The Partners in Flight Species Prioritization Scheme

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Abstract — The prioritization scheme identifies those birds at any locality on several geographic scales most in need of conservation action. Further, it suggests some of those actions that ought to be taken. Ranking criteria used to set priorities for Neotropical migratory landbirds measure characteristics of species that make them vulnerable to local and global extinction. Ranking parameters are global abundance, global extent of breeding and non-breeding distributions, threats during breeding and non-breeding periods, population trend, and the importance of the area under consideration for conservation of the species. Supplemental scores assigned to each species can indicate needs for greater survey and inventory, monitoring, research, or management effort. Species that share broadly classified habitats can be grouped to identify those habitats most in need of conservation attention. Management and acquisition strategies for efficient conservation of Neotropical migratory birds for a specific area, ranging in geographic scale from global to a small management unit, can then be developed.

INTRODUCTION

Clearly stated goals and objectives are the cornerstones of any conservation effort. To be successful, a conservation effort requires systems that set priorities for allocation of limited logistical and financial resources. A well-designed priority scheme should utilize available information to assist in making informed decisions among conflicting objectives.

The species targeted by Partners in Flight are linked on the basis of a single criterion - they all breed (at least partially) in North American temperate zones and migrate (at least partially) south of the continental United States during non-breeding seasons. Otherwise, the geographical distributions, life history traits, and taxonomic affinities of Neotropical migratory landbirds cover the range of avian biological potential. Some of these species are declining seriously and their continued survival is in doubt, others are still relatively numerous but show signs of recent widespread decline, while others are doing relatively well. Differentiating among species on the basis of their status and needs and identification of effective conservation actions should be the objectives of a prioritization scheme.

Conservation efforts to date have largely been aimed at individual species (e.g., game, endangered, or management indicator species) rather than ecosystems. However, there is increasing awareness that declines of individual species result from overall degradation of biological communities. The intent of a this priority scheme is to avoid single-species management by focusing attention on habitats used by suites of vulnerable species. Habitat-based approaches that combine information on individual species encourage efficient use of limited financial and logistical resources. Conservation plans can benefit suites of Neotropical migrants (and, hopefully, other birds and elements of biological diversity) in prioritized habitats. Highly vulnerable species dependent on habitats not otherwise among the highest priorities for conservation action can still be identified and appropriate measures implemented where necessary.

The following discussion provides a baseline for development of conservation strategies for Neotropical migrants. Readers (especially those who will be using this scheme) should

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be concerned less about assigning scores (which are to be provided by regional or local coordinators) and more about what the scores mean. Hopefully, all of the parameters will undergo rigorous examination in upcoming years. Elements of this scheme are all subject to modification and improvement as experience is gained through direct application. Users should remain in communication with appropriate Partners in Flight working groups and coordinators to be aware of and provide input into these changes. Even though this scheme is by no means perfect, it should provide approximate guidance in the absence of other useable tools. The intent of this scheme is to complement (and not compete with) existing lists of legally protected species at state and federal levels, candidates for legal protection, species of management (or special) concern, and sensitive species.

DEVELOPMENT OF A PRIORITIZATION SCHEME FOR NEOTROPICAL MIGRANTS

Background

Earlier conservation prioritization schemes that have influenced the evolution of this effort (Master 1991, Millsap et al. 1990, Rabinowitz 1981, Reed 1992) are not simultaneously applicable at different spatial scales. These schemes also do not allow consideration of the annual cycle of species with shifting seasonal distributions. The present scheme has been designed specifically for the unique conservation problems posed by migratory species.

The Management Steering Committee of Partners in Flight defined seven criteria that reflect a species' potential to be extirpated. These criteria include general aspects of the species' biology and factors operating at the various designated geographic scales important in the prioritization scheme (Table 1). Conservation planning should focus on local issues (species, habitats, status, trends, etc.), but efforts undertaken at local levels should be consistent with goals and objectives set at larger spatial scales (physiographic area, state, region, hemisphere). The emphasis of this scheme is geographical rather than taxonomic. Thus, evaluation of all the species occurring within a given region is of higher precedence than evaluation of all the regions within the range of a given species.

The geographic scale treated in this paper, the smallest for which reliable data are often available, can be defined either ecologically (physiographic area, based largely on the Breeding Bird Survey) or politically (state or province). Nations, commonwealths, and territories of the West Indies and smaller Latin American nations should be treated on the same scale as a physiographic area or state. Priorities can also be assigned at local, regional, and global geographic scales. Regions in temperate North America are based on the four Partners in Flight regional management working groups that follow the geographic structure of the International Association of Fish and Wildlife Agencies.

Table 1. — Spatial scales considered in setting priorities for Neotropical migratory landbirds, with examples for each scale underlined.

