The Partners in Flight

Handbook on Species Assessment

Version 2012

Partners in Flight Science Committee

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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, Berlanga et al. 2010). 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, Panjabi et al. 2005), and the procedures have been thoroughly tested, externally reviewed (Beissinger et al. 2000), and updated to address issues raised by reviewers and partners.

This version of the PIF Handbook incorporates assessment rules and global scores used in Saving Our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation (Berlanga et al. 2010), which involved review and update of scores during 2008-2010. It is a revision of the 2005 Handbook (Panjabi et al. 2005), which described the assessment rules and global scores used in the PIF North American Landbird Conservation Plan (Rich et al. 2004). All scores, data sources, and other information used for the Tri-National Vision (Berlanga et al. 2010) 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 excel files (http://www.rmbo.org/pif/pifdb.html). Changes to the database will be incorporated periodically 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 are also available from the website.

The Species Assessment Database includes scores for all 882 native North American landbirds along with well-established non-native species. PIF currently defines the North American continent as Canada, the continental U.S., and Mexico.

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.

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.

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.

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 since the mid-

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. For species occurring in Canada and the U.S., 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, details in the PIF Landbird Population Estimates Database < http://rmbo.org/pif_db/laped/> and associated Guide – Blancher et al. 2007). For species occurring only in Mexico, where no range-wide population data were available, we assigned PS scores by pairing Mexican species without population data to ecologically similar U.S. or Canadian species with similar relative abundance, and extrapolated the range-wide densities (breeding population estimate / breeding range size) of the better-known species to the range area of the lesser known species.

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) occupied by breeding-aged individuals during the breeding season, using digital range maps available from NatureServe (Ridgely et al. 2007). All range maps were reviewed for accuracy by the PIF International Science Committee and adjusted based on other data sources or expert knowledge concerning the species distribution. The use of digital range maps from NatureServe is a change from the 2005 version of this Handbook in which BD-g was typically estimated from published field guides.

The scoring criteria for BD-g (and ND-g) have also been revised from the 2005 Handbook and were adopted by the PIF International Science Committee in 2008. The following criteria represent improved complementarity of the PIF assessment system with BirdLife and IUCN criteria for range size and improved distribution of scores across all species, particularly with the inclusion of Mexican

species into the assessment process. These criteria provide improved discrimination among species that are range-restricted. Criteria based on the length of linear coastline were also removed from consideration in scoring BD-g and NG-g because those criteria were not applicable to most landbirds.

BD-g Score	Criterion
1	≥4,000,000 km^2
2	≥1,000,000 and <4,000,000 km^2
3	≥300,000 and <1,000,000 km^2
4	≥80,000 and <300,000 km^2
5	<80,000 km^2

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.

Distribution is calculated by determining the area (km^2) occupied by the population during the portion of the non-breeding season when birds are relatively sedentary, using digital range maps available from NatureServe (Ridgely et al. 2007). For landbirds we have not considered range size during migratory periods, or phenomena such as migratory bottlenecks. As for breeding distribution, Natureserve Maps were carefully reviewed for accuracy and adjusted based on other data.

ND-g Score	Criterion
1	≥4,000,000 km^2
2	≥1,000,000 and <4,000,000 km^2
3	≥300,000 and <1,000,000 km^2
4	≥80,000 and <300,000 km^2
5	<80,000 km^2

Threats to Breeding (TB-c) and Threats to Non-breeding (TN-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).

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 of TB-c and TN-c involves assessing the expected change over the next 30 years in the suitability of breeding or non-breeding conditions necessary for maintaining healthy populations of a species. Threats to suitable breeding or non-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, predicted impacts of climate change or any other factor that reduces the suitability of breeding or non-breeding conditions.

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 variables TB-c and TN-c are 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/TN-c Score	Definitions and possible scenarios
1	*Future conditions for breeding (TB-c) or non-breeding (TN-c) populations are expected to improve (e.g., due to widespread human activities or land-uses that benefit the species).* 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*], American Crow [*Corvus brachyrhynchos*]).
2	*Future conditions for breeding (TB-c) or non-breeding (TN-c) populations are expected to remain stable; no significant threats*. One or more of the following statements should be true: - no known threats to population or habitats - species relatively tolerant of future changes likely to result from 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 [*Pandion haliaetus*])

