The Partners in Flight
Handbook on Species Assessment

Version 2005

Partners in Flight Science Committee

Partners in Flight Technical Series No. 3
October 2005

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Suggested citation:

Panjabi, A. O., E. H. Dunn, P. J. Blancher, W. C. Hunter, B. Altman, J. Bart, C. J. Beardmore, H. Berlanga, G. S. Butcher, S. K. Davis, D. W. Demarest, R. Dettmers, W. Easton, H. Gomez de Silva Garza, E. E. Iñigo-Elias, D. N. Pashley, C. J. Ralph, T. D. Rich, K. V. Rosenberg, C. M. Rustay, J. M. Ruth, J. S. Wendt, and T. C. Will. 2005. The Partners in Flight handbook on species assessment. Version 2005. Partners in Flight Technical Series No. 3. Rocky Mountain Bird Observatory website: http://www.rmbo.org/pubs/downloads/Handbook2005.pdf

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Background

Partners in Flight (PIF) is a cooperative venture of federal, state, provincial, and territorial agencies, industry, non-governmental organizations, researchers, and many others whose common goal is the conservation of North American birds. While PIF is concerned primarily with landbirds, it works in conjunction with other bird partners to promote coordinated conservation of all birds.

PIF follows a step-by-step planning approach that develops a sound scientific basis for decision-making and a logical process for setting, implementing, and evaluating conservation objectives (Pashley et al. 2000, Rich et al. 2004). Those steps include:

1. Assessing conservation vulnerability of all landbird species;
2. Identifying species most in need of conservation attention at continental and regional scales;
3. Setting of numerical population objectives for species of continental and regional importance;
4. Identifying conservation needs and recommended actions for high importance species and their habitats;
5. Implementing strategies for meeting species and habitat objectives at continental and regional scales;
6. Evaluating success, making revisions, and setting new objectives for the future.

Part I of this Handbook describes the processes used for step 1: the assessment of species vulnerability at continental and regional scales. The species assessment process is based entirely on biological criteria that evaluate distinct components of vulnerability. The process has evolved over time (Hunter et al. 1992, Carter et al. 2000, Panjabi et al. 2001), and the procedures have been thoroughly tested, externally reviewed (Beissinger et al. 2000), and updated to address issues raised by reviewers and by Canadian and Mexican partners.

This version of the PIF Handbook incorporates assessment rules and global scores used in the PIF North American Landbird Conservation Plan (Rich et al. 2004), which involved review and update of scores during 2002-2004. All scores, data sources, and other information used for that plan are contained in the PIF North American Species Assessment Database, maintained by the Rocky Mountain Bird Observatory. Scores can be viewed online, and can be downloaded as text files (http://www.rmbo.org/pif/pifdb.html). Changes to the database will be incorporated annually into updated versions, and any necessary revisions of this Handbook will be made at the same time. Older versions of the database and documentation have been archived and can be obtained from the Database Manager (see contact information in Appendix B).

The Species Assessment Database includes scores for native North American landbirds and well-established non-native species. PIF currently defines the North American continent as Canada, the continental U.S., and Mexico. Assessment scores for species whose North American range includes parts of Mexico but no portion of the U.S. or Canada are not yet included in the database, but are expected to be added before the end of 2006.

Part II of this Handbook presents some of the ways the assessment scores can be used to identify conservation needs at continental and regional scales (step 2 of the PIF planning process). Steps 1 and 2 concern quite different components of bird conservation planning: assessment of status, and determining level of conservation importance. *Assessment* refers to the process of compiling and evaluating data regarding the biological vulnerability of every species on an equal footing, whereas *determining level of conservation importance* describes the process for using these data to determine which individual species, species guilds, and habitats are most in need of attention in order to achieve the PIF vision of maintaining native birds in their natural numbers, natural habitats, and natural geographic ranges (Rich et al. 2004).

'*Prioritization*' is often mistakenly used as short-hand for step 2, but that term is more appropriately applied to step 4 in the PIF planning process: i.e., developing action plans that set priorities for intervention based not only on biological criteria, but also on factors such as feasibility, cost-effectiveness, political considerations, and the interests and capabilities of participating agencies. In using assessment scores to define species of continental or regional conservation importance (as described in Part II), PIF relies on biologically-based criteria, not all of which necessarily indicate high priority for intervention. This document therefore avoids using the word 'priorities.' However, the PIF Species Assessment Process and Database are extremely valuable tools for ensuring that priorities are set based on sound, biologically-based information that considers all species on an equal footing.

Overview of the Species Assessment Process

Each species is assigned global scores for 6 factors, assessing largely independent aspects of vulnerability at the range-wide scale: Population Size (PS), Breeding Distribution (BD), Non-breeding Distribution (ND), Threats to Breeding (TB), Threats to Non-breeding (TN), and Population Trend (PT). (See box for overview.) Each score reflects the degree of a species' vulnerability (i.e., risk of significant population decline or rangewide extinction) as a result of that factor, ranging from "1" for low vulnerability to "5" for high vulnerability.

An important departure from Panjabi et al. (2001) and past PIF assessments of landbirds is the incorporation of Population Size (PS), which replaces the old "Relative Abundance" score. Use of Population Size follows the lead of other bird initiative plans and is now possible because of recently developed methodology to estimate population sizes of breeding landbirds from

Partners in Flight species assessment factors:

Population Size (PS) indicates vulnerability due to the total number of adult individuals in the global population.

Breeding Distribution (BD) indicates vulnerability due to the geographic extent of a species' breeding range on a global scale.

Non-breeding Distribution (ND) indicates vulnerability due to the geographic extent of a species' non-breeding range on a global scale.

Threats to Breeding (TB) indicates vulnerability due to the effects of *current and probable future* extrinsic conditions that threaten the ability of populations to survive and successfully reproduce in breeding areas within North America.

available survey data (Rich et al. 2004, Rosenberg and Blancher 2005).

Partners in Flight species assessment factors (cont.):

Threats to Non-breeding (TN) indicates vulnerability due to the effects of *current and probable future* extrinsic conditions that threaten the ability of North American breeding populations to survive over the non-breeding season.

Population Trend (PT) indicates vulnerability due to the direction and magnitude of changes in population size within North America over the past 30 years.

In addition to global scores, PIF assigns region-specific scores for those vulnerability factors that may vary geographically: population trend, threats to breeding and--for species that reside in the region outside the breeding season--threats to the species during the non-breeding season. Finally, the PIF assessment process considers two measures of area importance: the percentage of global population that occurs in the region of interest during the breeding or non-breeding season, and the relative density of the species among regions. This information is used to assess *stewardship responsibility*, as described later in this document.

PART I. SPECIES ASSESSMENT FACTORS

Global Assessment Scores

Population Size (PS-g)

Population Size (PS-g) indicates vulnerability due to the total number of adult individuals in the global population. Evaluation of PS is based on the assumption that species with small populations are more vulnerable to extirpation or extinction than species with large populations. Scores were assigned using population estimates derived primarily from abundance data collected by the North American Breeding Bird Survey (BBS), extrapolated after various adjustments to range size outside of BBS coverage; but other data on abundance were used when appropriate (Rich et al. 2004, Appendix B; Rosenberg and Blancher 2005).

