migrants Receive in the Southeast?

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Abstract: Widespread concern for neotropical migratory birds should be tempered with a review of the status of all landbirds, regardless of migratory status. A relationship exists between the proportion of declining neotropical migrants and temperate migrants, but not residents, among Southeastern physiographic areas. However, within physiographic areas where proportions of declining neotropical migrants are high, proportions of declining temperate migrants and residents are not as high. Nevertheless, concern for temperate migrant and resident species in some physiographic areas is justified in addition to concern for neotropical migrants. Rather than debating about which species are declining, we should identify habitats (with associated species assemblages) in need of conservation. In the Southeast, high priority habitats for avian conservation are likely to be determined principally by neotropical migrants with some temperate migrant and resident species of high concern.

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Robbins et al.'s (1989) determination that many neotropical migratory landbirds in eastern North America apparently declined at a accelerated rate from 1978 to 1987 sparked concern for species breeding in temperate areas and wintering in tropical areas. However, the apparent declines reported for neotropical migrants are not reflected in every species everywhere, nor are declines absent among temperate migrants and resident species (Askins et al. 1990, James et al. 1992, Witham and Hunter 1992). The emphasis to manage for neotropical migrants in the Southeast, therefore, should be carefully examined relative to the management needs of temperate migrant and resident species. Potential for misdirecting management efforts and dollars must be avoided as the very ambitious Partners in Flight-Neotropical Migratory Bird Conservation Program (Finch and Stangel 1993) continues to gain momentum.

I address 2 basic questions in this paper. First, where there are relatively high proportions of declining neotropical migrants by physiographic area, are there also relatively high proportions of declining temperate migrant and resident species? Second, within each physiographic area, are the actual proportions of declining

species similar among these residency groups? Both questions were asked for all landbird species and for a subset of those species scoring high using the Partners in Flight Prioritization Scheme, described below (Hunter et al. 1993*a*).

The Breeding Bird Survey (BBS) data discussed here were the result of a collaborative effort by many volunteers in the field and researchers and data managers with the National Biological Service at the Patuxent Wildlife Research Center, Maryland. I wish to thank J. Sauer and B. Peterjohn for adapting their analysis of BBS data to the physiographic area structure of the Southeast Management Working Group of Partners in Flight. The map of physiographic areas in the Southeast is courtesy of M. Swan and D. Pashley through The Nature Conservancy in Louisiana. M. Carter, B. Chapman, R. Coon, J. Dickson, F. James, A. Mueller, D. Pashley, S. Pearson, B. Peterjohn, P. Stangel, J. Woehr, and an anonymous referee provided comments that improved the manuscript.

Methods

All landbird species (to include here subspecies and populations identified to be of conservation interest) known or suspected of breeding in the Southeast were grouped by residency status. Residency status, once assigned, was constant across the range of each species, regardless of local status (i.e., a local population may be resident, but species is considered migratory, unless population is independently of conservation interest). Neotropical migrants were those species with most or all populations breeding north of the Mexico-United States Border withdrawing into Latin America (to include South Texas) and the West Indies (to include South Florida) when not breeding. Temperate migrants were species in which most or all North American temperate breeding populations migrate to and from other temperate areas north of the Mexico-United States Border. A resident species was defined by the presence of populations at all times of year throughout its range, even though there may be some movement of individuals or populations within that range. A complete listing of species considered in this paper and their residency status, relative concern, and population trend within each physiographic area is available upon request from the author.

The Southeast was divided into physiographic areas mostly after the scheme used by the U.S. Fish and Wildlife Service in previous analyses (Robbins et al. 1986). Some areas were combined and others split (consensus reached within the Southeast Management Working Group of Partners in Flight) to facilitate local data collection and interpretation (Hunter et al. 1993 *b*; Fig. 1). Population trends for most species were based on BBS data (1966–1991) for each physiographic area. Population trends for a few species (especially, federally-designated threatened and endangered species and species facing local extirpation or undergoing range expansion) were based on documented historical trends where BBS data were inadequate.