	- threats are assumed to be low
3	*Slight to moderate decline in the future suitability of breeding (TB-c) or non-breeding (TN-c) 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, with increased human activity expected - does not occur in highly altered landscapes, with some expectation of increased landscape alteration within breeding or non-breeding range - area-sensitive species, or sensitive to habitat fragmentation (with fragmentation expected to increase within the area for which scores are being assigned) - relatively specialized on sensitive habitats (e.g., native grasslands) or successional stages that are limiting populations, or expected to become limiting, due to human activity or natural changes - requires relatively specialized conditions within habitats that are limiting populations, or expected to become limiting, due to human activity or natural changes - relatively sensitive to biotic factors, such as cowbird parasitism, predation, overgrazing, and other phenomena that are limiting populations - demographic factors (low productivity, single-brooded) may contribute to limiting populations, especially when combined with other threats - concentration or coloniality increases vulnerability to otherwise lesser threats - 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 (TB-c) or non-breeding (TN-c) 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, with increased human activity expected - 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, are under threat, or expected to come under threat -extremely specialized on specific conditions within a habitat (e.g., requires large snags or specific water levels) that are in short supply, under threat, or expected to decrease in availability

	- biotic factors (parasitism, hybridization) currently are having or are expected to have a strong adverse effect on a majority of the breeding population - a high degree of concentration or coloniality makes sub-populations highly vulnerable to otherwise lesser 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 (TB-c) or non-breeding (TN-c) 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.

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 since the mid-1960sare 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. In Mexico, where population trend data is lacking for nearly all species, we used surrogate data on land cover trends from 1970-2000 (from CONAFOR, the National Forestry Commission in Mexico) combined with expert knowledge on species' affinities for specific land cover types. 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 (e.g., from 1966-2007 for BBS in the current version of the database), then converted annual rates of population change to total population size change over the period of consideration. PT-c scores were then determined based on the total population size change and the precision and reliability of the annual rate of population change estimate as presented in the table below. These PT-c criteria represent a slight revision from those listed in the 2005 version of this handbook regarding how scores are assigned relative to % total population change, precision, and reliability. This new rule set was instituted by the PIF Science Committee in 2008.

% total population change	90% CI excludes 0 ($P \leq 0.1$) and df ≥ 14	67% CI excludes 0 ($P \leq 0.33$) and df = 6-13	67% CI excludes 0 ($0.1 < P \leq 0.33$) and df ≥ 14	67% CI includes 0 ($P > 0.33$) and Trend is Reliable	67% CI includes 0 ($P > 0.33$) and Trend is Not Reliable
$\leq$ -50%	5	4	4	3	3
-50% to -15%	4	4	4	3	3
-15% to 0%	3	3	3	2	3
0% to +50%	2	3	2	2	3
$\geq$ +50%	1	2	2	2	3

Details on PT-c Score. CI = confidence interval for annual trend estimate used to calculate % total population change over the period of consideration. Criteria for degrees of freedom (df) are defined for Breeding Bird Survey analyses and may differ for other data sources.

All of the following criteria must be met for a trend to be considered "Reliable":
1. Trend Precision: BBS 95% Confidence Limits < 4 % / yr above or below trend
2. Sample size: BBS degrees of freedom > 14
3. Count Abundance: Average count > 0.1

Species for which trend direction and magnitude are both 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 because of an uncertain trend is reviewed by experts to determine whether a more appropriate score can be assigned.

Qualitative descriptions of the rule set for scoring population trend are provided in the following table:

PT	Description
1	Significant large increase (pop'n change $\geq$ 50%; $P \leq 0.1$)
2	Significant small increase (pop'n change 0% to 50%; $P \leq 0.1$) Possible increase (pop'n change > 0%; $P \leq 0.33$) Stable (pop'n change > -15%; $P > 0.33$; reliable trend)
3	Uncertain pop'n change ($P > 0.33$; unreliable trend) Stable or possible decrease (pop'n change $\leq$ -15%, $P > 0.33$; reliable trend) Possible small decrease (pop'n change -15% to 0%; $0.1 < P < 0.33$) Significant small decrease (pop'n change -15% to 0%; $P \leq 0.1$)
4	Possible moderate decrease (pop'n change -15% to -50%; $0.1 < P \leq 0.33$) Significant moderate decrease (pop'n change -15% to -50%; $P < 0.1$) Possible large decrease (pop'n change $\leq$ -50%; $0.1 < P < 0.33$)
5	Significant large decrease (pop'n change $\leq$ -50%; $P \leq 0.1$)