PS Score	Criterion
1	World breeding population ≥50,000,000
2	World breeding population <50,000,000 and ≥5,000,000
3	World breeding population <5,000,000 and ≥500,000
4	World breeding population <500,000 and ≥50,000
5	World breeding population <50,000

Breeding Distribution (BD-g)

Breeding Distribution (BD-g) indicates vulnerability due to the geographic extent of a species' breeding range. The underlying assumption of BD-g is that species with narrowly distributed breeding populations are more vulnerable than species with widely distributed

populations. BD-g is assessed at a truly global scale, such that the entire range of the species is considered in the evaluation.

Breeding Distribution was calculated by determining the area (km^2) or for coastal breeders, length (km) of linear coastline occupied by breeding-aged individuals during the breeding season, using range maps for the species in well-known field guides (e.g., Harrison 1983, National Geographic Society 1987, Howell and Webb 1995), as well as other sources (e.g., NatureServe). In future versions of the database, distribution scores will make use of area measurements from digital range maps such as those available from NatureServe (Ridgely et al. 2003). Comparisons to date indicate that most distribution scores will not change.

BD-g Score	Criterion
1	≥4,000,000 km^2, or >8,000 km of coast
2	≥2,000,000 and <4,000,000 km^2, or >5,000 to ≤8,000 km of coast
3	≥1,000,000 and <2,000,000 km^2, or >1,600 to ≤5,000 km of coast
4	≥500,000 and <1,000,000 km^2, or ≤1,600 km of coast
5	<500,000 km^2, or very restricted coastal areas or interior uplands

Note: thresholds for BD differ slightly from those described in Carter et al. (2000) and are no longer expressed as a percentage of North America.

Non-breeding Distribution (ND-g)

Non-breeding Distribution (ND-g) indicates vulnerability due to the geographic extent of a species' non-breeding range, with the assumption that species narrowly distributed in the non-breeding season are more vulnerable than widely distributed species. ND-g was assessed at a truly global scale.

For landbirds we have not considered range size during migratory periods, or phenomena such as migratory bottlenecks. Instead, evaluation of ND-g was based on the non-breeding range of a species when populations are relatively sedentary. However, for some birds that are known to be concentrated during migration, ND-g scores reflect the *smallest* area (km^2), or for coastal species amount of linear coastline (km) occupied by the population at any given time during the non-breeding season

Distribution is calculated by determining the area (km^2), or amount of linear coastline (km), occupied by the population during the portion of the non-breeding season when birds are relatively sedentary, using range maps for the species in well-known field guides (e.g., Harrison 1983, National Geographic Society 1987, Howell and Webb 1995), as well as other sources (e.g., Ridgely et al. 2003).

ND-g Score	Criterion
1	≥4,000,000 km^2, or >8,000 km of coast
2	≥2,000,000 and <4,000,000 km^2, or >5,000 to ≤8,000 km of coast

3	≥1,000,000 and <2,000,000 km^2, or >1,600 to ≤5,000 km of coast
4	≥500,000 and <1,000,000 km^2, or ≤1,600 km of coast
5	<500,000 km^2, or very restricted coastal areas or interior uplands

Threats to Breeding (TB-c)

Threats to Breeding (TB-c) indicates vulnerability due to the effects of current and probable future extrinsic conditions that threaten the ability of populations to survive and successfully reproduce in breeding areas within North America (i.e., unlike other global scores, TB-c is actually "continental"). Evaluation of TB-c includes threats to breeding habitats, as well as other factors that interfere with reproduction (e.g., competition with exotic species).

Scoring of TB-c involves assessing the expected change over the next 30 years in the suitability of breeding conditions necessary for maintaining healthy populations of a species. Threats to suitable breeding conditions are defined as any extrinsic factor that reduces the likelihood of the persistence of a population, and can include predation, poaching, parasitism, poisoning from pesticides or other environmental contaminants, habitat fragmentation/deterioration/loss, hybridization, collisions with power lines or other hazards, or any other factor that reduces the suitability of breeding conditions. To date, climate change has been considered a threat only for mountain-top species and a few others for which this is an obvious threat, but has not been used in scoring threats for most species due to lack of good information on probable effects on global population size (as opposed to effects on distribution).

Threats scores were assigned by the PIF Science Committee and the sources of all scores are maintained in the database. Although threat scores are the most subjective of the species assessment criteria, they are calibrated among taxa and subject to review. In practice, PIF has found close agreement among experts on the most appropriate threat scores.

The categorical variable TB-c is derived according to a multiple-choice list of scenarios that place the species into one of the broad, relative threats categories in the table below. In order for a species to be placed in a particular category, it must meet the criteria of that threats category definition, *and* meet one or more of the examples listed under the possible scenarios that follow each definition. It is important to understand that in order for a species to be assigned a given score, one or more of the example conditions listed *must actually be affecting the species at present, or be expected to do so within the next 30 years*. In other words, simply being *susceptible* to threats, without actually being affected by such threats in the foreseeable future, is not enough to warrant a high threat score.

TB-c Score	Definitions and possible scenarios
1	*Expected future conditions for breeding populations are enhanced by widespread human activities or land-uses*. This category includes potential problem species (e.g., European Starling [*Sturnus vulgaris*]), along with

	species that benefit substantially from human activity such as habitat fragmentation, urbanization, bird-feeding, etc. (e.g., American Robin [*Turdus migratorius*], Cliff Swallow [*Petrochelidon pyrrhonota*], House Finch [*Carpodacus mexicanus*]).
2	*Expected future conditions for breeding populations are expected to remain stable; no known threats*. One or more of the following statements should be true: - no known threats to breeding population or habitats - species relatively tolerant of human activities or land-use trends (i.e., breeds in altered landscapes) - potential threats exist, but management or conservation activities have stabilized or increased populations (e.g., Osprey) - threats are assumed to be low
3	*Slight to moderate decline in the future suitability of breeding conditions is expected*. This is a broad category that implies anything amounting to "moderate threats." One or more of the following statements should be true: - moderately vulnerable to human activities and land-use trends - does not breed in highly altered landscapes - area-sensitive species, or sensitive to habitat fragmentation (with fragmentation actually occurring within the area for which scores are being assigned) - relatively specialized on sensitive habitats (e.g., native grasslands) or successional stages - requires relatively specialized conditions within habitats - relatively sensitive to biotic factors, such as cowbird parasitism, predation, overgrazing, etc. - demographic factors contribute to vulnerability (low productivity, single-brooded) - concentration or coloniality contributes to moderate vulnerability - threats potentially increasing if present trends conditions continue - population likely to decline in future if trends conditions continue
4	*Severe deterioration in the future suitability of breeding conditions is expected*. This is essentially a "high threats" category, with basically more severe versions of the above list for TB-c =3, but for species that are not quite in danger of extirpation from significant portions of range (TB-c =5). One or more of the following statements should be true: - highly vulnerable to human activities and land-use trends - highly area sensitive or intolerant of fragmentation (with fragmentation a significant factor within the area for which scores are being assigned) - highly specialized/ dependent on sensitive or undisturbed habitats (e.g., old-growth-dependent, upper margins of saltmarsh, etc.) that are in short supply or are under threat - extremely specialized on specific conditions within a habitat (e.g., requires large snags or specific water levels) that are in short supply

	or under threat - biotic factors (parasitism, hybridization) currently are having a strong adverse effect on a majority of the breeding population - a high degree of concentration or coloniality makes sub-populations highly vulnerable to known threats - population certain to decline and may reach level where in danger of major range contraction if threats continue
5	*Extreme deterioration in the future suitability of breeding conditions is expected; species is in danger of extirpation from substantial portions of range leading to a major range contraction, or has a low probability of successful reintroduction across a substantial former range.* This designation should only be applied to species that are in danger of extirpation from substantial portions of range within the area for which scores are being assigned, or have already suffered major range contractions (e.g., Red-cockaded Woodpecker).