I accepted the route-regression approach for analyzing BBS data (Geissler and Noon 1981, Robbins et al. 1986). Sample size was considered adequate to de-

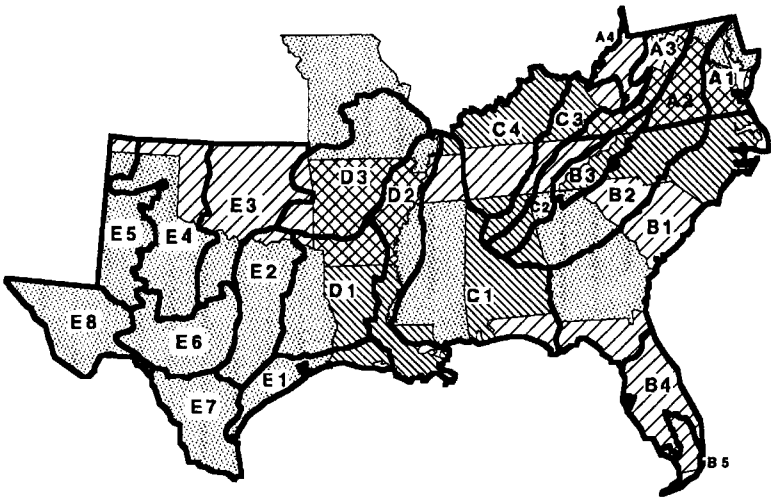

Figure 1. Map of states and physiographic areas in the Southeastern United States covered in this analysis. See Table 1 for physiographic area names.

termine population trends for most species when they were detected on >13 BBS routes in most physiographic areas (B. Peterjohn and J. Sauer, pers. commun.). Increasing or decreasing trends were considered definite when average change of at least 1.0% per year was significant at $P < 0.10$, or consistency of trend among all BBS routes in a physiographic area was significant at $P < 0.10$ even though the trend of at least 1.0% itself was not significant (Hunter et al. 1993 *a*).

Some of the smaller physiographic areas, covered by relatively few BBS routes, were often inhabited by species endemic or nearly so within the Southeast (e.g., Blue Ridge, Subtropical Florida, South Texas Brushlands, Trans-Pecos Texas). Population trend data were considered adequate in a few cases when such locally occurring species were detected on 5–13 BBS routes, if average change per year was highly significant ($P < 0.01$), consistency of trend among BBS routes was also significant, and the species was not of peripheral occurrence within the area.

The Partners in Flight Prioritization Scheme was developed to sort through existing information so as to provide managers with some guidance when addressing concerns for neotropical migrants as a group. The Prioritization Scheme was developed fully realizing that there was extensive variation in population trend and the relative importance of each physiographic area for conserving each species, as well as in the reasons influencing trends among species. The Prioritization Scheme was derived and modified from previous schemes (e.g., Millsap et al. 1990, Reed 1992) to allow flexibility in fully considering both local and global factors influencing the status of each species.

Applying the Prioritization Scheme allows for comparing species within and among the 3 residency groups with respect to 7 criteria. In addition to (1) population trends, other factors scored for each species were (2) global abundance, (3)

global breeding distribution, (4) global wintering distribution, (5) threats during breeding season, (6) threats during non-breeding seasons, and (7) importance of the physiographic area (relative distribution and abundance) compared with rest of distribution (Hunter et al. 1993 *a*, *b*). This approach allowed for contrasting the relative concern of species that may occur locally or are habitat specialists, despite population increases in some physiographic areas, from species that are widespread and habitat generalists, despite population decreases in many physiographic areas.

Each of the seven factors were scored from "1" (lowest concern) to "5" (highest concern). These scores were summed to derive Concern Scores ranging from 7 to 35. Generally, species scoring above 30 were likely in need of immediate management and monitoring attention (e.g., most threatened and endangered species and some candidates), between 24 and 29 likely in need of at least some management or monitoring attention, and with progressively less attention needed as Concern Scores decrease.

Concern Scores for neotropical migrant species were reviewed in all Southeastern States, except Maryland and West Virginia, and were considered by all reviewers as good working drafts to start planning conservation efforts for neotropical migrants. Concern Scores for each species in each physiographic area will continue to be subjected to revision as new data and understanding emerge for global criteria (e.g., abundance, distribution) or as consensus of local expertise dictate for local criteria (e.g., local threat, area importance, population trend). Reviews to update Concern Scores, to include temperate migrants and residents, will be solicited on a regular basis.