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, which were the focus of earlier PIF state and regional plans. 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 1966-2008 BBS trends were used for PT-r, as opposed to 1966-2007 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 the 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. Given the limited resources for conservation, the large number of competing needs among species, and the need to coordinate actions across broad scales, the PIF regional assessment process gives additional weight to species in areas supporting core populations, where the importance, and likelihood, of success are greatest. 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. 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/year 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 $\geq$ 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 used in PIF assessments prior to 2005. 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 (%Pop)

Percent of Population (%Pop) values reflect the proportion of the global population of a species that is contained within a BCR during the breeding season. 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, %Pop is influenced by the size of a BCR. Thus, large BCRs may have high population percentages but relatively low densities, or vice versa. %Pop therefore complements the Relative Density (RD) score[1].

For species sampled by the BBS, relative abundance (mean birds/route/year) 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 %Pop.

Average density is usually based on BBS, but in a few cases other sources of population data were used to estimate %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 %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 %Pop estimates should be valid as long as the detectability of a species on BBS routes is relatively constant across the species' range. %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 %Pop) estimates are not as sensitive to problems of low detection rate along routes.

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

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 recommended procedures.

Species of Continental Importance

PIF now recognize five overlapping categories of species that have continental conservation importance. The first two categories below were established in the North American Landbird

Conservation Plan (Rich et al. 2004), which covered only the United States and Canada. Three additional categories of importance were identified after Mexican species were added to the Species Assessment Database, as described in *Saving or Shared Birds: a Tri-National Vision for Landbird Conservation* (Berlanga et al. 2010). Together these species reflect a diversity of reasons for recognizing continental importance, including high vulnerability, high stewardship responsibility, steep declines, and shared responsibility among nations for full life-cycle conservation. This diversity of reasons for importance reflects the large shared avifauna across a large continent and Partners in Flight's mission of helping species at risk, keeping common birds common, and engaging in voluntary partnerships to implement bird conservation.

U.S.-Canada Watch List (UCWL) Species

The U.S.-Canada Watch List is synonymous with the list of U.S.-Canada Concern Species and includes those species that are most vulnerable at a continental scale within these two countries, 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. The current list has been updated from the Watch List presented in Rich et al. (2004) to reflect changes to assessment scores in 2010. As in Rich et al. (2004), this version of the Watch List only includes species occurring in the U.S. and Canada, and therefore we refer to this category of Continental Importance as "U.S.-Canada Watch List (UCWL) Species." Note that many Mexican species would qualify as "Watch List" species using current criteria, but rules for defining Mexican Watch List species have not yet been established.

To determine which species are most vulnerable, we summed global scores pertinent to each season to arrive at Continental Combined Scores for breeding (CCS-b) and non-breeding (CCS-nb) seasons, as follows:

Continental Combined Score – breeding (CCS-b) = TB-g + BD-g + PT-c + PS-g

Continental Combined Score – non-breeding (CCS-nb) = TN-g + ND-g + PT-c + PS-g

The overall Continental Combined Score (CCS-max) for each species is simply the larger of the two seasonal combined scores:

Continental Combined Score (CCS-max) = maximum of CCS-b or CCS-nb

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 are considered to exhibit moderate to high vulnerability across multiple factors.

[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); the new method addresses some theoretical concerns raised by Beissinger et al. (2000).

U.S.-Canada Stewardship (UCS) Species

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

To date, Stewardship Species have been identified for Avifaunal Biomes in Canada and the continental United States, as in Rich et al. (2004). Thus, for this iteration of the database we are calling this designation 'U.S.-Canada Stewardship' (UCS) species. Though not yet applied to Mexican regions, many of the species that would qualify as stewardship species in Mexico are already identified as high tri-national concern (see below) due to restricted ranges and small population sizes.

