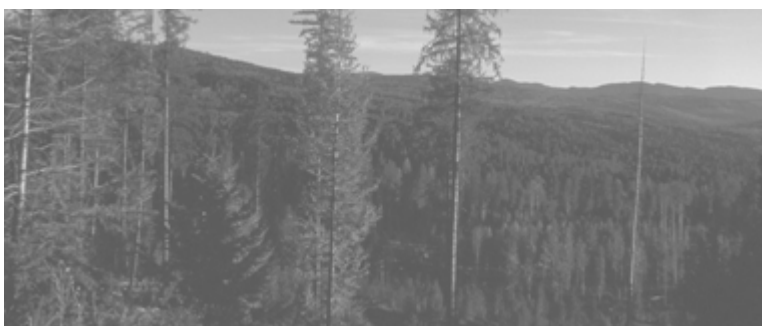


# CANADA'S GREAT BASIN LANDBIRD CONSERVATION PLAN



*Partners in Flight*



British Columbia and Yukon

**PARTNERS IN FLIGHT**  
**BRITISH COLUMBIA/YUKON**  
Version 1.0



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## Citation

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Please cite this document as follows:

**Partners in Flight British Columbia and Yukon. 2003. Canada's Great Basin Landbird Conservation Plan, Version 1.0. Partners in Flight British Columbia and Yukon, Delta, British Columbia, Canada. 100 pp.**

For copies of this plan, please write to:

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## Acknowledgements

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This document is the product of contributions from a wide range of individuals and supporting organizations that share a common interest in landbird conservation. A draft of this document was distributed and significantly improved by a wide range of industry, non-governmental organization, naturalists, academic and government reviewers.

Special thanks are owed to research assistants, Partners and Flight British Columbia and Yukon Steering Committee members and many others who participated in the Partners in Flight planning process including: Barry Booth, Les Bogdan, Dick Cannings, Bruno Delesalle, Myke Chutter, John Deal, Orville Dyer, Cameron Eckert, Bob Elner, Richard Feldman, Les Gyug, Blair Hammond, Trish Hayes, Ralph Heinrich, Rick Howie, Judith Kennedy, Pam Krannitz, Andrew MacDonald, Kathy Martin, Katherine Maxcy, Wendy Nixon, Ken Otter, Mark Phinney, Howie Richardson, Pam Sinclair, Jim Shaver, Jamie Smith and Christianne Wilhelmson.

We are greatly indebted to the Partners in Flight Western Working Group, in particular our colleagues from Washington, Oregon, California, Idaho and Montana. Portions of all their plans appear in this document. We recognize and thank these authors for the immense amount of work that has gone into their respective bird conservation plans (available at <http://www.partnersinflight.org>).

Finally, we wish to thank Christian Artuso, Laure Neish, M. Barry Lancaster, Richard J. Cannings, Steve R. Cannings, Les Gyug, Dana Seaman, John and Karen Hollingsworth, the U.S. Fish and Wildlife Service, Dan Derbyshire, the Rocky Point Bird Observatory, and Andy M. Bezener for the generous donation of their photographs contained within this publication.

# Executive Summary

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## Scope

This plan is intended to help guide and focus landbird conservation in the Canadian portion of the Great Basin Bird Conservation Region (BCR 9), encompassing British Columbia's Southern Interior Ecoprovince. It represents a cooperative effort among a wide range of partners in the region: various levels of government, conservation organizations, industry, landowners and academics interested in landbird conservation. The objectives of this plan are to:

1. Focus bird conservation in an ecologically-based Bird Conservation Region (BCR);
2. Assess all landbird species and their conservation threats within this BCR;
3. Determine priority species and habitats;
4. Set landscape-level population objectives using the focal species approach, and to further development of landscape-level habitat objectives for focal species;
5. Recommend actions to achieve objectives, and outline implementation strategies;
6. Recommend research and monitoring activities to evaluate and improve conservation recommendations.

This document will be gradually improved through experience, improved scientific knowledge, and evaluation of conservation effort.

## Framework

This plan adopts primarily a habitat-based approach, using the biological needs of focal species to help define an 'ideal' landscape. No single species can act as an adequate umbrella for all other species. However, by selecting a group of 'focal species,' each with the most stringent ecological requirements within a given habitat, and using those requirements as criteria to delineate a landscape, it is possible to define a landscape that combines all the ecological characteristics necessary to meet the needs of focal species, as well as those of other wildlife.