Scale	Examples
Global=hemispheric	Western Hemisphere (i.e., entire distribution of the species in the Western Hemisphere)
Regional	
1. Subsections of a subcontinent	As with temperate North America:
	Northeast
	Southeast
	Midwest
	West
2. Multinational	As within the West Indies:
	Bahamas
	Greater Antilles
	Lesser Antilles
Stratum, state or province, nation, commonwealth, teriitory	
1. Physiographic Area	As in Southern Piedmont
2. State or Province	As in Georgia
3. Nation, Commonwealth, Territory	As in Jamaica, Puerto Rico, U.S. Virgin Islands
Local	
1. Southern Piedmont of Georgia	Defined land management unit or group of cooperating land management units, as in Piedmont National Wildlife Refuge, Oconee National Forest, Hitchiti Experimental Forest
2. Wet tropical highlands in Puerto Rico	Defined land management unit or group of cooperating land management units, as in the Caribbean National Forest and surrounding properties

Concern Score

Seven factors are considered in ranking each species relative to other species at the state or physiographic area level (Table 2). A species is assigned a rank score in each category ranging from "1" (low concern) to "5" (extremely high concern). Globally determined factors are (1) global abundance, (2) extent

Table 2. — Seven factors considered within regional and state or physiographic area spatial scales for ranking Concern Scores for individual bird species. Each factor is scored from a minimum of "1" to a maximum of "5" points with total scores ranging from 7 to 35. The columns below represent only two of the spatial scales listed in Table 1, and it is important to consider that different types of information enter into the scoring process at each spatial scale.

Region	Physiographic area or state
Global abundance	Global abundance
Global breeding distribution	Global breeding distribution
Global wintering distribution	Global wintering distribution
Threats to breeding within region when known, global when not known	Threats to breeding within state or physiographic area when known, global when not known
Threats to non-breeding within region when known, global when not known	Threats to non-breeding within state or physiographic area when known, global when not known
Regional population trend	Physiographic area or state population trend
Area importance; percentage of global distribution	Area importance; abundance and distribution relative to global range

of breeding distribution, and (3) extent of winter distribution. For rankings in areas in which a bird breeds, (4) threat during the breeding season is determined specifically for the area of interest, whereas (5) threat during the non-breeding season is a constant value across all areas where each species breeds. For ranking a species in wintering habitat, (4) threats breeding is constant and (5) threats non-breeding would be based on local conditions. Two factors always scored locally are (6) population trend and (7) importance of the area to the species. A total species concern score can thus range from 7 to 35. Scores are site-specific, and will vary for a species across its range based upon varying local conditions.

Supplemental Scores

There is variability in the confidence with which concern scores are assigned. Reliability in population trend estimates is particularly questionable where Breeding Bird Survey data are limited. As another example, degrees of threat in specific areas may be derived solely on inference from larger spatial scales (Ehrlich et al. 1988, Finch 1991, Gradwohl and Greenberg 1989, Hagan and Johnston 1992).

As a result, a system of supplemental scores (action scores *sensu* Millsap et al. 1990) has been devised whereby reliable scores can be differentiated from scores in which there is less confidence. Each supplemental variable is scaled from "1" (little need for more information or action) to "5" (great need for more information or action).

Supplemental scores indicate the extent and location of gaps in our knowledge of Neotropical migratory bird biology. Where there is high uncertainty, effort must be invested to more accurately determine conservation needs. High supplemental scores can highlight needs for better survey (distribution) information, increased monitoring or research efforts, or for more intensive management than presently applied (Table 3). Supplemental scores also can protect managers from premature investment of resources on a species with a high concern score that is based on insufficient information.

CONCERN SCORE CRITERIA DEFINITIONS

Global Abundance

Global abundance, a constant used at all spatial scales, is a crude measure of a species' (hereafter to include subspecies and populations specifically identified for conservation purposes) vulnerability to catastrophic stochastic environmental events and, to some extent, demographic stochasticity. This presumes that more abundant species are more capable of absorbing adverse environmental and internal population dynamic impacts. Because total population sizes of all but the rarest species are unknown, global abundance is based on relative abundance in appropriate habitat and distribution of that habitat within the range of the species, relative to all other species (Table 4).

Breeding Distribution

Breeding distribution, another constant used at all spatial scales, is based on a review of range maps in various field guides, the American Ornithologists' Union Checklist of North American Birds (1983), and other sources (particularly, Rappole et al. 1983; Table 5). This and the following criterion also measure a species' vulnerability to stochastic environmental variation. Generally, species with wide distributions are less subject to naturally occurring or human-induced local effects. A species such as the Barn Swallow (*Hirundo rustica*) that is very widespread would receive the minimum score of "1," while a species such as the Colima Warbler (*Vermivora crissalis*) with a very local breeding range would receive the maximum score of "5." Locally occurring species (score of "4") include such birds as the Mountain Plover (*Charadrius montanus*) and Swainson's Warbler (*Limnothlypis swainsonii*) that occur locally within a wide distribution.