I counted the total number of species within each residency group and determined how many of these species were tracked by adequate BBS data (as described previously) or other information to determine population trends. Among those species with adequate data in each residency group, the percentage of all species and species with Concern Scores >23, respectively, with significant declines from 1966–1991 were calculated. Physiographic areas were ranked from high to low percentages of declining species within each residency group. Spearman Rank Correlation Coefficients (r_s) were calculated separately for all species and species with high Concern Scores to test whether those physiographic areas with relatively high proportions of declining neotropical migrants were also areas with relatively high proportions of declining temperate migrant and resident species (Daniel 1978). In addition, actual percentages of declining neotropical migrants were compared directly with other residency groups, within each physiographic area. A separation of at least 6 percentage points was selected *ad hoc* to indicate different proportions of declining species among residency groups within a physiographic area.

Results

The total number of neotropical migratory species is higher than the total number of either temperate migrant or resident species in all physiographic areas, save for a few areas in Florida and Texas (Table 1). A similar pattern emerges

Table 1. Number of breeding landbird species among physiographic areas in the Southeast, classified as to residency status, whether data were adequate (inadequate) to indicate population trends, and whether they attain a Concern Score (CS) >23 points. Physiographic areas are identified in Fig. 1 by their alpha-numeric code.

Physiographic area	*N* of BBS routes	*N* species with (without) trend data					
		Neotropical		Temperate		Resident	
		CS >23	Total	CS >23	Total	CS >23	Total
Mid Atlantic Coastal Plain (A1)	42	12 (3)	45 (8)	2 (4)	37 (9)	1 (0)	18 (3)
Mid Atlantic Piedmont (A2)	36	4 (1)	39 (9)	2 (2)	35 (7)	0 (0)	18 (2)
Mid Atlantic Ridge and Valley (A3)	40	13 (1)	59 (12)	3 (1)	41 (11)	0 (0)	17 (2)
Ohio Hills (A4)	51	13 (1)	52 (11)	3 (0)	39 (11)	0 (0)	18 (2)
South Atlantic Coastal Plain (B1)	104	12 (2)	51 (4)	4 (3)	27 (4)	5 (0)	22 (2)
Southern Piedmont (B2)	43	7 (3)	47 (10)	2 (0)	34 (1)	1 (0)	11 (2)
Blue Ridge (B3)	16	22 (0)	52 (15)	2 (1)	27 (18)	1 (0)	16 (6)
Peninsular Florida (B4)	31	3 (3)	23 (13)	4 (1)	26 (5)	8 (0)	24 (4)
Subtropical Florida (B5)	9	2 (7)	12 (12)	1 (2)	16 (6)	6 (1)	17 (6)
East Gulf Coastal Plain (C1)	76	9 (2)	48 (10)	3 (3)	34 (5)	4 (0)	21 (3)
Southern Ridge and Valley (C2)	28	12 (2)	51 (9)	4 (0)	35 (0)	2 (0)	17 (2)
Cumberland Plateau (C3)	18	14 (3)	49 (11)	2 (1)	30 (6)	1 (0)	15 (2)
Highland Rim and Lexington Plain (C4)	76	9 (1)	54 (3)	4 (1)	39 (3)	0 (0)	15 (1)
West Gulf Coastal Plain (D1)	41	12 (1)	45 (11)	3 (1)	29 (6)	2 (0)	20 (3)
Mississippi Alluvial Plain (D2)	31	16 (2)	47 (13)	2 (0)	29 (4)	1 (0)	16 (2)
Ozark-Ouachita Highlands (D3)	35	12 (1)	54 (6)	4 (0)	37 (6)	1 (0)	18 (3)
Coastal Prairies (E1)	19	4 (1)	26 (19)	3 (4)	23 (13)	2 (0)	23 (6)
Oaks and Prairies (E2)	22	8 (1)	38 (18)	2 (1)	25 (9)	0 (1)	22 (12)
Osage Plains (E3)	52	13 (1)	57 (9)	3 (1)	35 (12)	1 (0)	24 (6)
Rolling Red Plains (E4)	18	3 (1)	28 (13)	4 (0)	35 (6)	0 (1)	17 (14)
Staked and Pecos Plains (E5)	14	1 (1)	19 (12)	3 (0)	25 (14)	1 (0)	10 (23)
Edwards Plateau (E6)	18	8 (1)	41 (17)	1 (0)	28 (10)	2 (0)	29 (8)
South Texas Brushlands (E7)	18	8 (4)	36 (20)	2 (0)	22 (16)	7 (0)	34 (9)
Trans-Pecos Texas (E8)	15	5 (12)	33 (43)	3 (0)	24 (22)	3 (1)	21 (24)

when comparing only species with Concern Scores >23 points. Species with inadequate population trend data, included in the total numbers of species, were not considered further.