Note: derivation of threats scores differs from that described in Carter et al. (2000) in that past conditions are no longer considered and a semi-quantitative matrix of conditions has been abandoned in favor of the more descriptive list of scenarios shown above.

Threats to Non-breeding (TN-c)

Threats to Non-breeding (TN-c) indicates vulnerability due to the effects of current and future extrinsic conditions that threaten the ability of North American breeding populations to survive over the non-breeding season. Unlike TB-c, evaluation of TN-c considers vulnerability throughout the non-breeding range of North American breeding populations. However, it is still a "continental" score in that it refers to threats faced by North American populations. Evaluation of TN-c includes threats to habitat as well as other factors affecting survival outside the breeding season. Migration season threats are included, but for landbirds, TN-c is almost exclusively based on the portion of the non-breeding season in which birds are relatively sedentary.

Scoring is the same as described above for TB-c.

TN-c Score	Definition (based on the same scenarios as described above for TB-c)
1	Expected future conditions for non-breeding populations are enhanced by widespread human activities or land-uses; potentially a 'problem' species
2	Expected future conditions for non-breeding populations are expected to remain stable; no known threats
3	Slight to moderate decline in the future suitability of non-breeding conditions is expected
4	Severe deterioration in the future suitability of non-breeding conditions is expected

5	Extreme deterioration in the future suitability of breeding conditions is expected; species is in danger of extirpation from substantial portions of range leading to a major range contraction, or has a low probability of successful reintroduction across a substantial former range

Population Trend (PT-c)

Population Trend (PT-c) indicates vulnerability due to the direction and magnitude of recent changes in population size. Like the threats scores, PT-c actually reflects trends only within North America, even for species with ranges that extend beyond the continent. It is therefore a continental, rather than a global, score. Species that have declined by 50% or more over 30 years are considered most vulnerable, whereas species with increasing trends are least vulnerable.

The primary source of trends was the BBS, but Christmas Bird Count (CBC) or specialized data sources were used where these were the best available breeding or non-breeding data on North American population trends. In some cases, particularly for extirpated or possibly extinct species, historical trends were considered. Where empirical data did not exist, PT-c was assigned by expert opinion, using the qualitative definitions below as guidelines.

We used trends from the longest period available (from 1966-2001 for BBS in the current version of the database). On the assumption that rate of change has been reasonably constant over the long term, PT-c scores were calculated based on the annual rates of change that would produce population size change of a particular size over 30 years (see table below).

Simplified scores:

PT-c score	% Change over 30 yrs	Equivalent % annual change	Qualitative definitions
1	≥ 50% increase	≥1.36%	Large population increase
2	15-49% increase, OR <15% change	0.47 to 1.36%, OR -0.54 to 0.47%	Possible or moderate population increase OR Population stable
3	Highly variable, OR Unknown	N/A	Uncertain population trend
4	15-49% decrease	<-0.54 to -2.28%	Possible or moderate population decrease
5	≥ 50% decrease	≤-2.28%	Large population decrease

PT-c scores include consideration of data quality when possible (see more detailed table below). Species for which trends are uncertain, either because of highly variable data or poor sample size, receive a score of 3. This intermediate score is assigned on the reasoning

that uncertain trends should invoke more concern than stable trends (for which PT-c =2). Any species that receives a PT-c score of 3 is reviewed by experts to determine whether a more appropriate score can be assigned.

Details on PT-c Score. (Degrees of freedom [df] ≥14 unless otherwise specified; UCI and LCI=Upper and Lower 90% Confidence Intervals. Criteria for df were defined for BBS, and may differ for other data sources.)

PT-c	Description
1	Significant large increase (trend ≥1.36%/yr, $P \leq 0.10$)
2	Significant moderate increase (≥0.47 to 1.36%/ yr, $P \leq 0.10$)
2	Possible increase (≥0.47%/yr, $0.1 < P \leq 0.35$)
2	Possible increase (as above, but based on df=6-13)
2	Stable (between -0.54 and +0.47%/yr, and UCI<0.47 OR LCI>-0.54), except if trend is negative and P≤0.10 and LCI<-0.54 (in which case PT=4)
3	Trend uncertain (≤-0.54%/yr or ≥0.47%/yr and P>0.35)
3	Trend uncertain (>-0.54%/yr and <0.47%/yr and UCI>0.47 and LCI<-0.54)
4	Significant small or moderate decrease (between -0.54 and 0, and LCI<-0.54 and $P \leq 0.10$)
4	Possible decrease (≤-0.54%/yr, $0.1 < P \leq 0.35$)
4	Possible decrease (as above but based on df=6-13)
4	Significant moderate decrease (≤-0.54 to -2.27%/yr, $P \leq 0.10$)
5	Significant large decrease (≤-2.28/yr and $P \leq 0.10$)

Regional Assessment Scores

Conditions may vary regionally, such that concern levels may be much different in certain portions of the range than elsewhere. Because a high proportion of conservation effort takes place at local or regional levels, it is important for PIF to provide tools for assessing regional, as well as global, status.

In the past, PIF assigned regional scores for species in Physiographic Areas. All bird initiatives in North America, however, have now adopted Bird Conservation Regions (BCRs) as the standard conservation planning unit (see http://www.nabci-us.org/bcrs.html for details and map).

Some of the global vulnerability factors described in the previous section also are useful in describing species' status at the regional level. For example, global population size, size of breeding distribution, and size of non-breeding distribution are intrinsic factors that cause a species to be vulnerable regardless of the portion of the range being considered. Other vulnerability factors, however, may vary geographically, including threats and population trend. The PIF Species Assessment Database contains BCR scores for these latter factors, TB-r, TN-r and PT-r (where "-r" indicates a region-specific score). These are scored using

the same criteria described for global scores (except that 1996-2002 BBS trends were used for PT-r, as opposed to 1996-2001 trends for PT-c), but considering only threats or trends within the BCR for which the scores are being assigned. All BCR scores have been reviewed by regional experts.

Regional scores are assigned for both the breeding season and, for species that remain in North America between breeding seasons, for the portion of the non-breeding season when they are relatively sedentary. Assigning scores for both seasons allows assessment of conservation needs in a region during periods when a different suite of species may be present than during the breeding season. The database does not currently include regional scores for species present only during migration, but these may be added in future.

TB-r (threats to regional breeding) scores are assigned for regionally-breeding species, using the same criteria as described above for TB-g scores. TN-r (regional threats to non-breeding) scores are similarly assigned to species present in the region outside the breeding season. In the absence of evidence that regional threats differ from global threats, regional scores are the same as global scores.

Area Importance Factors

The 6 species assessment factors described above are all indications of a species' *vulnerability*. However, species are not distributed evenly over the continent, and using vulnerability alone to identify species of conservation interest will produce regional lists that include many species at the periphery of their range. PIF therefore includes two additional criteria in the regional assessment process, which reflect the importance of the area of interest to each species.