Table 3. — Supplemental rank scores addressing need for additional monitoring, survey/inventory, research, and management at any spatial scale. Adapted primarily from Millsap et al. (1990). These supplemental scores are intended to assist directing financial and logistical resources where they would be most needed; i.e., towards specific needs of species or groups of species in concert with their Concern Scores.

Criteria/Subcriteria	SCORE
Survey/inventory needs	
Distribution is extrapolated from a few localities or knowledge limited to general range maps	5
Some range limits or habitat associations are known, but local or regional occurrences cannot be predicted accurately	4
Broad range limits or habitat associations are known, but local occurrences cannot be predicted accurately	3
Distribution is generally well known and occurrences can be accurately predicted most of the time throughout range	2
Distribution is well known and occurrences can be accurately predicted throughout the range	1
Monitoring needs (population trend uncertainty)	
Not currently monitored, but monitoring needed	5
Areawide monitoring, but not with statistical sensitivity	4
Monitored locally with statistical sensitivity, but not areawide	3
Areawide monitoring with minimum sample size for statistical sensitivity	2
Areawide monitoring with statistical sensitivity, nearly complete census, or areawide monitoring deemed unnecessary	1
Research needs (identify breeding and non-breeding threats separately)	
Factors affecting population size and distribution, necessary for effective management, are unknown or unsubstantiated	5
A few factors affecting population size and distribution are known, but 1 or more factors are unknown hindering management efforts	4
Some factors affecting population size and distribution are known allowing for some effective management, but 1 or more important factors remain unknown	3
Most major factors affecting population size and distribution are known allowing for reasonably effective management	2
All major factors affecting population size and distribution are known or there is little perceived need to discover these factors	1
Management needs	
None or little directed at species, but management likely needed	5
Management mostly related to enforcement of conservation laws, deemed inadequate for recovery	4
Some direct or indirect (habitat or ecosystem level) management activities in addition to enforcement of conservation laws	3
Direct management intensively applied to taxon, some additional attention may be needed	2
None directed at species, with little perceived need	1

Table 4. — Definitions of rank scores for the Global Abundance criterion.

Rank Score	Definition
1	Abundant.
2	Common (to include locally abundant).
3	Uncommon to Fairly Common (to include locally common).
4	Rare to Uncommon (to include locally fairly common).
5	Very Rare to Rare (to include locally uncommon).

Table 5. — Definitions of rank scores for the Global Breeding Distribution criterion.

Rank Score	Definition
1	Very widespread -- ≥ 76-100% of temperate North America.
2	Widespread -- 51-75% of temperate North America.
3	Intermediate -- 26-50% of temperate North America.
4	Local -- 11-25% of temperate North America.
5	Very Local -- ≤ 10% of temperate North America.

Winter Distribution

Winter distribution, also a constant value, is generally not as well-delineated as breeding distribution for Neotropical migratory species. Therefore, actual examples of wintering distributions for each rank are used rather than some percentage of a subcontinent (Rappole et al. 1983; Table 6).

The distribution of species during migration, a factor that should be evaluated separately from breeding and winter distribution, is not herein considered (however, see Rappole et al. 1979). Consensus on how to produce a single score for distributions that vary within a migration period and that often differ between vernal and autumnal movements does not exist.

Threats During Breeding Season

This criterion, adapted from Millsap et al. (1990), is a measure of threat to each species in the area of interest (Table 7). It can incorporate three different aspects of the breeding biology of the species in question: demographic vulnerability, ecological vulnerability, and habitat loss and disruption. Demographic vulnerability assesses the ability of a species to recover from population loss on the basis of reproductive rate and/or juvenile mortality. Species with strict habitat limitations, or with specialized feeding and breeding requirements, are given a higher rank for ecological vulnerability. Habitat loss and

Table 6. — Definitions of rank scores for the Global Wintering Distribution criterion.

Rank Score	Definition
1	Very widespread -- southern latitudes of the U.S. through middle America into northern South America; or all of South America.
2	Widespread -- southern latitudes of the U.S. through Central America; or southern Central America into most of Southern America.
3	Intermediate -- throughout, but only in, Mexico; the entire Caribbean Basin and Caribbean Slope of Central America and southern Mexico; the Middle American highlands; or the entire Amazon Basin.
4	Local -- Caribbean Basin alone; Caribbean Slope of Middle America alone; Pacific Slope of Middle America alone; the Mexican Highlands; or the Andean Ridge of northern South America.
5	Very Local -- e.g., Bahamas only; Guatemala, Honduras, and Nicaragua highlands only; States of Jalisco, Michoacan, and Guerrero in Mexico; southern Sinoloa and southern Baja California in Mexico.

Table 7. — Definitions of rank scores for Threats during Breeding Season criterion when specific data are not available, but there is general consensus on threats (to include habitat loss, predation, parasitism, contaminants, persecution).