The relative ranking of proportions for declining neotropical migrants and temperate migrants were significantly related among physiographic areas. This result was found for all species and for species with Concern Scores >23 points (both $P < 0.05$; Table 2). In contrast, the proportions of declining resident species among physiographic areas were not correlated with either temperate or neotropical migrants.

Direct comparisons within physiographic areas indicated that areas with high proportions of declining neotropical migrants, especially among species of high concern, do not have proportions of decline as high for resident species nor temperate migrant species (Table 3). However, this finding does not imply that concern should be lower for temperate migrant and resident species in all physiographic areas. In many physiographic areas, where there are high proportions of

Table 2. Relationships ampng physiographic areas in the proportions of declining landbirds. Percentage of declining species within each residency group is based on the total number of species with adequate data (see Table 1). High to low percentages among physiographic areas are ranked and Spearman Rank Correlation Coefficients (r_s) are calculated for each comparison. This process was repeated for species with Concern Scores (CS) >23 points and for all (All) species regardless of Concern Score. All correlations have sample size of 24, referring to number of physiographic areas.

Comparison	Species Groupings	r_s	$P \leq$
Neotropical migrants vs. Temperate migrants	CS >23	0.3489	0.05
	All	0.3578	0.05
Neotropical migrants vs. residents	CS >23	-0.0498	NS[a]
	All	0.0722	NS
Temperate migrants vs. residents	CS >23	-0.1507	NS
	All	0.3156	NS

[a] NS = not sufficient.

declining neotropical migrants, there are also relatively high proportions of declining temperate migrants (Table 2). This pattern is apparent even where there are differences in actual percentages among these residency groups.

There are some physiographic areas where concern for temperate migrants or residents may be equivalent to or surpass concern for neotropical migrants (Table 3). However, few temperate migrants have high Concern Scores in any of these physiographic areas. High levels of concern should be expressed for residents in some physiographic areas (all in Texas, Florida, or otherwise bordering coastal areas). The high number of resident species Federally listed or candidates for listing found in these physiographic areas contributes to this pattern.

Discussion

There has been great interest in interpreting BBS population trends since Robbins et al.'s (1989) paper, almost to the exclusion of examining those factors that may imperil a species. Use of the Prioritization Scheme to identify species of high concern did not fundamentally alter results found with correlations considering all species within each residency group. However, the Prioritization Scheme does allow managers to specifically identify which species and species assemblages are most likely in need of management attention without regard to residency group. The Prioritization Scheme is intended to guide managers, but not make decisions for them, in delegating limited financial and logistical resources. Defining species assemblages, representing habitats, and assigning supplemental action scores on additional survey, management, monitoring, and research needs for each species or species assemblage should also assist managers in allocating specific resources (Hunter et al. 1993 *a*, *b*).

Table 3. Comparisons of actual percentages of species declining among residency groups within each physiographic area. These comparisons are presented separately for all species and for species with Concern Scores (CS) >23 points. Physiographic areas, defined in Table 1, are ordered from high to low percentages of declining neotropical migrants, with top 10 representing an arbitrary break to see if differences among residency groups are more likely than when all physiographic areas are considered. The percentages of species declining among residency groups were considered different if they were >5 percentage points apart.