This plan identifies priority birds and habitats for conservation within each of four broad habitat classes within the Canadian portion of the Great Basin BCR: Riparian, Grassland/Shrubsteppe, Dry Woodland and Moist Coniferous Forest. From a list of 53 priority species, a total of 25 focal species have been selected as the proposed focus for conservation action.

## Objectives and Recommendations

The proposed conservation objectives and recommendations that form the core of this plan have been derived from the best available science, and are intended to address conservation concerns that threaten regional landbird populations. It is hoped the conservation objectives and recommendations suggested within this plan will serve as the foundation for developing specific conservation strategies to secure healthy ecosystems with viable landbird communities.

Biological objectives provide management targets for planning and implementation, and establish milestones for measuring progress. Population objectives, in general, are stated to achieve stable or increasing population trends, or to maintain or expand distribution of a species. Where suitable data is available, more specific, quantified population objectives are proposed. Habitat objectives relating to required habitat attributes, ecological processes and/or landscape conditions must be developed with local and regional partners for both the landscape-level, and where possible, the site-specific level. Conservation action implemented to achieve these population and/or habitat objectives will require evaluation, including monitoring efforts, to determine if objectives are being achieved.

Since suitable local data is currently unavailable for many of this plan's focal species, both population and habitat objectives are often based on studies conducted elsewhere in British Columbia or from the broader United States portion of the Great Basin. For this reason, improved local research and monitoring efforts designed to test existing data and assumptions are recommended for most focal species.

Both focal species-specific and general conservation recommendations are proposed in the categories of research, monitoring and evaluation, habitat securement, habitat management, restoration and enhancement, outreach and education, and policy and legislation. All recommendations suggested in this plan are proposed as part of an adaptive management process, and should periodically be evaluated and improved if necessary.

## Implementation

Coordination among existing and new partners, political support, public awareness and the allocation of financial resources for this process will be essential for the plan to succeed. Partners in Flight British Columbia and Yukon will facilitate the implementation phase of this plan through a regional steering committee in which regional partners will define their roles and distribution of responsibilities. The main objectives of the regional steering committee will be:

- To identify local initiatives, projects and organizations capable of working as local partners to achieve conservation objectives and recommendations stated in this plan;
- To identify shared priorities for habitat securement, habitat management, research, monitoring and evaluation, and outreach and education;
- To identify site-specific projects, and appropriate groups and organizations to carry out those projects for each of the priority actions;
- To foster the integration of this plan with existing regional and international conservation initiatives, incorporating landbird conservation actions. This could include recovery strategies, management plans for other taxa and development of strategic alliances to identify funding alternatives;
- To define a list of quantifiable achievement indicators for each recommendation which will facilitate regular evaluation of the plan and ensure it is continually adapted and improved.

Among the primary functions of the regional steering committee, two will be integral to the entire process:

- Identification of leading entities for implementation of strategies in each of the four broad habitat classes identified within this plan;
- A plan implementation strategy that will include tasks, responsibilities, timelines, funding sources, and a list of pre-identified potential problems and solutions.

Furthermore, the Canadian portion of the Great Basin BCR forms part of the Canadian Intermountain Joint Venture (CIJV). This new all-bird joint venture proposes to provide opportunity for all local and regional conservation partners to collaborate in effective and coordinated all-bird conservation efforts. Wherever possible, Partners in Flight British Columbia and Yukon will work within the CIJV partnership to achieve shared objectives proposed within this plan.

# Chapter 1

## Introduction

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### What is Partners in Flight?

Partners in Flight ([www.partnersinflight.org](http://www.partnersinflight.org)) is a coalition of countries, government agencies, conservation groups, academic institutions, First Nations, industry, and other citizens who share a common vision: **to maintain the health of bird populations and their habitats**. Partners in Flight was developed in recognition of the fact that effective migratory bird conservation requires international efforts. The Partners in Flight initiative now spans the continent, with active programs in Canada, the U.S., Mexico and Central America. Although international in scope, Partners in Flight advocates a grassroots approach where regions work with local communities to **keep common birds common**. Planning, education and outreach, research, monitoring and applied conservation are the mainstays of its approach. Through Partners in Flight, local involvement and regional data on species trends and management issues are integrated with an international standard for selecting priority species and habitats and to guide conservation actions.