Rank Score	Definition
1	No known threat -- habitat increasing or stable, species with high reproductive potential, and ecological generalist.
2	Minor threat -- habitat loss between 1 and 10%, moderate generalist.
3	Moderate threat -- habitat loss between 11 and 25%, species with moderate reproductive potential and ecological specialization.
4	Extensive threat -- habitat loss between 26 and 50%, ecological specialist.
5	Extirpation likely -- habitat loss exceeding 50%, species with low reproductive potential, and ecological specialist.

disruption can result from certain forest management, water management, development, mining, and grazing practices. Habitat loss is often the most severe of these threats.

This criterion, particularly habitat loss, should be analyzed specifically for the area of consideration (Table 8). However, because local information is not available for most species in most areas, breeding threat scores set at higher spatial scales will generally be applied locally until better local information becomes available. Needs for clarification of breeding threats can be identified under the research supplemental score (Table 3).

Table 8. — An example format for threat during breeding at any scale of interest, when data are available, as adapted from Millsap et al. (1990). Rank scores for insertion into priority scheme could be: 5=33-40 pts., 4=25-32 pts., 3=17-24 pts., 2=9-16 pts., 1=0-8 pts. Also see Table 3.

Criteria/subcriteria	Score
Distribution/habitat trend (range 0-10 points)	
Area/habitat declined 51-100%	10
Area/habitat declined 26-50%	8
Area/habitat declined 11-25%	6
Area/habitat declined 1-10%	3
Area/habitat stable or increasing	0
Population concentrations (range 0-10 points)	
Majority concentrates at a very few separate locations (for example, ≤ 20 at state or physiographic area, or smaller scale, and ≤ 50 at regional scale or larger	
Widespread but locally occurring	8
Numbers concentrated over moderately wide range	
Numbers concentrated over a wide range	
Does not concentrate	0
Reproductive potential for recovery (range 0-10 points)	
A) Average number of offspring produced after depredation and parasitism	
1 offspring/female/year	5
2 offspring/female/year	3
3 offspring/female/year	1
3 offspring/female/year	0
B) Average number of years female expected to reproduce	
1 year	5
2 years	3
3 years	1
3 years	0
Ecological and behavioral specialization (range 0-10 points)	
A) Dietary specialization (for example, feeds on a few specific food items)	
Decline, no shift to other resources, when primary resource declines	3.3
Substantial shift when primary resource declines	0
B) Reproductive specialization (for example, dependency on cavities, narrow physiological tolerances to climate for nesting)	
Decline, no shift to other resources, when primary resource declines	3.3
Substantial shift when primary resource declines	0
C) Other ecological or behavioral specialization not covered in A) or B) above (for example, requires exposed perch for foraging, specificroosting requirements)	
Highly specialized	3.3
Moderately specialized	1.7
Not specialized	0

Threats During the Non-breeding Seasons

Threats during migration and overwintering include two of three factors discussed under breeding threats (ecological specialization and habitat loss/disruption) (Table 9). This score remains constant for a species for areas in which it primarily breeds, and also can be constant in areas where it winters or through which it migrates where local data are not available (Table 10). Vulnerability due to distributional constraints during migration can be addressed indirectly under this criterion. Needs for additional data on threats during the non-breeding seasons, identified under research supplemental scores (Table 3), should generally be high.

Table 9. — Definitions of rank scores for Threats during Non-breeding Seasons criterion when specific data are not available, but there is general consensus on threats (to include habitat loss, predation, parasitism, contaminants, persecution).

Rank Score	Definition
1	No known threat -- habitat increasing or stable, ecological generalist during both migration and winter.
2	Minor threat -- habitat loss between 1 and 10%, moderate generalist during both migration and winter.
3	Moderate threat -- habitat loss between 11 and 25%, moderate ecological specialization during migration and/or winter.
4	Extensive threat -- habitat loss between 26 and 50%, ecological specialist during migration and/or winter.
5	Extirpation likely -- habitat loss exceeding 50%, ecological specialist during both migration and/or winter.

Population Trend

Population trend is determined independently in each area considered. Of the various population trend tracking approaches in use, only the Breeding Bird Survey (hereafter BBS) has broad utility across landscape, state/physiographic area, and regional spatial scales (Robbins et al. 1986). There are generally adequate BBS data available in the eastern 1/3 of temperate North America for assessment of population status at least to the state or physiographic area level. Although BBS data are also available throughout central and western temperate North America, interpretation of these data below the grossest spatial levels is problematic and nearly impossible for the many species occurring in riparian habitats or high elevations.

Localized monitoring studies (e.g., bird-banding, Breeding Bird Censuses, Christmas Bird Counts) can provide insight into population trends. Unfortunately, trend data in the tropics are non-existent beyond localized study sites. Even where local monitoring exists, great caution should be employed in applying these data beyond specific study areas.

Table 10. — An example format for threat during non-breeding at any scale of interest, when data are available. Also see Tables 3 and 8.