% of all species declining				% of all species with CS >23 declining			
Physio. area	Neotropical	Temperate	Resident	Physio. area	Neotropical	Temperate	Resident
C2	61[a,b]	37	35	D2	26[a,b]	7	6
D2	49[a,b]	28	25	B3	25[a,b]	7	6
E2	47[a,b]	36[c]	14	E2	21[a,b]	4	0
B3	46[b]	44[c]	31	E3	19[a,b]	9	4
E3	39[b]	34[c]	13	C2	18[a,b]	11	6
C3	37[a,b]	27	27	E7	18[a]	9	21[f]
A4	33[b]	36[c]	17	A4	17[a,b]	8[c]	0
A3	32[b]	34[c]	18	E6	17[a,b]	4	7
C1	29	24	24	D1	16[a,b]	7	10
E6	29[a,b]	18[c]	7	A3	14[a,b]	7[c]	0
E7	28[a]	18	27[f]	A1	13[a,b]	5	6
D1	27[b]	28[c]	15	B2	13[a,b]	3	6
D3	26	22	22	C1	13	9	14
E8	24[a,b]	13	10	C4	13[b]	8[c]	0
A1	22	24	22	E8	12[a]	4	9
C4	22[b]	30[c,d]	7	C3	12	7	7
E4	21	23	18	D3	11	8	6
A2	18	37[c,d]	17	B5	8[a]	0	29[e,f]
B2	17	18[c]	12	E4	7[b]	9[c]	0
B5	17[a]	6	21[f]	B1	6	7	18[e,f]
E1	15	22[d]	26[e]	E5	5	4	0
B4	13	39[d]	38[e]	B4	4	4	25[e,f]
B1	12	37[d]	32[e]	E1	4	4	9
E5	11	8	10	A2	3	6[c]	0

[a] Percent of declining neotropical migrants > declining temperate migrants.
[b] Percent of neotropical migrants > residents.
[c] Percent of temperate migrants > resident.
[d] Percent of temperate migrants > neotropical migrants.
[e] Percent of residents > neotropical migrants.
[f] Percent of residents > temperate migrants.

Focusing management on neotropical migrants appears to be justified within most Southeastern physiographic areas. In addition, at least one temperate migrant of high concern was identified in all but one of the Southeast's physiographic areas. In those physiographic areas where high numbers of resident species are of high concern, there are also at least a few neotropical migrants (and usually temperate migrants) of concern as well.

There is still a need to be careful about interpretation of population trend data, even when using the Prioritization Scheme, before developing and implementing

management plans. The BBS data were not divided into 10-year periods here, as was done in previous analyses (e.g., Robbins et al. 1989), and may not reflect any recent changes in population trends. Populations of many neotropical migratory species underwent their steepest decline during the 1980s (Robbins et al. 1989) suggesting that rates of decline reported here, including years of relative stability (1966–1978), were conservative for this group of species. Further delineation of population trends using blocks of years within each physiographic area will be the subject of future analyses.

Also, some species had steeper declines than other species in each physiographic area (e.g., 5% per year versus 1% per year). Magnitude of decline is not addressed in this paper, again allowing for a conservative treatment of the results (i.e., some species undergoing declines may be in more trouble than others). However, distinguishing which species deserve more attention because of steeper declines (all other factors, as discussed above, being equal) is an issue best left to local coordinators, but may be a subject for future analyses at the regional level.

The fact that a decreasing population trend is found for a species does not indicate that there is complete understanding as to why the trend exists and what can be done to reverse the trend. Also, the potential is high for conflicting or confusing trend data requiring careful consideration. For example, similar rates of decline among 2 of more species assemblages with directly opposing habitat needs in the same area or increasing and decreasing trends within the same species assemblage are frequently found within the Southeast. Open discussions between managers and researchers should commence if there are doubts about how to interpret these data. Examples illustrating potential interpretations of these data follow.

Some common and widespread species occurring in the Southeast, in all residency groups, are showing consistent and apparently long-term declines among physiographic areas. The fact that temperate migrants like blue jays (*Cyanocitta cristata*), red-winged blackbirds (*Agelaius phoeniceus*), and brown-headed cowbirds (*Molothrus ater*) are undergoing population declines should not necessarily be cause for alarm because of consistently low Concern Scores for these species. The same is true for a few neotropical migrants, such as common yellowthroat (*Geothlypis trichas*).

In contrast, some neotropical migrant species with consistently high Concern Scores, like cerulean warbler (*Dendroica cerulea*) and Swainson's warbler (*Limnothlypis swainsonii*), are apparently increasing in some physiographic areas, as are a few temperate migrants like loggerhead shrike (*Lanius ludovicianus*) and Bachman's sparrow (*Aimophila aestivalis*). However, species with low relative abundances appear to have a positive bias associated with BBS data analyses used to track their population trends (B. Peterjohn 1993, pers. commun.). Thus, isolated increasing trends should be considered cautiously and should not cause managers to lessen emphasis on efforts to closely monitor populations and continue promoting population increases for species with high Concern Scores, regardless of residency status.