Relative Density (RD)

Relative density (RD) scores reflect the mean density of a species within a given BCR relative to density in the single BCR in which the species occurs in its highest density. The underlying assumption of this score is that conservation action taken in regions where the species occurs in highest density will affect the largest number of birds per unit area. Because the score is one of *relative* density, it is unaffected by the size of the BCR or the absolute density of the species. One use of RD scores is to filter out species that do not occur in a planning region (see Part II). Therefore, for species that are being, or have been, extirpated from a region, the RD score may be based on an estimate of historic density to ensure they are not overlooked in conservation planning.

Scores in the current database are for the breeding season only (RD-b), but non-breeding scores (RD-n) will be added later. RD-b scores for most species were calculated from BBS data for the breeding season (density=mean birds/route within the BCR). Other sources of data and expert opinion were used for species with few range-wide abundance data. Expert opinion was also used to adjust RD values where the region with maximum density of the species is likely to be outside of BBS coverage, e.g., for a species with highest density outside of North America. Scoring by expert opinion was based on estimation of mean

density across entire BCRs (including both suitable and unsuitable areas), to make scores comparable to those based on BBS data.

RD-b score	Quantitative definition	Equivalent qualitative definition
P		Peripheral: has bred only irregularly, or strong evidence of regular breeding is lacking
1	BCR density < 1% of the maximum density	Breeds regularly but in very small numbers or in only a very small part of the region in question
2	BCR density 1-10% of maximum density	Breeds in low mean abundance relative to the region(s) in which the species occurs in maximum density
3	BCR density 10-25% of maximum density	Breeds in moderate mean abundance relative to the region(s) in which the species occurs in maximum density
4	BCR density 25-50% of maximum density	Breeds in moderately high mean abundance relative to the region(s) in which the species occurs in maximum density
5	BCR density ≥ 50% of maximum density	Breeds in high mean abundance, similar to the region(s) in which the species occurs in maximum density

Note: RD replaces the Area Importance (AI) score previously used in PIF assessments. The concept is essentially unchanged, but the name was changed to better reflect the true nature of the score and to avoid confusion with another measure of area importance, percent of population. However, some minor changes were also made to the qualitative definitions (used when assigning scores by expert opinion) between scores of 1 and 2, to bring them into line with the numerical definitions. A sixth category (P) was added for truly peripheral species.

Percent of Population (Pct_POP)

Percent of Population (Pct_POP) values reflect the proportion of the global population of a species that is contained within a BCR during the breeding season[1]. Scores for the non-breeding season will be added later. The underlying assumption of this value (a continuous variable, unlike the scores discussed thus far) is that regions with high proportions of a species' population have a high responsibility for the species as a whole, and actions taken in those regions will affect the largest number of that species. Unlike RD, Pct_POP is often influenced by the size of a BCR. Thus, large BCRs may have high population percentages but relatively low densities, or vice versa. Pct_POP therefore complements the Relative Density (RD) score.

[1] In the database Pct_POP is rounded to the nearest %. For species with <0.5 Pct_POP, the value appears as 0%. If an RD score disagrees with a Pct_POP (e.g., where there is an RD value but no Pct_POP), users should rely on the RD score. (The latter were reviewed by regional experts and sometimes revised, whereas Pct_POP scores have not been thoroughly reviewed.)

For species sampled by the BBS, relative abundance (mean birds/route) is calculated for each BCR. This value is multiplied by the size of the BCR (km^2), and the area-weighted value is then divided by the sum of area-weighted values from all the BCRs in which the species occurs. The concept is as follows:

$$\text{Pct\_POP}_{(\text{Region})} = \frac{\text{Relative Abundance}_{(\text{Region})} * \text{Region Area } (km^2)}{\sum_{(\text{All regions})} (\text{Relative Abundance}_{(\text{Region})} * \text{Region Area})}$$

In fact, BCRs are broken down into individual state, province, and territory portions of BCRs before applying the above formula, and results from these geo-political regions are then summed up to full BCR Pct_POPs.

Average density is usually based on BBS, but in a few cases other sources of population data were used to estimate Pct_POP (e.g., use of checklist counts combined with Breeding Bird Census data in arctic Canada, Rich et al. 2004). Percent of range was used as a surrogate for Pct_POP for parts of range outside of BCRs with BBS coverage, for example in countries south of the U.S., and for a few species particularly poorly sampled by BBS and other surveys.

Even if BBS greatly underestimates the absolute abundance of a species, relative abundance values and Pct_POP estimates should be valid as long as the detectability of a species on BBS routes is relatively constant across the species' range. Pct_POP based on BBS is more questionable for species occupying very patchy habitats (e.g., wetlands) in regions where BBS routes do not adequately sample these habitats, or where BBS sampling is limited to only a small part of the area of interest. However, compared to trend estimates, relative abundance (and subsequent Pct_POP) estimates are not as sensitive to problems of low detection rate along routes.

PART II. USING SPECIES ASSESSMENT SCORES TO IDENTIFY SPECIES OF CONSERVATION IMPORTANCE

Since its inception, PIF has explored various means of combining assessment scores to indicate species that should be of high interest to conservation planners. The approach is to highlight species that for biological reasons are either continentally or regionally important, and to suggest means of using this information to guide priority-setting at any geographic scale. This section describes current procedures.

Species of Continental Importance

As detailed in the PIF North American Landbird Conservation Plan (Rich et al. 2004) and summarized briefly below, PIF recognizes two categories of species that have continental conservation importance.

Continental Concern: Watch List Species

Continental Watch List Species are those which are most vulnerable at the continental scale, due to a combination of small and declining populations, limited distributions, and high threats throughout their ranges. Some of these species are already recognized as Threatened or Endangered at federal levels.

To determine which species are most vulnerable, we used the global scores to calculate a Continental Combined Score (CCS) for each species:

(highest of TB-g or TN-g scores) + (highest of BD-g or ND-g scores) + PT-c + PS-g

The Continental Combined Score can range from 4 for a widespread, numerous, and increasing species which is expected to face even more favorable conditions in the future to 20 for a species of the very highest conservation concern[1]. Species were included in the Watch List if they had a Continental Combined Score $\geq$14, or of 13 in combination with PT-c = 5. Species with scores higher than these cut-offs had moderate to high scores across multiple vulnerability factors.

Continental Stewardship Species

Conservation of Continental Watch List Species alone will not accomplish the PIF mission of maintaining healthy populations of all native birds across their ranges. To meet this goal, PIF has traditionally stressed the importance of responsibility for species that have a high proportion of their global population or range within an ecological planning area. Rich et al. (2004) applied this concept to the North American scale by identifying Continental Stewardship Species (some of which are also on the Continental Watch List).

Cluster analyses were used to identify groups of BCRs that share a similar suite of landbirds, based on the percentage of the total global breeding population of each species in each BCR (Rich et al. 2004). These clusters were termed 'Avifaunal Biomes' (defined for the purpose of identifying Continental Stewardship Species, and not intended to represent a new layer for conservation planning). Continental Stewardship Species were then defined as species that have a disproportionately high percentage of their world population within a single Avifaunal Biome during either the breeding season or the non-migratory portion of the non-breeding season. The cut-off for "high percentage" varied among the biomes according to their size: 90% for large biomes, 75% for medium biomes, and 50% for small biomes.

The selection of Continental Stewardship Species characteristic of biogeographic regions (rather than the continental as a whole) assumes that such 'biome-restricted' species have more stringent ecological requirements than species that are more evenly distributed throughout North America. Because the analysis identified species representative of each part of the continent, this group of Stewardship Species as a whole is of continental

[1] Note that the Continental Combined Score differs from the previous method of simply totaling all six factor scores at the continental scale (Carter et al. 2000, Pashley et al. 2000) to address some theoretical concerns raised by Beissinger et al. (2000).

importance. Attention to their welfare will lead to stewardship of regionally-characteristic habitats, which will also benefit additional species that are not as narrowly distributed.