Criteria/subcriteria	Score
Distribution/habitat trend (range 0-10 points)	
Area/habitat declined 51-100%	10
Area/habitat declined 26-50%	8
Area/habitat declined 11-25%	6
Area/habitat declined 1-10%	3
Area/habitat stable or increasing	0
Population concentrations (range 0-10 points)	
Majority concentrates at a very few separate locations (for example, ≤ 20 at state or physiographic area, or smaller scale, and 50 at regional scale or larger	10
Widespread but locally occurring	8
Numbers concentrated over moderately wide range	6
Numbers concentrated over a wide range	3
Does not concentrate	0
Specialization (range 0-20 points)	
A) Dietary specialization during winter	
Decline, no shift to other resources, when primary resource declines	3.3
Substantial shift when primary resource declines	0
B) Other ecological or behavioral specialization during winter not covered in "A)" above (for example, requires exposed perch for foraging, specific roosting requirements, thermal tolerances, sexual or age specific habitat segregation)	
Highly specialized	3.3
Moderately specialized	1.7
Not specialized	0
C) Percent of southern U.S. border crossed by 90% of all individuals	
25% of border	3.3
26-75% of border	1.7
76-100% of border	0
D) Typical location for crossing into the Neotropics during migration	
Trans-Gulf of Mexico/Atlantic Ocean	3.3
Circum-Gulf or western riparian zones	1.7
Many locations for crossing	0
E) Ecological or behavioral specialization during migration	
Highly specialized	3.3
Moderately specialized	1.7
Not specialized	0
F) Typical time of migration flight	
Nocturnal	3.3
Diurnal	1.7
Both nocturnal and diurnal	0

The high degree of variability in the quality and quantity of population trend data results in a variety of means of scoring this criterion. In states or physiographic areas where there are adequate sample sizes for discerning population trends, a simple interpretation of BBS data, or other data sets, is possible (Table 11). Significance of trend and/or consistency of trend among samples are sufficient to determine rank scores where sample size is adequate.

Table 11. — Definitions of rank scores for Population Trends criterion, generally when sample size for BBS or other data sets allows for simple interpretations of trend magnitude and/or consistency.

Rank Score	Definition
1	Significant or definite increase -- significant overall increase or widespread signs of increase across a majority of sample units regardless of detection rate.
2	Possible increasing trend -- non-significant increasing trend or signs of increase especially in sample units where species is most frequently detected.
3	Apparently stable or trend unknown -- overall balance of increasing and decreasing trends among all sample units regardless of detection rates or data are unavailable or inadequate for interpretation.
4	Possible decreasing trend -- non-significant decreasing trend or signs of decrease especially in sample areas where species is most frequently detected.
5	Significant or definite decrease -- significant overall decrease or widespread signs decrease across all sample units regardless of detection rate.

Table 12. — Definitions of rank scores for Population Trends criterion, specifically where sample size for BBS does not allow for simple interpretations of trend magnitude and/or consistency.

Rank Score	Definition
1	Large increase -- (a) stable or increasing with fourteen or more routes with statistical significance and significant proportion of increasing routes agree with overall trend or (b) ≥ 5% annual increase with fourteen or more routes with statistical significance and proportion of increasing routes agreeing with overall trend.
2	Increase -- (a) stable or increasing with fourteen or more routes without statistical significance and/or the proportion of increasing routes corresponding with overall trend or (b) fourteen or more routes without statistical significance and/or the proportion of increasing routes do not agree with overall trend, with trend being ≥ 1% annual increase.
3	Trend unknown -- (a) non-significant trend is between -1.0 and 1.0% exclusive and/or sample size for species from Breeding Bird Survey is insufficient or (b) no quantitative monitoring information exists for species in the area.
4	Decrease -- (a) decreasing with fourteen or more routes without statistical significance and/or the proportion of decreasing routes corresponding with overall trend or (b) fourteen or more routes without statistical significance and/or the proportion of decreasing routes do not agree with overall trend, with the trend being 1% annual decrease.
5	Large decrease -- (a) decreasing with fourteen or more routes with statistical significance and significant proportion of decreasing routes agree with overall trend or (b) ≥ -5% annual decrease with fourteen or more routes with statistical significance and proportion of decreasing routes agreeing with overall trend.

Assessment of change in population status where sample sizes are small requires more care. Where sample sizes are small, trends must meet guidelines of reliability and magnitude in order to warrant either a very high or a very low score for population trend. Trend reliability will be affected by sample size, statistical significance, and consistency across BBS routes in the area of interest. A minimum sample size of 14 BBS routes for a state/physiographic area is recommended (B. Peterjohn and J. Sauer 1992, pers. comm.). Even where birds are recorded on a sufficient number of routes, data where average abundances are low (<1 bird per route) should be viewed with caution. Spatial consistency of trends within an area (among routes) is reflected in the values and significance test for the percentage of routes showing increases versus those showing decreases. A trend is considered numerically consistent if the majority of routes agree with the annual percent change trend, and even more consistent if the proportion of routes in agreement is significant.