Species of High Tri-National Concern (TNC)

The PIF *Saving our Shared Birds* document (Berlanga et al. 2010) took a geographically expanded look at species of continental concern and highlighted 148 species in need of immediate conservation attention because of their highly threatened and declining populations. Species (including Mexican species) meeting the Watch List criteria listed above qualify as species of High Tri-National Concern if they fall into any of the following immediate need "Action Categories":

- "CX" - possibly extinct in wild;
- "CR" - critical needs (TB-g=5 or TN-g=5, and PT-c>3);
- "IM" - immediate needs (PT-c=5 and (TB-g=4 or TN-g=4); or else PT-c=4 and (TB-g=4 or TN-g=4) and PS-g=5)

The TNC species have been subdivided into several categories in the assessment database, as in Berlanga et al. (2010), based on patterns of distribution, abundance, and risk. The subdivisions help to highlight species with most critical needs, as well as the geographic and habitat affiliations of these species and the different conservation strategies required for each group. The subdivision groups are indicated in the downloadable files from the Species Assessment website, but the lists displayed on the website only indicate "Y" for any species meeting the TNC criteria. The subdivisions of this category are as follows:

- Species at Greatest Risk of Extinction (SGRE) – North American species at greatest risk because of severe threats, distributions less than 80,000km^2 (i.e. BD or ND=5), and small, declining global populations.
- Tropical Residents of High Tri-National Concern – includes primarily tropical species that reach their most northerly distribution in Mexico and that are highly threatened in their range within Mexico; this category is further subdivided based on distribution (see Berlanga et al. 2010):
    - primarily Mexican (TRMX) – species with their distribution primarily within Mexico.
    - primarily Meso-American (TRMA) – species with the largest portion of their distribution in Meso-America.
    - primarily South American (TRSA) – species that are widely distributed in South America.
- Temperate Breeders of High Tri-National Concern (TBTC) – species with moderate to large breeding distributions within the temperate zone in the U.S. and Canada. These species were identified as high priorities by Rich et al. (2004) and continue to warrant immediate tri-national conservation action.

Common Birds in Steep Decline (CBSD)

In addition to the species of high tri-national concern, Berlanga et al. (2010) identified a group of common birds (not meeting criteria for tri-national concern) whose populations have declined by an estimated 50% or more during the past 40 years (i.e. PT=5). Together these Common Birds in Steep Decline have lost close to a billion or more breeding birds during this period, raising concern for the vital ecosystem services that they provide. Species qualified for this list if the % population lost since the mid-1960s was $\geq$ 50% based on trend data from the Breeding Bird Survey or Christmas Bird Count or on PT score if no reliable survey data were available. As indicated in Berlanga et al. (2010), these species may be considered collectively as indicators of habitats where underlying causes of decline need to be addressed; note that some of these species also have been identified as U.S.-Canada Watch List species in need of targeted management.

Species of Regional Importance

Species of Continental Importance should receive appropriate conservation attention within BCRs where significant populations 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 at the BCR scale. Note that the area importance criteria, RD and %Pop, are used in various ways to help define these groups.

Designated due to Continental Importance –4 Categories

A) United States / Canada Watch List (UCWL): Species must meet all of the following criteria:
- Meet criteria for PIF Watch List (UCWL)
- Occur regularly in significant numbers in the BCR, i.e., RD > 1
- Future conditions are not expected to improve, i.e., Threat Score > 1

B) United States / Canada Stewardship (UCS): 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., %Pop$\geq$ 25% OR (RD=5 and %Pop $\geq$ 5%)
- Future conditions are not expected to improve, i.e., Threat Score > 1

C) Tri-national Concern (TNC): species must meet all of the following criteria:

- Listed as a species of High Tri-National Concern in *Saving our Shared Birds* (Berlanga et al. 2010)
- Occurs regularly in significant numbers in the BCR, i.e., RD > 1

D) Common Birds in Steep Decline (CBSD): species must meet all of the following criteria:

- Listed as a Common Bird in Steep Decline in Berlanga et al. (2010)
- Occurs regularly in significant numbers in the BCR, i.e., RD > 1

Designated due to 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:

RCS-b = BD-g + PS-g + PT-r + TB-r + 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:

RCS-n = ND-g + PS-g + PT-c + TN-r + RD-n

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. Note that the Regional Combined Scores differ from the Continental Combined Scores in that they incorporate an area importance score (RD). 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.

[1] 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.