Species of Regional Importance

Species of continental importance should receive appropriate conservation attention within BCRs where they occur, but these are not the only species that regional planners should consider. Many species that have moderate or even low Continental Combined Scores may be declining steeply within certain regions, or face higher threats than elsewhere. Species that are concentrated within a BCR also merit stewardship, even if they are not Continental Stewardship Species. Here we describe the categories of species that PIF considers to be regionally important. Note that the area importance criteria, RD and Pct_POP, are used in various ways to help define these groups.

Species of Continental Importance – 2 Categories

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

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

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

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

Species of Regional Importance – 2 Categories

Regional Combined Scores (RCS) are calculated for each species according to which season(s) they are present in the BCR. The formulae include a mix of global and regional scores pertinent to each season[1]. The Regional Combined Score for the breeding season (RCS-b) is a simple total of 5 scores:

$$\text{RCS-b} = \text{BD-g} + \text{PS-g} + \text{PT-r} + \text{TB-r} + \text{RD-b}$$

Regional Combined Scores for non-breeding residents (RCS-n, soon to be added to the database) are calculated by replacing breeding season values with non-breeding values:

$$\text{RCS-n} = \text{ND-g} + \text{PS-g} + \text{PT-c} + \text{TN-r} + \text{RD-n}$$

[1] Regional Combined Scores differ from the previous method of totaling seven factor scores by only including five scores pertinent to each season (BD-g and ND-g are no longer included in the same total, nor are TB-g and TN-g), in part to address theoretical concerns raised by Beissinger et al. (2000), and also to help draw attention to the season(s) when a species needs most attention within the region.

An exception is made for permanent non-migratory residents in the region; breeding season trends and RD scores are retained in the calculation of the Regional Combined Scores for the non-breeding season for these species, as their scores should not change seasonally:

RCS-n (for permanent residents) = ND-g + PS-g + PT-r + TN-r + RD-b

Future versions of the database will include a column indicating seasonal residency status. As more non-breeding information becomes available, for instance where regional trends from Christmas Bird Counts are available, or where RD values are calculated for migratory periods, these will be used to refine non-breeding Regional Combined Scores.

Regional Combined Scores for each season can range from 5 to 25. Species defined as regionally important will include many that meet criteria A or B above and others that do not. Note that the Regional Combined Scores differ from the Continental Combined Scores in that they incorporate RD as well as vulnerability criteria. Regional scores therefore include an element of stewardship responsibility, giving greater weight to those species in a group of equal vulnerability that are also concentrated in the planning region.

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

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

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

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

Using Species Assessment Data to Set Priorities for Action

The PIF Species Assessment Database (http://www.rmbo.org/pif/pifdb.html) contains all BCR scores for categories A-D above and can be used to generate a pool of regionally important species based on uniformly applied biological criteria. Regional planners may wish to add certain species to this pool, such as federally listed species at risk that did not meet the PIF criteria for a particular region. (For current federal listings in Canada, the U.S., and Mexico, respectively, see http://www.cosewic.gc.ca/eng/sct1/index_e.cfm; http://ecos.fws.gov/tess_public/servlet/gov.doi.tess_public.servlets.VipListed?code=V&listings=0#B; and http://www.ine.gob.mx/ueajei/aves1_5.html). Additional species may also merit consideration in regional conservation planning even though they do not meet the PIF criteria for regional conservation importance. For example, planners for the Canadian portion of BCR13 decided to add those few landbird species not in the pool of regionally important species that had steep declines (PT-r=5), elevated regional threat

scores (3 or higher), and RD > 1 for which there is concern that steep declines will continue into the future if corrective actions are not taken now. Additional species of regional interest for the Southeastern U.S. included continental Watch List species with RD=1, economically important species (such as hunted species or targets of eco-tourism and birders), species that often serve as environmental indicators, and species that may have high impact on other species of conservation importance. While these additional species should not be the main targets of regional conservation plans, their needs may often be addressed simultaneously with those of the regionally important species if all are considered together during conservation planning.

Once the pool of regionally important species has been completed, the data for species in the pool can be used in various ways to set priorities for action. The PIF database website (http://www.rmbo.org/pif/pifdb.html) has downloadable tables showing the PIF pool of regionally important species for each BCR. First on the list are species in the BCR that are of Continental Concern (category A). Many of these Continental Concern species are also Regional Concern (category C) and/or Stewardship (categories B and/or D) species. These Continental Concern species are followed by additional species of Regional Concern (Category C birds not already on the list because of Continental Concern, some of which may also be Stewardship species.) The last group listed includes additional Stewardship species (categories B and/or D not already listed). Within each of these groups, species are ordered taxonomically. Columns of data for each species indicate which of groups A-D the species qualifies for, as well as the breeding season Regional Combined Score.

Species of high conservation concern for which the BCR is also a center of abundance will tend to be at the top of this list of regionally important species, while Stewardship Species with low concern and relatively low representation in the BCR will be at the bottom. It does not necessarily follow, however, that species in between these extremes are listed in a sequence suggesting high to low priority for conservation action. Users must decide for themselves what balance to give to concern vs. responsibility, and the answers are likely to be affected by interests of each agency as well as financial, political, and logistic considerations.

Additional information derived from biologically-based criteria can be used to provide some guidance on priorities for taking action. For example, the PIF tables for preliminary BCR pools of important species also include codes for general categories of action most needed for improving or maintaining current population status of each species, defined from the PIF scores as described below.

Action codes

CR (Critical Recovery)	Regional Concern species[1] subject to very high regional threats (TB-r or TN-r=5). Critical recovery actions are needed to prevent likely extirpation or to reintroduce a species that has been extirpated.

IM (Immediate Management)	Regional Concern species[1] subject to high regional threats (TB-r or TN-r =4) combined with a large population decline (PT-r=5). Conservation action is needed to reverse or stabilize significant, long-term population declines in species where lack of action may put species at risk of extirpation.
MA (Management Attention)	Regional Concern species[1] with moderate threats (TB-r or TN-r =3) and undergoing moderate to large declines (PT-r=4 or 5), OR has high regional threats (TB-r or TN-r =4) but no large decline (PT-r<5). Management or other on-the-ground conservation actions are needed to reverse or stabilize significant, long-term population declines where threats are moderate, or to reverse high threats in species that are not currently experiencing steep long-term declines.
PR (Planning and Responsibility)	Species of Continental Concern but not Regional Concern, any continental or regional Stewardship Species that is neither of continental nor regional concern, and additional species added to the pool (i.e., do not meet any of criteria A-D). Long-term Planning actions are needed to ensure that sustainable populations are maintained in regions with high responsibility for these species. Actions often target many species at once, for example long-term multi-species monitoring programs, or broad plans/programs targeting suites of species sharing a habitat.

[1] Many, although not all, species of continental concern that occur in a BCR may also qualify as species of regional concern

These codes indicate that not all species require immediate conservation attention, even though they may appear high on the BCR list, and for some species it may be sufficient to continue monitoring or periodic assessment to ensure that populations remain stable. Other species require more direct conservation action to identify and remedy factors causing population declines or limiting population growth. Sorting the pool of species by needs for action can help planners identify groups of species with similar needs, promoting comprehensive planning to address many needs simultaneously.