Trend magnitude refers to the degree of population change per year. With high reliability, a 1% decline per year over a 20-year period results in an overall 18.2% population loss, which may not signal a need for emergency conservation action but should indicate that the species requires management attention. However, a 5% decline per year over a 20-year period, equating to an overall 64.2% population loss, suggests a need for emergency conservation action to avoid extirpation of the species from the area of interest. This urgency should be considered even if uncertainty values are high (Table 12).

Temporal consistency of BBS trend information can provide insight into a species' conservation needs. Not all population changes mandate a conservation response. For example, a species that decreased over the long-term (25+ years) period, but increased over the short-term (the last 10 years) might not be of immediate conservation concern if other information indicates that the species is undergoing natural population fluctuations or is showing recovery. In contrast, species that increased over the long-term, but have severely decreased recently could be of concern if decreases are due to rapid habitat loss or other catastrophic effects. Trends consistent in one direction and significant over long and short time frames are more reliable than trends that have changed over time. Although it is not obvious how to combine the two time frames for population trend into a single score that does justice to the species, a "combination score" can be developed (see approach taken by Thompson and Lewis, these proceedings).

Interpretation of these and other trend data is clearly a complex issue and the degree of reliability of data sets must be identified through the monitoring needs supplemental score (Table 3).

Importance of Area

The importance of area criterion, determined specifically for the area under consideration, is based upon the abundance and distribution of a species within the area relative to its abundance and distribution in other parts of its total range. Importance of an area will need to be calculated independently for breeding and non-breeding seasons where a species may be found throughout the year. This parameter is evaluated for a regional geographic scale on the basis of the percentage of the total distribution of the bird encompassed by the region under consideration (Table 13). Scores at the physiographic area/state scale are based on average detection rate and sample size among BBS routes relative to all other physiographic areas or states within the range of the bird (Table 14). Where reliable BBS data are unavailable, this criterion must be scored based on the consensus opinion of local experts. An understanding of the extent of optimal, suitable, and marginal habitat for each species in an area is useful in scoring this factor.

Table 13. — Definitions of rank scores for Importance of Area criterion for the regional spatial scale.

Rank Score	Definition
1	Very low -- < 1% of species' total distribution.
2	Low -- 1-10% of species' total distribution.
3	Moderate -- 11-25% of species' total distribution.
4	High -- 26-50% of species' total distribution.
5	Very High -- 51-100% of species' total distribution.

A species restricted in distribution to the area under consideration and another species that is globally widespread but abundant within the same area relative to the rest of its range both would receive high scores under this criterion. Recognizing high importance of an area for both types of species focuses conservation efforts on both local and widespread species. Nonetheless, the total concern score for the first species probably would include higher scores for both distribution parameters, global abundance, and levels of potential threat.

Because an area's importance is always evaluated relative to the rest of a bird's range, this value will initially be scored by regional and national coordinators and consistently and provided to states and physiographic areas for verification. Need for additional information on distribution, range of habitats used, and relative abundance can be identified in the survey/inventory supplemental score (Table 3).

IMPLEMENTATION OF THIS PRIORITY SYSTEM

Regional reports for these proceedings (Carter and Barker, Hunter et al., Thompson and Lewis, Smith et al.) that outline the use of this prioritization scheme at regional, physiographic area, and/or state spatial scales demonstrate the overall usefulness of this system. However, there are some general issues of use that should be expanded upon here.

Table 14. — Definitions of rank scores for Importance of Area criterion for the state/physiographic area spatial scale.

Rank Score	Definition
1	Very Low -- individual or isolated reports of breeding (or during migration or winter) of the species on an irregular or occasional basis.
2	Low (marginal)-- widespread but very local, "naturally" rare, or peripheral populations as defined by populations occurring on the extreme edge of geographical range or ecological tolerance and not considered significant overall to the species, but may be considered more important locally; this may include species with small and local populations occurring just within a physiographic area or state that are more widespread in adjacent areas, or species that are widespread within a physiographic area or state but occur in very low numbers.
3	Moderate (suitable, significant populations) -- populations important for representing the full genetic and ecological variation inherently found within the species, but are not populations with the highest rates of detection or relative abundance.
4	High -- important isolated populations as defined by a very local but relatively stable population or populations, often within a specific mountain range or river system, that should receive local attention but may not be of specific interest elsewhere within the physiographic area or state.
5	Very High (optimal) -- (a) a center of the species' abundance as defined by a high relative rate of detection on Breeding Bird Survey routes, (b) known optimal habitat is widespread within the area (in the absence of reliable data on relative abundance), (c) the only place or one of a few where the species is found, or (d) the species (historically numerous and widespread) is now extirpated or nearing extirpation.