The two categories of Regional Importance are:

E) Regional Concern (RC): Species must meet all criteria in the seasons for which they are listed:

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

F) Regional Stewardship (RS) – species must meet all criteria in the season(s) for which they are listed:

- Regional Combined Score > 13
- High importance of the BCR to the species; %Pop≥ 25% OR (RD=5 and %Pop≥5%)
- Future conditions are not expected to improve, i.e., Threat Score > 1

Other Species of Interest: Opportunities for International Collaboration

Species Shared Substantially Among Countries (Subst. Shared)

Saving our Shared Birds (Berlanga et al. 2010) also identified a group of species for which a substantial portion of their distribution and populations are shared across national boundaries. For these species, the responsibility for full life cycle stewardship is shared among countries. Species were included in this list of substantially shared species if at least one-quarter of their range or population occurs in at least two of the three countries (i.e., Mexico, United States, and Canada). Including this list as a category of Species of Continental Importance does not imply that these species have equally urgent conservation needs as Watch List species or Common Birds in Steep Decline. Rather they are included to bring attention to the large number of species for which stewardship is shared among nations and therefore require international partnership to conserve them throughout their life cycle. As with the list of Common Birds in Steep Decline, these species are more appropriately considered collectively, rather than individually, as groups of species for which increased and strategic international cooperation are needed to maintain sufficient high quality habitat across the continent to sustain shared populations of these species. The Species Assessment Database presents the estimated maximum percent of the global population occurring within each of the three Tri-National Vision countries in the breeding or non-breeding (winter) season (%POP US, %POP CN, and %POP MX, respectively).

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-F 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 or state 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.sararegistry.gc.ca/species/default_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 Ontario 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) can display a table showing the PIF pool of regionally important species for each BCR. Columns of data for each species indicate which of groups A-F the species qualifies for, as well as the breeding season Regional Combined Score. These tables can be sorted by any of these columns, allowing for sorted lists representing different reasons for concern and importance. 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, joint venture, or other planning group, 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

CX (Possibly Extinct)	Species acknowledged as possibly extinct in the wild. Credible sitings of the species have not been reported in recent history. Survey efforts may be warranted to determine if any extant population exists.
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[1], OR continental or regional Stewardship Species that are neither of continental nor regional concern, OR 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 action codes can help planners identify groups of species with similar needs, promoting comprehensive planning to address many needs simultaneously.

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 bird conservation plans developed by Partners in Flight (http://www.partnersinflight.org/bcps/pifplans.htm) and all-bird planning efforts by Joint Ventures and state bird initiatives (http://www.partnersinflight.org/conservation_plans/AllPlans.cfm). 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.

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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.

2004 Watch List: 2004 US-Canada Watch List species (Rich et al.2004).

Action: 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.

AOU_52: Taxonomic sequence of species following the 7th American Ornithologists' Union Check-list through the 52nd supplement (useful for sorting species by taxonomic order).

Agriculture: Major threats due to Agriculture (see *Saving Our Shared Birds: The Partners in Flight Trinational Vision*).

BCR: Bird Conservation Region number.

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

BD-g Area: Breeding Distribution, global range area.

BD-g_com1: Breeding Distribution: global score comment 1.

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

Biome: Avifaunal Biome (per Rich et al. 2004) most important for Continental Stewardship.

CBSD: Common Bird in Steep Decline.

CCS-b: Continental Concern Score, breeding = TB-g + BD-g + PT-c + PS-g.

CCS-nb: Continental Concern Score, non-breeding = TN-g + ND-g + PT-c + PS-g.

CCS-Max: Continental Concern Score, maximum of breeding or non-breeding.

Climate Change: Major threats due to anticipated effects from climate change (see *Saving our Shared Birds:The Partners in Flight Trinational Vision*).

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 52nd supplement.

Contaminents/Exotic Species: Major threats due to Contaminents or Exotic Species Invasions (see *Save our Shared Birds: The Partners in Flight Trinational Vision*).

Ecosystem Modifications: Major threats due to Ecosystem Modifications such as loss of fire, flooding, etc. (see *Save our Shared Birds: The Partners in Flight Trinational Vision*).

Energy and Transportation: Major threats due to Energy and Transportation infrastructure and development (see *Save our Shared Birds: The Partners in Flight Trinational Vision*).

Global Pop Size: Global population size estimate (# individuals).

Introduced?: I = Species introduced (i.e., not native) to North America.

Livestock: Major threats due to inappropriate livstock grazing or related deforestation (see *Save our Shared Birds: The Partners in Flight Trinational Vision*).

Logging / Wood Harvest: Major threats due to unsustainable logging, wood harvest and charcoal operations (see *Save our Shared Birds: The Partners in Flight Trinational Vision*).

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

ND-g Area: Non-breeding Distribution, global range area.