Partners in Flight forms the landbird component of the North American Bird Conservation Initiative (NABCI), a trilateral initiative involving Canada, the U.S. and Mexico. The goals of NABCI include: 1) to achieve regionally-based, biologically-driven, landscape-oriented partnerships delivering the full spectrum of bird conservation across the entirety of the North American continent; 2) to support simultaneous, on-the-ground delivery of conservation for all birds; 3) to facilitate the conservation of all native North American birds, by increasing the effectiveness of programs and initiatives—both existing and new—and enhancing coordination and fostering greater cooperation among the nations and peoples of the continent.

Partners in Flight British Columbia and Yukon ([www.pifbcyukon.org](http://www.pifbcyukon.org)) was formed in 1998 with participants representing academia, conservation groups, consulting firms, industry, local, regional and federal government and interested individuals from across North America. Its mission is “to conserve birds and their habitats in British Columbia and Yukon through multi-interest partnerships”.

#### Goals of Partners in Flight in British Columbia and Yukon:

- Ensure the long-term viability of birds and their habitats throughout their annual cycle;
- Base conservation action on science and traditional ecological knowledge;
- Integrate, evaluate and improve data on status and trends of birds and their habitats;
- Support bird conservation initiatives in management practices, including actions that support other taxa;
- Address issues before birds become endangered;
- Reduce the adverse impact of human activities on birds and their habitats;
- Establish non-traditional working partnerships, both local and international, in the areas of research, monitoring, education, management and conservation;
- Enhance opportunities for communication and education that promote the value of birds and their habitats.

The Canadian portion of the Great Basin Conservation Region (Southern Interior) is the first priority region for Partners in Flight British Columbia and Yukon. This Plan represents the first step towards a collaborative approach for landbird conservation in the region and suggests a framework that guides landbird management, research and conservation.

## Objectives of the Landbird Conservation Plan

The purpose of this document is to set objectives and recommend activities necessary to conserve landbirds and their habitats in the Canada's Great Basin. Although Partners in Flight conservation plans focus primarily on terrestrial bird species, a group that has been under-represented in past conservation initiatives, the objectives listed in this plan are intended to complement the conservation needs of other taxa.

### The specific objectives of this plan are to:

1. Focus bird conservation in an ecologically-based Bird Conservation Region (BCR);
2. Assess all landbird species and their conservation threats within this BCR;
3. Determine priority species and habitats;
4. Set landscape-level habitat and population objectives using the focal species approach;
5. Recommend actions to achieve objectives, and outline implementation strategies;
6. Recommend research and monitoring activities to evaluate and improve conservation recommendations.

This plan was developed for a broad range of government agencies, non-government organizations, naturalists, landowners, industries and academics interested in landbird conservation in Canada's Great Basin. Its purpose is to help guide the research, monitoring, habitat securement, stewardship, education, and communication activities of these groups. This document is the result of consultation with a wide range of local experts and managers and will be gradually improved through experience and evaluation of results.

It is beyond the scope of this document to identify spatially explicit objectives, projects or groups to achieve the objectives set out here. Objectives and projects will be developed and prioritized in collaboration with regional partners through different mechanisms including a regional steering committee. Where possible, these activities will be incorporated within existing ecosystem-level conservation initiatives and programs. Chapter 8 at the end of this plan provides an overview of how this plan will be implemented.



Common Poorwill. Photo: Christian Artuso

### 'Landbirds' are terrestrial-based birds including:

#### ▪ Birds of Prey:

- eagles
- hawks
- falcons
- owls

#### ▪ Upland

#### Gamebirds:

- grouse
- ptarmigan

#### ▪ Songbirds:

- flycatchers
- vireos
- swallows
- jays
- chickadees
- nuthatches
- wrens
- thrushes
- thrashers
- warblers
- tanagers
- buntings
- grosbeaks
- sparrows
- blackbirds
- finches

#### ▪ Other bird groups:

- doves
- pigeons
- woodpeckers
- nightjars
- hummingbirds
- swifts.