Another approach to using PIF BCR tables to guide conservation is to add additional information for each species and look for common needs that can be addressed comprehensively. For example, the PIF global database contains a code for continental monitoring needs, as described below. Adding these codes to the BCR tables may highlight high priority monitoring needs

Monitoring need codes

Mo1	Little or no information on population status (PT-c=3 due to lack of data)
Mo2	Trend information available from an existing survey, but trend precision over past 20 years is unknown or very low (SE > 0.02)
Mo2a	PT-c=3 because of wide confidence intervals on long-term trend
Mo3	1/3 or more of the Canadian/U.S. breeding range is not covered by a breeding-season survey, because much of the range is north of the BBS coverage area

Mo4	2/3 or more of Western Hemisphere breeding range is not covered by a breeding-season survey, because most of the range is south of the U.S. border
S	Rare and range-restricted species with some species-specific monitoring, but with high need for continuation, improvement and coordination

Note: Codes Mo2a, Mo4, and S were added to the database following the completion of the PIF Continental Plan (Rich et al. 2004) as explained more fully in the companion document devoted to monitoring (Dunn et al. 2005).

Finally, determining the important habitats for each species in the pool of regionally important species, and developing specific conservation actions to protect or improve those habitats, is one of the key elements in regional PIF Conservation Plans (http://www.blm.gov/wildlife/pifplans.htm). Information on general habitat and other ecological requirements (food supply, nest site requirements) can be compiled from the literature for each species, which can then be grouped into suites of species that share habitats or other ecological needs. These ecological suites serve to define habitats that are a priority because they are used by many species of regional importance, and where conservation actions can efficiently meet the needs of many species at once. Some habitats may have very few species, yet nonetheless merit attention because of high levels of concern or stewardship responsibility for the few species that use them.

LITERATURE CITED

Beissinger, S. R., J. M. Reed, J. M. Wunderle, Jr., S. K. Robinson, and D. M Finch. 2000. Report of the AOU conservation committee on the Partners in Flight species prioritization plan. Auk 117:549-561.

Carter, M. F., W. C. Hunter, D. N. Pashley, and K. V. Rosenberg. 2000. Setting conservation priorities for landbirds in the United States: the Partners in Flight approach. Auk 117:541-548.

Dunn, E. H., B. L. Altman, J. Bart, C. J. Beardmore, H. Berlanga, P. J. Blancher, G. S. Butcher, D. W. Demarest, R. Dettmers, W. C. Hunter, E. E. Iñigo-Elias, A. O. Panjabi, D. N. Pashley, C. J. Ralph, T. D. Rich, K. V. Rosenberg, C. M. Rustay, J. M. Ruth, and T. C. Will. 2005. High priority needs for range-wide monitoring of North American landbirds. Partners in Flight Technical Series No. 2. Partners in Flight website: http://www.partnersinflight.org/pubs/ts/02-MonitoringNeeds.pdf.

Harrison, P. 1983. Seabirds: an identification guide. Houghton Mifflin Company, Boston.

Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press. New York.

Hunter, W. C., M. F. Carter, D. N. Pashley, and K. Barker. 1993. The Partners in Flight prioritization scheme. Pp. 109-119 in Status and Management of Neotropical Migratory

Birds, D. Finch and P. Stangel, eds. USDA For. Ser. Gen. Tech. Rep. RM-229. Fort Collins, Colorado.

National Geographic Society. 1987. Field Guide to the Birds of North America, 2nd edition. National Geographic Society, Washington, D.C.

Panjabi, A., C. Beardmore, P. Blancher, G. Butcher, M. Carter, D. Demarest, E. Dunn, C. Hunter, D. Pashley, K. Rosenberg, T. Rich and T. Will. 2001. The Partners in Flight handbook on species assessment and prioritization. Version 1.1. Rocky Mountain Bird Observatory. Brighton, Colorado.

Pashley, D. N., C. J. Beardmore, J. A. Fitzgerald, R. P. Ford, W. C. Hunter, M. S. Morrison, and K. V. Rosenberg. 2000. Partners in Flight: Conservation of the land birds of the United States. American Bird Conservancy. The Plains, Virginia. 92 pp.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, New York.

Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young and J.R. Zook. 2003. Digital distribution maps of the birds of the Western Hemisphere, version 1.0. NatureServe. Arlington, Virginia.

Rosenberg, K. V. and P. J. Blancher. 2005. Setting numerical population objectives for priority landbird species. Pp. 57-67 *in* Bird Conservation and Implementation in the Americas: Proceedings of the Third International Partners in Flight Conference, Vol. 1. C. J. Ralph and T. D. Rich, eds. USDA For. Ser. Gen. Tech. Rep. PSW-GTR-191. Pacific Southwest Research Station. Albany, California. 651 pp.

Appendix A. Database Dictionary and Key to Data Sources

The following list explains the field headings (in alphabetical order) in all Partners in Flight Species Assessment Databases (http://www.rmbo.org/pif/pifdb.html). The databases should be used in consultation with this Handbook, which defines the terms listed.

Act: Action code indicating the type of conservation action most needed for improving or maintaining current population status of each species. CR=Critical Recovery; IM=Immediate Management; MA=Management Attention; PR=Planning and Responsibility.

AOU7_46: Taxonomic sequence of species following the 7th American Ornithologists' Union Check-list through the 46th supplement (useful for sorting species by taxonomic order).

BCR: Bird Conservation Region number.

BCR-name: Full descriptive name of the Bird Conservation Region.

BD-g: Breeding Distribution score (global score).

BD-g_s: Source of information for Breeding Distribution (BD-g) score (see key to sources below).

CC: Continental Concern species (Y=yes, blank=no).

CCS: Continental Combined Score (continental concern score: the sum of the higher of either Breeding (BD-g) or Non-breeding Distribution (ND-g) score (D-max), Population Size (PS-g), Population Trend (PT-c), and the higher of either the continental Threats to Breeding (TB-c) or Non-breeding (TN-c) scores (T-max).

Common Name: English common name of species according to the 7th edition of the American Ornithologists' Union Check-list of North American Birds, including changes through the 46th supplement.

CS: Continental Stewardship species (Y=yes, blank=no).

D-max: **T**he higher of either the Breeding Distribution (BD-g) or Non-breeding Distribution (ND-g) scores; used in calculation of the Continental Combined Score (CCS).

Global Pop Size: Global population size estimate (if available).

Intro: Species introduced (i.e., exotic) to North America (Y=yes; blank=no)

MoN: Continental Monitoring Need. Mo1=no trend data; Mo2=trend has low precision; Mo2a= precision better than Mo2, but still low enough to assign an uncertain trend score

(PT=3); Mo3=inadequate coverage of northern part of range (mainly in Canada); Mo4=inadequate coverage of southern part of range (mainly in Latin America); S=species-specific monitoring needs continuation/improvement.

ND-g: Non-breeding Distribution score (global score).

ND-g_s: Source of information for Non-breeding Distribution (ND-g) score (see key to sources below).

Pct_POP US/CA: Percent of species' global breeding population in the U.S. and Canada, rounded to the nearest percent.

Pct_POP: Percent of species' global breeding population in each Bird Conservation Region, rounded to the nearest percent. Percents <0.5 are shown as "0%".

Pct_POP_s: Source of information for Pct_POP value (see key to sources below).