Similarly, physiographic areas with a large proportion of species in decline should not automatically raise warning flags in absence of other information. For example, nearly half of all species are undergoing population declines in the Blue Ridge Physiographic Area (Tables 1, 3; also see James et al. 1992). Despite these declining trends, the Blue Ridge includes large and relatively contiguous tracts of public forested lands and remains a very important center of abundance for many landbirds (Wilcove 1985). A review of land use patterns (both of breeding and non-breeding habitats), potential environmental contaminant effects, and adequacy of existing population trend data may be needed to clarify what the correct level of concern should be within some physiographic areas. Such a review appears necessary before making large-scale management adjustments in the Blue Ridge, a physiographic area likely supporting source populations for many species (S. M. Pearson unpubl. rep.; Southern Blue Ridge Migratory Bird Research Group; Oak Ridge National Laboratory, Tenn.).

A review of land use patterns in other physiographic areas where many species are undergoing declines leaves little doubt as to factors influencing these declines. Declining trends for all residency groups, and especially neotropical migrants, in the Southern Ridge and Valley and Mississippi Alluvial Plain are likely related to the massive conversion of forests and grasslands to other uses (agriculture, residential, and commercial) that have continued during the last 25 years (Turner 1990; Creasman et al. 1992; Smith, et al. 1993; S. M. Pearson, V. Dale, and H. Offerman, pers. commun.). Management actions in these physiographic areas must include habitat restoration as well as investigations into adjustments needed in local management of existing habitats within larger landscapes.

A relatively low number of neotropical migrants are declining in some "lowland" physiographic areas (Table 3; also see James et al. 1992), yet long-term land use patterns would suggest that we not become complacent about the status of these species in these areas. Physiographic areas like the Southern Piedmont and South Atlantic Coastal Plain have been under intense agricultural use, with some forest recovery during the last 60 years (e.g., Odum and Turner 1990, Turner 1990). However, much remaining or recovered forested land, whether hardwood or natural pine, is now being converted to short-rotation (<30 years) pine plantation or cleared completely for other commercial and residential uses. Thus, any stabilization or recovery for species of high concern using mature forests during the last 25 years may be short-lived in these physiographic areas. This may be especially true for neotropical migrants using bottomland forests (e.g., Swainson's warbler or prothonotary warbler [*Protonotaria citrea*]) or coastal scrub-forests (e.g., painted bunting [*Passerina ciris*]).

In coastal plain and other lower latitude physiographic areas, several species associated with mature pine forests are also of high concern and generally undergoing declines, including temperate migrants (e.g., Bachman's sparrow, Southeastern American kestrel [*Falco sparverius paulus*]) and residents (e.g., northern bobwhite [*Colinus virginianus*], red-cockaded woodpecker [*Picoides borealis*], brown-headed nuthatch [*Sitta pusilla*]). These species are especially common in or dependent upon remnant fire-maintained longleaf pine (*Pinus palustris*), a community type with few

neotropical migrant species restricted to it. Thus, it is important to determine whether the habitat needs of neotropical migrants of high concern correspond with the habitats important to other landbirds and taxa of high concern. Few ecologists would debate the need to protect, enhance, and restore bottomland hardwoods, coastal scrub-forests, and longleaf pine communities in southeastern coastal plain areas. However, priority needs for neotropical migrants would not lead necessarily to management action for all priority habitats.

Rather than continuing to debate about which species, or species groups, are declining most, we should identify habitats most in need of conservation action on a physiographic area (or other appropriate local scale) basis. Assemblages composed of species of high concern should help to identify important habitats (e.g., Millsap et al. 1990), with population trend being only one factor considered for determining concern level. In the Southeast, high priority habitats for avian conservation are likely to be determined in most physiographic areas by neotropical migrants with some temperate migrant and resident species of high concern. However, high priority habitats used primarily by temperate migrant or resident species of high concern, and not by many neotropical migrants, should also be part of any Partners in Flight conservation strategy. Certainly, this approach must be taken in the tropics where many resident species are in much higher need of conservation action than all but a few neotropical migrants.

Once clearly identified, habitats of greatest concern within each local area should receive priority attention from managers. However, managers should avoid monitoring to judge management success using either simplistic single-species (e.g., management indicator species) or index (e.g., habitat suitability, species richness, species diversity) approaches alone. Instead managers should consider implementing approaches to management and monitoring that involve evaluating entire ecosystem or community health such as those outlined by Karr (1990) and Noss (1990).

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