## Chapter 2

# The Planning Approach

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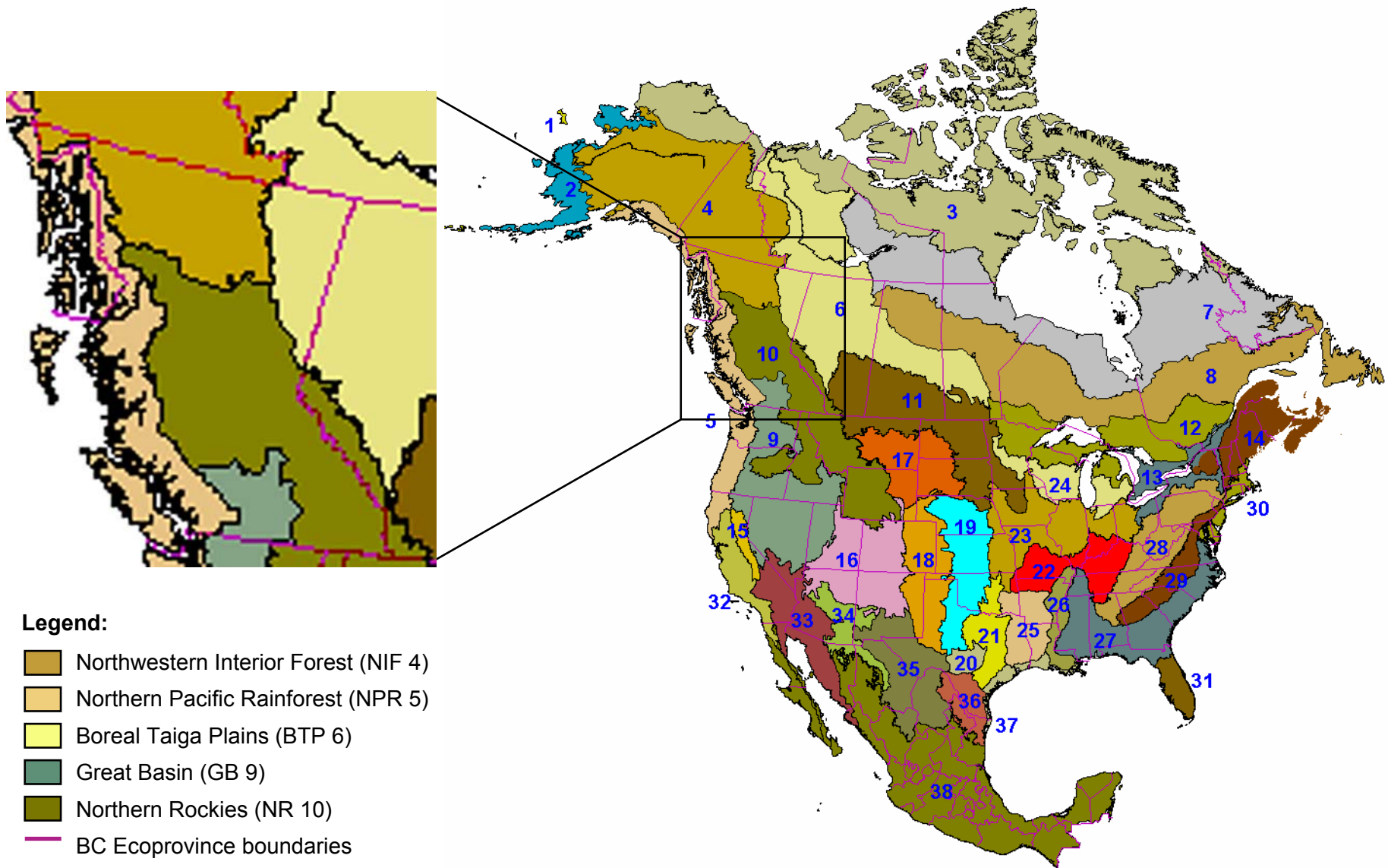
Landbirds include a large number of species with a diverse range of ecological requirements, geographic distributions, ecological threats and management issues. In order to be effective, conservation planning for this bird group must address this variation, but also identify and focus on priority activities and practical and relevant management scales. To accomplish this, Partners in Flight follows international standards to assess species, set priorities and focus conservation efforts within ecologically-based Bird Conservation Regions (Figure 2-1).

### Bird Conservation Regions

Bird Conservation Regions (BCR) are international areas with similar physical features, vegetation, bird communities and habitat-related issues (Bird Studies Canada 2001). As ecologically- vs. politically-based units, BCRs are thought to be most effective at addressing key avian conservation needs, while still providing practical, relevant management units for landscape-oriented actions.

In BC, BCRs follow boundaries of the provincial Ecoregion Classification System (<http://srmwww.gov.bc.ca/ecology/ecoregions/index.html>). The Canadian portion of the Great Basin BCR (i.e., Canada's Great Basin), is one of the four transboundary BCRs found within BC and Yukon (Figure 2-1), and follows the boundaries of BC's Southern Interior Ecoprovince.