PS-g: Population Size score (global score).

PS-g_com: Comments or other information related to the Population Size (PS-g) score.

PS-g_s: Source of information for Population Size (PS-g) score (see key to sources below).

PT-c: Population Trend score (continental score).

PT-c_com: Comments or other information related to the continental Population Trend (PT-c) score.

PT-c_s: Source of information for the continental Population Trend (PT-c) score (see key to sources below).

PT-r: Population Trend score (regional, breeding-season score).

PT-r_com: Comments or other information related to the regional Population Trend (PT-r) score.

PT-r_s: Source of information for the regional Population Trend (PT-r) score (see key to sources below).

RC: Regional Concern species (Y=yes, blank=no).

RCS-b: Regional Combined Score for the breeding season (sum of Breeding Distribution (BD-g), Population Size (PS-g), regional Population Trend (PT-r), breeding Relative Density (RD-b), and regional Threats to Breeding (TB-r).

RCS-n: Regional Combined Score for the non-breeding season (sum of Non-breeding Distribution (ND-g), Population Size (PS-g), continental Population Trend (PT-g) [regional

Population Trend (PT-r) used for permanent resident species], non-breeding Relative Density (RD-n), and regional Threats to Non-breeding (TN-r).

RD-b: Relative Density score (regional, breeding season score)

RD-b_com: Comments or other information related to the Relative Density (RD-b) score

RD-b_s: Source of information for Relative Density (RD-b) score (see key to sources below).

RD-n: Relative Density score (regional, non-breeding season score).

RD-n_s: Source of information for the non-breeding Relative Density (RD-n) score (see key to sources below).

RS: Regional Stewardship species (Y=yes, blank=no).

Scientific Name: **S**cientific name of species according to the 7th edition of the American Ornithologists' Union Check-list of North American Birds, including changes through the 46th supplement.

TB-c: Threats to Breeding score (continental score).

TB-c_com: Comments or other information related to the continental Threats to Breeding (TB-c) score.

TB-c_s: Source of information for the continental Threats to Breeding (TB-c) score (see key to sources below).

TB-r: Threats to Breeding score (regional score).

TB-r_com: Comments or other information related to the regional Threats to Breeding (TB-r) score.

TB-r_s: Source of information for the regional Threats to Breeding (TB-r) score (see key to sources below).

T-max: **T**he higher of either the continental Threats to Breeding (TB-c) or Threats to Non-breeding (TN-c) scores; used in calculation of the Continental Combined Score (CCS).

TN-c: Threats to Non-breeding score (for continental population).

TN-c_com: Comments or other information related to the continental Threats to Non-breeding (TN-c) score.

TN-c_s: Source of information for the continental Threats to Non-breeding (TN-c) score (see key to sources below).

TN-r: Threats to Non-breeding score (regional score).

TN-r_com: Comments or other information related to the regional Threats to Non-breeding (TN-r) score.

TN-r_s: Source of information for the regional Threats to Non-breeding (TN-r) score (see key to sources below).

WL-04: PIF Continental Watch List for North America in 2004 (Y=yes; blank=no).

Key to sources:

Source	Source details
Altman	Bob Altman, American Bird Conservancy
AOU 1983	American Ornithologists' Union. 1983. Checklist of North American birds. 6th edition and supplements. American Ornithologists' Union, Washington, D.C.
Atwood & Collins 1997	Atwood & Collins 1997. Birding 29:476-485.
Aubry	Yves Aubry, Canadian Wildlife Service
AZ Game & Fish	Arizona Dept. of Game and Fish
AZ-PIF	Arizona Partners in Flight
AZRC	Arizona Review Committee
BBS	Breeding Bird Survey
BBS-01	Breeding Bird Survey (1966-2001), used for global PT scores
BBS-02	Breeding Bird Survey (1966-2002), used for regional PT scores
BBS-99	Breeding Bird Survey (1990-1999), used for regional RD_B scores
Beardmore	Carol Beardmore, U.S. Fish and Wildlife Service
BirdLife Int. 2000	BirdLife 2000. Threatened Birds of the World
Blake	Blake, E.R. 1977. Manual of Neotropical Birds, volume 1. The University of Chicago Press. Chicago and London
Blancher	Peter Blancher, Bird Studies Canada / Canadian Wildlife Service
BNA Atwood & Bontrager 2001	Atwood & Bontrager. 2001. California Gnatcatcher. In BNA No. 574, Poole & Gill, eds., BNA, Phil.
BNA Beedy & Hamilton 1999	Beedy & Hamilton. 1999. Tricolored Blackbird. In BNA No. 423, Poole & Gill, eds., BNA, Philadelphia.
BNA Briskie 1993	Briskie. 1993. Smith's Longspur. In BNA No. 34. Poole, Stettenheim, & Gill, eds., Acad. Natl. Sci., Phil., & AOU, D.C.
BNA Bull & Duncan 1993	Bull & Duncan. 1993. Great Gray Owl. In BNA No. 41, Poole & Gill, eds., BNA Philadelphia.
BNA Johnson et al 2000	Johnson, Hendricks, Pattie, & Hunter. 2000. Brown-capped Rosy-Finch. In BNA No. 536, Poole & Gill, eds., BNA, Phil.
BNA Ladd & Gass 1999	Ladd & Gass. Golden-cheeked Warbler. 1999. In BNA No. 420, Poole & Gill, eds., BNA, Phil.
Braun 1998	Braun, C.E. 1998. Sage grouse declines in western North America: what are the problems? Proc. West. Assoc. State Fish and Wildl. Agencies 78:139-156.
Cannings	Richard Cannings, Bird Studies Canada
Carter	Michael Carter, Playa Lakes Joint Venture
Casey	Dan Casey, American Bird Conservancy
CBC-01	Christmas Bird Count trend graphs to 2001
CBO	Colorado Bird Observatory (Now RMBO - Rocky Mountain Bird Observatory)