ND-g_com1: Non-breeding Distribution: global score comment 1.

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

nCN: Occurs in Canada (1 = Yes).

nMX: Occurs in Mexico (1=Yes).

nUS: Occurs in U.S. (1 = Yes).

%Pop CN: Maximum percent of global population in Canada in breeding or non-breeding (winter) season.

%Pop MX: Maximum percent of global population in Mexico in breeding or non-breeding (winter) season.

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

% POP_s: Source of information for %POP value (see key to sources below).
%Pop source: Data used to estimate maximum percent of population (Range or Population).

%Pop US: Maximum percent of global population in US in breeding or non-breeding (winter) season.

Primary Habitat: Primary Habitat (see *Saving Our Shared Birds: The Partners in Flight Trinational Vision).*

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

PS-g_com1: Population Size, global score comment 1.

PS-g_com2: Population Size, global score comment 2.

PS-g_com3: Population Size, global score comment 3.

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_com1: Population Trend, continental score comment 1.

PT-c_com2: Population Trend, continental score comment 2.

PT-c_com3: Population Trend, continental score comment 3.

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), regional Population Trend (PT-r), non-breeding Relative Density (RD-n), and regional Threats to Non-breeding (TN-r).

RD-b: Regional Density score (breeding season score)

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

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

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

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

Scientific Name: Scientific name of species according to the 7th edition of the American

Ornithologists' Union Check-list of North American Birds, including changes through the 52nd supplement.

Subst. Shared: substantially shared between countries (Canada, Mexico, USA)

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

TB-c_com1: Threats to Breeding, continental score comment 1.

TB-c_com2: Threats to Breeding, continental score comment 2.

TB-c_com3: Threats to Breeding, continental score comment 3.

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).

TNC: Tri-National Concern species (SGRE=Species at Greatest Risk of Extinction, TBTC=Temperate Breeder of Tri-National Concern, TRMX=Tropical Resident, primarily Mexican, TRMA=Tropical Resident, primarily Meso-American, TRSA=Tropical Resident, primarily South American).

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

TN-c_com1: Threats to Non-breeding, continental score comment 1.

TN-c_com2: Threats to Non-breeding, continental score comment 2.

TN-c_com3: Threats to Non-breeding, continental score comment 3.

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

Trapping / Shooting: Major threats due to illegal trapping and shooting (see *Saving Our Shared Birds: The Partners in Flight Trinational Vision*).

UCS: United States / Canada Stewardship species (Y=yes, blank=no).

UCWL: United States / Canada Watch List (i.e., U.S. / Canada Concern Species) (Y=yes; blank=no).

Urbanization: Major threats due to Urbanization (see *Saving our Shared Birds: the Partner in Flight Trinational Vision*)

Key to sources:

Source	Source details
2005 TB-r	2005 Threats breeding regional score
AB Atlas	Alberto Breeding Bird Atlas
Alberta Atlas	Alberto Breeding Bird Atlas
AFWA Sage- and Columbian Sharp-tailed Grouse Tech Cmte, 2008	Association of Fish and Widlife Agencies, sage and columbian sharp-tailed grouse technical committee, 2008
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
AZPIF	Arizona Partners in Flight
AZ-PIF	Arizona Partners in Flight
AZRC	Arizona Review Committee
BAMP	Boreal Avian Modeling Project (http://www.borealbirds.ca/)
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-07	Breeding Bird Survey (1966-2007), used for global PT scores
BBS-99	Breeding Bird Survey (1990-1999), used for regional RD_B scores
BC Atlas	British Columbia Breeding Bird Atlas
BCR10/17bbs08	Breeding Bird Survey (1966-2008) for Bird Conservation Regions 10 and 17
BCR11/23bbs08	Breeding Bird Survey (1966-2008) for Bird Conservation Regions 11 and 23
BCR12bbs08	Breeding Bird Survey (1966-2008) for Bird Conservation Region 12