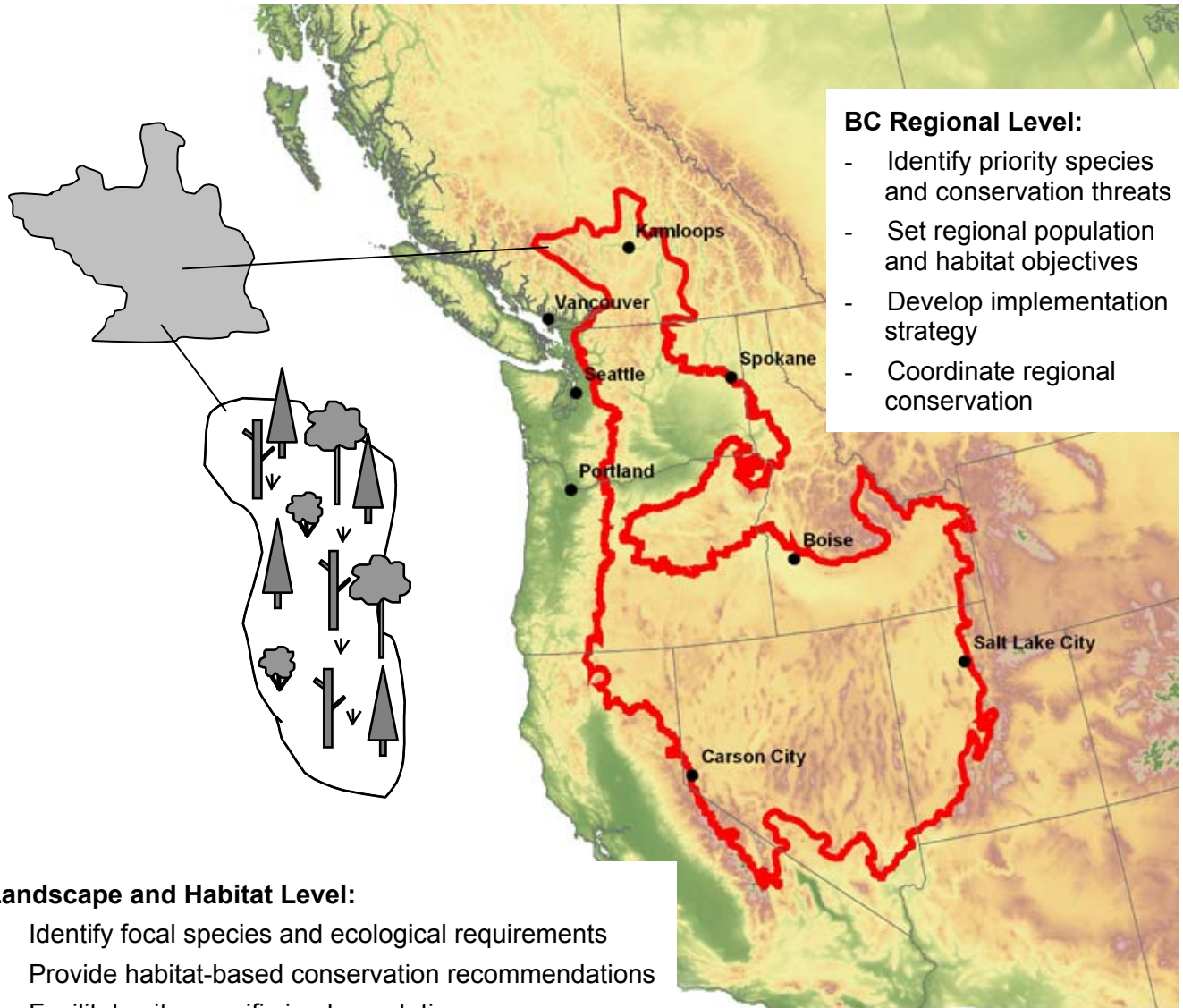
Partners in Flight BC and Yukon conservation plans and activities will function at a variety of scales (Figure 2-2). Many conservation objectives and recommendations will focus on the BC and Yukon portion of each BCR, but are designed to complement, extend and coordinate with bird conservation underway by Partners in Flight in the USA. Broadening our focus and coordinating efforts with neighbouring jurisdictions will help ensure effective and efficient conservation planning and delivery, both within BC and the Yukon Territory and throughout each BCR.