Source	Source details
CDE	Chihuahuan Desert Experts
CDE 1999	Chihuahuan Desert Experts 1999
CDE 2002	Chihuahuan Desert Experts 2002
Chipley	Robert Chipley, American Bird Conservancy
CO-PIF	Colorado Partners in Flight
Corman	Troy Corman, Arizona Game and Fish
Dale	Brenda Dale, Canadian Wildlife Service
DeGroot	Krista DeGroot, Canadian Wildlife Service
DeSch	DeSchauensee, R.M. 1970. A Guide to the Birds of South America. Academy of Natural Sciences of Philadelphia, U.S.A.
Dettmers	Randy Dettmers, U.S. Fish and Wildlife Service
Dunn	Erica Dunn, Canadian Wildlife Service
Falardeau	Gilles Falardeau, Canadian Wildlife Service
Fitzgerald	Jane Fitzgerald, American Bird Conservancy
FWS BCVI Recovery Plan 1991	U.S. Fish and Wildlife Service. 1991. Black-capped Vireo (*Vireo atricapillus*) Recovery Plan. Austin, TX. Pp. vi + 74.
FWS GCWA Recovery Plan 1992	U.S. Fish and Wildlife Service. 1992. Golden-cheeked Warbler *(Dendroica chrysoparia)* Recovery Plan. Albuquerque, New Mexico. 88 pp.
Gauthier and Aubry 1996	Gauthier, J. and Y. Aubry (eds.). 1996. The Breeding Birds of Quebec: Atlas of the Breeding Birds of Southern Quebec. Association quebecoise des groupes d'ornithologues, Province of Quebec Society for the Protection of Birds, Canadian Wildlife Service, Environment Canada, Quebec Region, Montreal, 1302 pp.
GBE	Great Basin Experts
GBE-05	Great Basin Experts 2005
Global default	Global score default (see species' score in Global database for source info.)
Hannah	Kevin Hannah, Canadian Wildlife Service
Hodgman & Wilson 1999	Hodgman, T.P. and P.U. Wilson. 1999. Saltmarsh Birds. *in* A survey of rare, threatened, and endangered fauna in Maine: eastern central and eastern coastal regions. Maine Department of Inland Fisheries and Wildlife, Bangor, Maine.
Howe	William Howe, U.S. Fish and Wildlife Service
Howell & Webb 1995	Howell, S.N.G. and S. Webb. 1995. A guide to the birds of Mexico and northern Central America. Oxford University Press. New York.
Hunter	William C. Hunter, U.S. Fish and Wildlife Service
ID-PIF	Idaho Partners in Flight
J Raptor Res 2001	Journal of Raptor Research, Volume 35 (2001), Issue 4. Proceedings from the 2nd International Burrowing Owl Symposium
Jones	Stephanie Jones, U.S. Fish and Wildlife Service
KIWA Singing Male Survey 2002	http://www.michigan.gov/dnr/0,1607,7-153-10370_12145_12202-32591--,00.html#census_graph
Knutson	Melinda Knutson, U.S. Fish and Wildlife Service
Krueper	David Krueper, U.S. Fish and Wildlife Service
Lammertink et al. 1996	Lammertink, Roja-Tome, Cassillas-Orona, & Otto. 1996. Tech. Rep. #69, Inst. Syst. & Pop. Biol., U. Amsterdam, Netherlands. In, BirdLife 2000. Threatened Birds of the World.
LEPC WG 2003	Lesser Prairie Chicken Interstate Working Group, 2003
Matsuoka	Steve Matsuoka, U.S. Fish and Wildlife Service
Mesta	Robert Mesta, U.S. Fish and Wildlife Service
Mexican NSAC	Mexican National Species Assessment Committee

Source	Source details
Meyer	Ken Meyer, Avian Research and Conservation Institute
MW-PIF	Midwest Partners in Flight
MWRC	Midwest Review Committee
NatGeo 1987	National Geographic Society. 1987. Field Guide to the Birds of North America, 2nd edition. National Geographic Society, Washington, D.C.
NE MX workshop	Northeast Mexico PIF Species Assessment Workshop 2004
NE-G&P	Nebraska Game and Parks
NE-PIF	Northeast Partners in Flight
Niemuth	Neal Niemuth, U.S. Fish and Wildlife Service, Bismarck ND HAPET Office
NM-PIF	New Mexico Partners in Flight
NV-PIF	Nevada Partners in Flight
NWT	Northwest Territories/Nunavut Bird Checklist Survey http://www.mb.ec.gc.ca/nature/migratorybirds/nwtbcs/index.en.html
Panjabi	Arvind Panjabi, Rocky Mountain Bird Observatory
Peregrine Fund Website	http://www.peregrinefund.org/condor_factsheet.asp
Phinney	Mark Phinney, LP Forest Resources Division, LP Corp
PIF-ON	Ontario Partners in Flight
PIF-QC	Quebec Partners in Flight
PIFTC	Partners in Flight Technical Committee
PIFTC-02	Partners in Flight Technical Committee, 2002
PIFTC-03	Partners in Flight Technical Committee, 2003
RMBO	Rocky Mountain Bird Observatory
Rosenberg	Ken Rosenberg, Cornell Lab. Of Ornithology
Russell	Robert Russell, U.S. Fish and Wildlife Service
Rustay	Christopher Rustay, Playa Lakes Joint Venture
SE-PIF	Southeast Partners in Flight
Shackelford	Cliff Shackelford, Texas Parks and Wildlife
Sinclair	Pam Sinclair, Canadian Wildlife Service
Smith 1996	Smith. P.W. 1996. Antillean Nighthawk. In Rodgers, Kale, & Smith, eds., Rare & Endangered Biota of Florida. Vol. 5. U. Florida Press, Gainesville.
STKI_Int.WG	Swallow-tailed Kite International Working Group
Svedarsky et al. 1999	Svedarsky, Hier, and Silvy, eds., 1999 The Greater Prairie Chicken: A National Look. U. Minn. Misc. Publ. 99 -- 1999.
USBR	U.S. Bureau of Reclamation
UT-PIF	Utah Partners in Flight
Will	Tom Will, U.S. Fish and Wildlife Service
Winker et al. 2002	Winker et al. 2002 Birds of St Matthew's Island
Wires	Linda Wires, University of Minnesota
WWG	Western Working Group of Partners in Flight
Wylie	Jim Wylie, US Geological Service
Young	Jock Young, University of Montana

Appendix B. Process for Changing Species Assessment Database

The Species Assessment Database is continually being reviewed and updated by regional and international experts. Users who notice clear errors, or who are aware of new data that supports a different score, should send the information to the PIF Database manager. However, we discourage second-guessing of scores. Appropriate assignment of scores requires careful consideration of all species at one time, to ensure that all scoring criteria are applied consistently across species. The process for changing the database is outlined here.

1. Any person wishing to propose change to one or more scores in the database should request an electronic "change of score form" from the PIF Database manager. Reviewers must fill in all cells related to the revised scores. These forms will also be used by the PIF Science Committee during its periodic extensive reviews of scores. Change of score forms should be submitted to the PIF Database manager electronically or by hard copy, and suggested changes will undergo the procedures described in 2-4 below. Electronic forms will be printed and filed to document all suggestions for change.

2. Suggested changes to scores in the *global database* should be submitted on a special form to the PIF Database manager (see #1), along with an explanation/justification for the change, and citations of any information that supports the proposed change, if available. Although published sources are preferred over personal communications, we appreciate the fact that a great deal of useful knowledge about particular species is currently unpublished. The Database manager forwards this information to the PIF Science Committee for consideration. The entire PIF Science Committee evaluates the proposal and comes to agreement on whether to accept the changes or not, or defers the decision to species experts. The Science Committee chair settles disputes.

3. Suggested changes to scores (or species presence/absence) in the *regional BCR database* should be submitted on a special form to the PIF Database manager (see #1), along with an explanation/justification for the change, and citations of any information that supports the proposed change, if available. Published sources are preferred over personal communications. The Database manager forwards this information to members of the PIF Science Committee with appropriate expertise in the region(s) in question. These members evaluate the proposal and determine whether or not to accept the changes. Changes approved by the regional experts are forwarded to the entire PIF Science Committee so members have the opportunity to comment on proposed changes. Barring any disputes, changes are approved by the regional expert(s) on the Committee. Disputes are decided by the Science Committee chair.

4. Where a BCR, or in the case of global scores, a species' range overlaps with Canada or Mexico, proposed changes to information in the database are reviewed and approved jointly by representatives from both countries.

5. Following decision, the PIF Database manager dates and initials hard copies of the

change forms, and informs submitters of the outcome by email or other means.

6. The PIF Species Assessment Database website will be updated on 1 November of each year. However, requests for changes in scores and updates to the Database can be made at any point during the year. Version numbers or other designations with dates will be attached to the database, and specific tables will be made available that highlight changes between past and present versions of the database.

7. Contact information for the current PIF Database manager is:

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