BCR22bbs08	Breeding Bird Survey (1966-2008) for Bird Conservation Region 22
BCR23bbs08	Breeding Bird Survey (1966-2008) for Bird Conservation Region 23
Beardmore	Carol Beardmore, U.S. Fish and Wildlife Service
BirdLife Int. 2000	BirdLife 2000. Threatened Birds of the World
Birdlife International	Birdlife International (birdlife.org)
Birds in Europe 2004 + global range	Birds of Europe (Svensson et al. 2004) plus global range (used for estimating BD/ND scores)
Blake	Blake, E.R. 1977. Manual of Neotropical Birds, volume 1. The University of Chicago Press. Chicago and London
Blancher	Peter Blancher, Environment Canada (followed by year assigned, e.g., -08)
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.
Butcher	Greg Butcher, USFS International Program
C Elphick, Uconn, Feb 2008 e-mail	Chris Elphick, University of Connecticut, personal communication email, february 2008
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
CBC-06	Christmas Bird Count analysis through 2006
CBO	Colorado Bird Observatory (Now RMBO - Rocky Mountain Bird Observatory)
CDE	Chihuahuan Desert Experts
CDE 1999	Chihuahuan Desert Experts 1999
CDE 2002	Chihuahuan Desert Experts 2002

Cdn BCR plans	Canadian Bird Conservation Region Plans
CDTT	Chihuahuan Desert Technical Team of the Rio Grande Joint Venture
Chipley	Robert Chipley, American Bird Conservancy
Continental TB Scores	TB-r default to continental TB score
CO BBA 1998	Colorado Breeding Bird Atlas 1998
CO-PIF	Colorado Partners in Flight
Corman	Troy Corman, Arizona Game and Fish
CWS-Atl	CWS-Atlantic Provinces
CWS-ON	Canadian Wildlife Service - Ontario
CWS-ON BCR plan	Canadian Wildlife Service - Ontario BCR plan
CWS-PNR	Canadian Wildlife Service - Prairie and Northern Region
CWS-Quebec	Canadian Wildlife Service - Quebec
Dale	Brenda Dale, Canadian Wildlife Service
Default to global score	Global score used for Regional score; See Global Score database for details on score
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
DOD/USFWS 2006 fact sheet	Dept. of Defense / U.S. Fish and Wildlife Service fact sheet from 2006
Dunn	Erica Dunn, Environment Canada
Easton	Wendy Easton, Canadian Wildlife Service
Falardeau	Gilles Falardeau, Canadian Wildlife Service
Fed Register Vol 71 N 74	U.S. Federal Register Volume 71, Number 74
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
Giocomo	Jim Giocomo, American Bird Conservancy
Global default	Global score default (see species' score in Global database for source info.)
Global Score	Global score default (see species' score in Global database for source info.)
Gomez	Hector Gomez de Silva (Eagle-eye Tours, formerly with National Autonomous University of Mexico - UNAM)
Green	Mike Green, U.S. Fish and Wildlife Service
Gustafson	Mary Gustafson, American Bird Conservancy
Hannah	Kevin Hannah, Canadian Wildlife Service
historical decline	Evidence of past decline based on pre-BBS data sources
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
Hunter 2009	William C. Hunter, U.S. Fish and Wildlife Service, 2009
ID-PIF	Idaho Partners in Flight
International Bicknell's Thrush Conservation Group (2010)	International Bicknell's Thrush Conservation Group (2010)
insufficient coverage	insufficient coverage by survey program to assign score
J Raptor Res 2001	Journal of Raptor Research, Volume 35 (2001), Issue 4. Proceedings from the 2nd International Burrowing Owl Symposium
Jim Johnson	Jim Johnson, US Fish and Wildlife Service
Jones	Stephanie Jones, U.S. Fish and Wildlife Service
Kelsey 2008 TRBL Survey	Rodd Kelsey, Audubon California; Tricolored Blackbird Survey 2008
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

L Goodrich, HMANA, May 2007 e-mail	Laurie Goodrich, Hawk Migration Association of North America (personal communication May 2007)
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
Mex NSAC	Mexican National Species Assessment Committee
Mexican NSAC	Mexican National Species Assessment Committee
Meyer	Ken Meyer, Avian Research and Conservation Institute
Michigan DNR 2008 males x 2	Michigan Department of Natural Resources 2008 survey of singing males (doubled, to account for presumed 1:1 ratio of males:females)
MW-PIF	Midwest Partners in Flight
MWRC	Midwest Review Committee
MXNSAC	Mexican National Species Assessment Committee
MX-NSAC-07	Mexican National Species Assessment Committee, 2007
MX-NSAC-08	Mexican National Species Assessment Committee, 2008
MX-NSAC-09	Mexican National Species Assessment Committee, 2009
MxRange	Range in Mexico
NatGeo 1987	National Geographic Society. 1987. Field Guide to the Birds of North America, 2nd edition. National Geographic Society, Washington, D.C.
Natureserve 3.0	Natureserve Range Maps, version 3.0
NE MX workshop	Northeast Mexico PIF Species Assessment Workshop 2004
NE-G&P	Nebraska Game and Parks
NE-PIF	Northeast Partners in Flight
NL BCR Plan	Newfoundland and Labrador Bird Conservaiton Region Plan
Niemuth	Neal Niemuth, U.S. Fish and Wildlife Service, Bismarck ND HAPET Office
NM-PIF	New Mexico Partners in Flight
No data	No data available
Not Evaluated	Score not evaluated