**Figure 2-1. North American Bird Conservation Regions (BCRs), highlighting Bird Conservation Regions within British Columbia, Canada.**

**BCR Level:**

- Identify priority species and conservation threats
- Exchange science and management ideas (e.g. shrubsteppe working group).
- Collaborate on cross-border conservation programs
- Evaluate program success through long-term, broad-scale monitoring of species and habitats.



- BC Regional Level:**
- Identify priority species and conservation threats
  - Set regional population and habitat objectives
  - Develop implementation strategy
  - Coordinate regional conservation

- Landscape and Habitat Level:**
- Identify focal species and ecological requirements
  - Provide habitat-based conservation recommendations
  - Facilitate site-specific implementation
  - Evaluate project success through project-based monitoring.

**Legend**

Great Basin Bird Conservation Region

**Figure 2-2. Geographic scales of Partners in Flight planning and implementation in the Great Basin BCR.**

## Determining Priorities

In 1991, Partners in Flight (PIF) began developing a standardized protocol to assess the conservation status of landbirds in order to help identify regional species and conservation priorities. This protocol (Carter et al. 2000) was reviewed and accepted by scientists of the American Ornithologists' Union (Beissinger et al. 2000), improved by PIF technical committees (Winnipeg, Manitoba, February 2000; The Plains, Virginia, July 2000; Brighton, Colorado, August 2001), and has merged with methods developed by PIF-Canada and the Canadian Wildlife Service (Dunn 1997, Dunn et al. 1999) to create a standard international system. The protocol and revisions are summarised in the Partners in Flight Handbook on Species Assessment and Prioritization Version 1.1 (Panjabi et al. 2001). The priority-setting system is continuing to evolve, especially in determining objective methods to assess species and populations for which monitoring data are poor.

### Criteria For Assessing Species

Landbird species are assessed within each BCR based on seven criteria (Panjabi et al. 2001). These criteria reflect a proactive approach to species assessment by including factors beyond current status so that conservation threats can be addressed before populations reach critical levels.

Each species is assigned a score for each criterion ranging from one (low priority) to five (high priority). The scale at which species are assessed for each criterion may vary. Three criteria (Breeding and Non-breeding Distribution, Relative Abundance) are scored only at a global level (i.e. assigned once per species over its entire distribution), one (Area Importance) is scored only at a BCR level, and the remaining criteria (Population Trend, Threats to Breeding, and Threats to Non-Breeding) may be scored at global, BCR as well as local scales (e.g. British Columbia portion of a BCR).

Panjabi et al. 2001, Carter et al. 2000, Dunn et al. 1999 provide more details on criteria and how species are evaluated. Global and BCR-level scores for species are listed in the Partners in Flight database housed at the Rocky Mountain Bird Observatory (<http://www.rmbo.org/pif/pifdb.html>).

### **Global Scores**

#### **1. Breeding Distribution (BD):**

- Proportion of global range that is covered by a species' breeding range.
- Species with a narrow distribution score higher than those with a broad range as they may be more vulnerable to threats/extinction.

#### **2. Non-breeding Distribution (ND):**

- Proportion of global range that is covered by the smallest area occupied by the species at any given time during the non-breeding season.
- Species with a narrow distribution score higher than those with a broader range.

#### **3. Relative Abundance (AA):**

- Relative abundance of a species is calculated from the average number of individual birds per Breeding Bird Survey (BBS) route, based on all routes on which the species occurred during the 1990's. Only the 10 BBS routes with the highest abundance are evaluated for each species. For species without BBS data, expert opinion is used.
- Less abundant species score higher than more abundant species (e.g. a raptor may score higher than a songbird as it is inherently less abundant throughout its range).

## BCR-level Scores

### 4. Area Importance (AI):

- BCR in which a species population is most concentrated scores highest, regardless of area of the BCR, as these BCRs are thought to have the greatest stewardship responsibility for that species.
- For breeding birds, the BCR with the highest mean number of individuals per BBS route, across all BBS routes in that BCR, is used to derive a maximum abundance value. The mean numbers of birds per route in other BCRs are calculated and assigned a categorical AI score based on the percent of the maximum abundance attained in each BCR. For wintering birds, an analogous method uses Christmas Bird Count data. For resident birds, the highest of the breeding or wintering AI scores are used in assessing priority species.