Temperate Migrants and Permanent Residents

The focus of Partners in Flight is generally on long-distance migrants that breed primarily north of the Mexican-United States International Boundary and spend non-breeding seasons primarily south of this border (the "A" species list; Gauthreaux 1992). In addition, those Neotropical migratory species whose breeding ranges extend from primarily south of this border into the American Southwest and south Texas ("C" species list) and Peninsular Florida ("D" species list) also are receiving international conservation attention.

Calculation of concern scores should not be limited to these "A", "C", and "D" species. Other truly migratory birds include temperate migrants that winter entirely or primarily north of the

Importance of Area

The importance of area criterion, determined specifically for the area under consideration, is based upon the abundance and distribution of a species within the area relative to its abundance and distribution in other parts of its total range. Importance of an area will need to be calculated independently for breeding and non-breeding seasons where a species may be found throughout the year. This parameter is evaluated for a regional geographic scale on the basis of the percentage of the total distribution of the bird encompassed by the region under consideration (Table 13). Scores at the physiographic area/state scale are based on average detection rate and sample size among BBS routes relative to all other physiographic areas or states within the range of the bird (Table 14). Where reliable BBS data are unavailable, this criterion must be scored based on the consensus opinion of local experts. An understanding of the extent of optimal, suitable, and marginal habitat for each species in an area is useful in scoring this factor.

Table 13. — Definitions of rank scores for Importance of Area criterion for the regional spatial scale.

Rank Score	Definition
1	Very low -- < 1% of species' total distribution.
2	Low -- 1-10% of species' total distribution.
3	Moderate -- 11-25% of species' total distribution.
4	High -- 26-50% of species' total distribution.
5	Very High -- 51-100% of species' total distribution.

A species restricted in distribution to the area under consideration and another species that is globally widespread but abundant within the same area relative to the rest of its range both would receive high scores under this criterion. Recognizing high importance of an area for both types of species focuses conservation efforts on both local and widespread species. Nonetheless, the total concern score for the first species probably would include higher scores for both distribution parameters, global abundance, and levels of potential threat.

Because an area's importance is always evaluated relative to the rest of a bird's range, this value will initially be scored by regional and national coordinators and consistently and provided to states and physiographic areas for verification. Need for additional information on distribution, range of habitats used, and relative abundance can be identified in the survey/inventory supplemental score (Table 3).

IMPLEMENTATION OF THIS PRIORITY SYSTEM

Regional reports for these proceedings (Carter and Barker, Hunter et al., Thompson and Lewis, Smith et al.) that outline the use of this prioritization scheme at regional, physiographic area, and/or state spatial scales demonstrate the overall usefulness of this system. However, there are some general issues of use that should be expanded upon here.

Table 14. — Definitions of rank scores for Importance of Area criterion for the state/physiographic area spatial scale.

Rank Score	Definition
1	Very Low -- individual or isolated reports of breeding (or during migration or winter) of the species on an irregular or occasional basis.
2	Low (marginal)-- widespread but very local, "naturally" rare, or peripheral populations as defined by populations occurring on the extreme edge of geographical range or ecological tolerance and not considered significant overall to the species, but may be considered more important locally; this may include species with small and local populations occurring just within a physiographic area or state that are more widespread in adjacent areas, or species that are widespread within a physiographic area or state but occur in very low numbers.
3	Moderate (suitable, significant populations) -- populations important for representing the full genetic and ecological variation inherently found within the species, but are not populations with the highest rates of detection or relative abundance.
4	High -- important isolated populations as defined by a very local but relatively stable population or populations, often within a specific mountain range or river system, that should receive local attention but may not be of specific interest elsewhere within the physiographic area or state.
5	Very High (optimal) -- (a) a center of the species' abundance as defined by a high relative rate of detection on Breeding Bird Survey routes, (b) known optimal habitat is widespread within the area (in the absence of reliable data on relative abundance), (c) the only place or one of a few where the species is found, or (d) the species (historically numerous and widespread) is now extirpated or nearing extirpation.

Temperate Migrants and Permanent Residents

The focus of Partners in Flight is generally on long-distance migrants that breed primarily north of the Mexican-United States International Boundary and spend non-breeding seasons primarily south of this border (the "A" species list; Gauthreaux 1992). In addition, those Neotropical migratory species whose breeding ranges extend from primarily south of this border into the American Southwest and south Texas ("C" species list) and Peninsular Florida ("D" species list) also are receiving international conservation attention.

Calculation of concern scores should not be limited to these "A", "C", and "D" species. Other truly migratory birds include temperate migrants that winter entirely or primarily north of the

Mexican-United States International Boundary. Many of these species include some populations or individuals that spend boreal winters south of that border and are technically considered Neotropical migrants ("B" species list). There are also many other "Neotropical migrants" that rarely or never occur in the United States (Mexican and Caribbean breeding migrants, austral migrants, altitudinal migrants, etc.).