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
ON 7 BCR Plan	Ontario BCR7 Plan
ON atlas	Ontario Breeding Bird Atlas
onatl	Ontario Breeding Bird Atlas
Ontario 2nd Atlas	Ontario Breeding Bird Atlas II
Panjabi	Arvind Panjabi, Rocky Mountain Bird Observatory
PB	Peter Blancher, Environment Canada
Peregrine Fund Website	http://www.peregrinefund.org/condor_factsheet.asp
Phinney	Mark Phinney, LP Forest Resources Division, LP Corp
PIF BBS-based calculation (followed by year performed; e.g., 2008)	Partners in Flight landbird population estimate based on North American Breeding Bird Survey data (Rosenberg and Blancher 2005)
PIF-ON	Ontario Partners in Flight
PIF-QC	Quebec Partners in Flight
PIFSC-08	Partners in Flight Science Committee, 2008
PIFSC-08 continental	Partners in Flight Science Committee, 2008 Continental Score
PIFSC-09	Partners in Flight Science Committee, 2009
PIFSC-12	Partners in Flight Science Committee, 2012
PIFSC-Dec-08	Partners in Flight Science Committee, December, 2008
PIFTC	Partners in Flight Technical Committee
PIFTC-02	Partners in Flight Technical Committee, 2002
PIFTC-03	Partners in Flight Technical Committee, 2003
PIFTC-05	Partners in Flight Technical Committee, 2005
PIFTC-old	Partners in Flight Technical Committee (old score)
Pulich 1976	Pulich, W .M. 1976. The Golden-cheeked Warbler: A bioecological study. Texas Parks and Wildlife Department, Austin, Texas.
range	Range (Natureserve 3.0) used in estimation
RMBO	Rocky Mountain Bird Observatory
RngG	Global Range

Robichaud	Isabelle Robichaud, Canadian Wildlife Service
Rosenberg	Ken Rosenberg, Cornell Lab. Of Ornithology
Ruffed Grouse Conservation Plan	Ruffed Grouse Conservation Plan (http://ruffedgrousesociety.org/conservation-plan#RG)
Russell	Robert Russell, U.S. Fish and Wildlife Service
Rustay	Christopher Rustay, Playa Lakes Joint Venture
S Crosbie, UC Davis, Feb 2008	Scott Crosbie, University of California - Davis (personal communication Feb 2008)
Scott Morrison	Scott Morrison, The Nature Conservancy
SE-PIF	Southeast Partners in Flight
Shackelford	Cliff Shackelford, Texas Parks and Wildlife
Siegel	Rodney Siegel, Institute for Bird Populations
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.
Spruce Grouse Continental Conservation Plan (Williamson et al 2008)	Spruce Grouse Continental Conservation Plan (Williamson et al 2008)
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.
Tapley et al 2007: WITU status in 2004;	STATUS AND DISTRIBUTION OF THE WILD TURKEY IN 2004; http://www.nwtf.org/NAWTMP/downloads/Literature/Status_Distribution_Wild_Turkey_2004.pdf
TB_r 05	Threats to breeding, regional score, 2005
TB-c	Threats to breeding, continental score
TB-r 05	Threats to breeding, regional score, 2005
TOS Handbook 2004	Texas Ornithological Society Handbook, 2004
TX BBA	Texas Breeding Bird Atlas
USBR	U.S. Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
UT-PIF	Utah Partners in Flight
Vermillion	Bill Vermillion, U.S. Fish and Wildlife Service
White et al. 2002, BNA, upper end	White, C. M., N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine Falcon, Bird of North America No. 660, Poole & Gill, eds., BNA, Phil.

	(upper end of population estimate range)
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