Concern scores also can be calculated for those species generally resident within the same geographical range throughout their annual cycle. The majority of residents requiring conservation attention occur in areas where Neotropical migrants spend boreal winters. Application of the prioritization scheme to residents and wintering migrants in Puerto Rico reveals the residents (and especially the endemics) are in much greater need of conservation attention than are the majority of migrants (Table 15). The general need to address conservation of Neotropical endemics as a priority over wintering Neotropical and temperate migrants is clearly justified. Moreover, conservation efforts for tropical endemics should result in benefits for vulnerable migrants as well and would make Partners in Flight a truly international and holistic conservation program.

Temperate migrants and permanent residents should not be ignored in inventory, monitoring, management, and other conservation efforts focused on Neotropical migrants. Segregation of data among species group can occur during analysis when desired. Comparison of trends between these and co-occurring Neotropical migratory species can be instructive.

Table 15.—Numbers of terrestrial bird species occurring in Puerto Rico within each of 5 concern score categories.

Range in concern score and definition	Caribbean residents	Neotropical migrants	Temperate migrants
30-35 Extremely High Priority	5(5*)	1	0
24-29 Very High Priority	23(10*)	9	0
19-23 High Priority	9(1*)	32	0
13-18 Moderate Priority	6	16	8
7-12 Low Priority	1	3	5

*Number of species endemic to Puerto Rico.

Comparisons Among States and Physiographic Areas

A standardized prioritization scheme applied nationwide can highlight conservation objectives that may not be obvious from a strictly local perspective. Where physiographic area boundaries cross into several states, shared ecological information can increase efficiency and effectiveness of management policies. Although comparisons among states and physiographic areas can assist in searches for patterns in the development of conservation plans, concern scores should not be used to pit states or physiographic areas against each other in setting priorities. Because unique sets and combinations of Neotropical migrants and habitats occur in each state and physiographic area, concentration on one area more highly rated than another could lead to unfortunate gaps in overall conservation efforts.

Developing Priorities for Habitats

Priorities for habitats are set by identifying the habitats used by each species and determining the sum of the concern scores for all species in each habitat type within a state or physiographic area. Rankings based on this procedure identify those habitats most in need of focused attention for effective Neotropical migrant conservation. Each regional working group has been charged with the identification of habitats requiring conservation attention and the reader is referred to the regional reports for these proceedings. Habitat-specific conservation planning, including management recommendations, is one of the upcoming goals for Partners in Flight. Note that progress toward habitat-specific efforts is hampered by the lack of consensus as to what constitutes a habitat and how they are classified regionally, nationally, and globally.

Next Steps

As indicated in the regional reports accompanying this paper, tentative prioritized lists for the breeding season for most regions of the United States, the physiographic areas of the Southeast and West, and the states of the West are currently available. These lists need to be revised on the basis of reviews of assigned values and greater national consistency in assessment of the above parameters. Temperate migrants (including "B" species) and permanent residents need to be added, and separate winter lists developed. Physiographic areas and states not currently treated should be completed and efforts should be started to apply this scheme to wintering grounds in the Neotropics. Greater attention needs to be directed toward evaluation and conservation of key stopover sites for in-transit migrants.

In the meantime, there are many specific steps that land managers and others interested in the conservation of these birds can take. A basic need on much public and most private land

across the continent is inventory, initially of breeding and wintering species and habitat types. Nationally mandated criteria for monitoring programs are essentially available, and monitoring should be instigated in appropriate situations. Where inventory is incomplete or there are not clear and measurable management objectives for populations or habitats, however, a monitoring program may be premature.

In general, the supplemental scores are designed to direct conservation activity. High monitoring needs scores for many species in a given area may suggest a need for more BBS routes or other monitoring techniques for areas and habitats poorly served by BBS methodology. High management needs scores may stimulate specific actions by land managers. As management plans are devised and implemented, local monitoring may suggest a need for research into, for example, responses to land use practices.

The prioritization scheme can also guide land acquisition activities to some extent. Conservation agencies and organizations should include Neotropical migratory bird habitat as a criterion along with other issues of protection of biological diversity in making acquisition decisions. To the extent that birds are considered, habitat that is highly prioritized should be preferable to areas of lesser value.

There is no question that a certain amount of subjectivity is employed in assigning values, that more good data on the natural history of these birds is badly needed, and that the prioritization scheme needs to be applied and used and then modified where appropriate. Development of this scheme has been a dynamic process to date, and there is no intent for it to become a static entity with the publication of this document.

CONCLUSION

We agree with Millsap et al. (1990) that priority ranking systems should not replace human judgement in the allocation of conservation resources. Priority schemes should (1) serve as guides to resources in greatest need of conservation attention, (2) help identify where there are gaps in information, and (3) be flexible in allowing for revision when new and better information becomes available. We believe the scheme presented here fulfills these needs by addressing issues of identification of species, groups of species, or habitats of concern, of the primary causes leading to high concern scores, and of some potentially appropriate conservation responses.

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