## Global/BCR/Local Scores

### 5. Population Trend (PT):

- Species with a declining trend are assigned high scores and species with an increasing trend are assigned low scores. Scores also incorporate a measure of data quality based on number of routes and significance of trend.
- Scores are based on population trends from Breeding Bird Survey (BBS) data where possible. BCR and global scores are based on U.S. analyses of 30-year trend, trend scores for the BC portion of a BCR are based on Canadian Wildlife Service analysis of the longest run of available BBS data (Downes et al., 2002) and are scored following methods in Dunn 1997.
- The highest of the BCR and BC portion of BCR scores are used when assessing breeding species. Global scores are used for wintering birds, and occasionally for breeding species if BCR-level BBS data are not available and species show strong global declines.

### 6. Threats to Breeding (TB):

- Projection of the ability of an area to support healthy populations of a species.
- Regional experts assess the expected change over the next 30 years in suitability of breeding conditions for maintaining healthy populations of the species. Threats can include habitat loss and degradation, hunting, ecological sensitivities to parasitism, depredation, contaminants, etc. and flexibility of a species to respond to changing environments.
- Global and BCR scores for each species are obtained from Partners in Flight database (<http://www.rmbo.org/pif/pifdb.html>). Threat scores for the BC portion of a BCR are assigned by regional experts at regional BC workshops (Table 2-1).
- The highest of the BCR and BC portion of a BCR threat scores are used in the scoring process for breeding and resident species (to be conservative and pro-active). Threats are almost always the same or higher the more local they are scored. Global threats for breeding are used for those species that only winter in the BC portion of BCR.



Degradation of habitats used by breeding, migrating and overwintering landbirds occurs in many forms, and in a cumulative context can significantly contribute to landbird population declines. Addressing threats to landbirds and their habitats must be achieved in partnership with a wide range of stakeholders.

Photo: BC MWLAP.

**7. Threats to Non-breeding (TN):**

- Scored in the same manner as threats to breeding for threats during the non-breeding season. For migrant species not present in Canada's Great Basin during the winter, global threats to non-breeding are used.

**Table 2-1. Guidelines for scoring threats\***

Score	Definition
1	Species Enhanced by Human Activity Habitat increasing or stable; potentially a 'problem' species.
2	No Threat e.g. Habitat increasing or stable, or an ecological generalist.
3	Minor to Moderate Threat e.g. Habitat loss/degradation between 1% & 25% or moderate ecological generalist.
4	Severe Threat e.g. Habitat loss/degradation between 26% & 50%, or an ecological specialist.
5	Extreme Threat e.g. Habitat loss/degradation between 51% & 100%, or an extreme ecological specialist.

\*as presented at Canada's Great Basin Workshop, Kelowna, BC, March 2000.

**Additional Criteria:**

- Responsibility by Population (RP): based on the percent of a species' total population present in a BCR. Species may be assessed as a priority within a BCR if their percent population score is above a BCR-specific threshold. This threshold reflects the size of the BCR, thus, unlike the Area Importance score which is relative and area independent, RP reflects the size of a given region. For species sampled by BBS in the Great Basin BCR:

$$RP_{GB\ BCR} = \frac{(\text{Relative Abundance}_{GB\ BCR} * \text{Great Basin BCR Area})}{\sum_{\text{ALL BCRs}} (\text{Relative Abundance}_{BCR} * \text{BCR Area})}$$

- Provincial and national 'at risk' status.
- Local discretionary species or species of local management interest.

**Process For Selecting Priorities**

We use the criteria described above to assess each native landbird species regularly present in Canada's Great Basin (Figure 2-3). The assessment process (Panjabi et al. 2001) combines the criteria in several ways, to assess a species' vulnerability and a region's stewardship responsibility for conservation of a species (also see Dunn 1997, Dunn et al. 1999).

After the initial pool of priority species is created, regional experts at the Partners in Flight workshop in Kelowna, BC (March 2000) reviewed and adjusted the list (see Chapter 3 for a final list of priority species). We consider review by regional experts a critical step in finalizing the priority list of species as many of the assessment criteria are based on limited data and regional conservation issues may not be apparent.

Priority species habitats identified within this plan are based on habitat associations documented in literature, and in some cases, additional anecdotal information provided by regional experts. Habitats containing a relatively large number of priority species may then be considered a higher priority for conservation than those with fewer priority species. Requirements of a subset of the priority species (focal species) are then used to help guide conservation activities within habitats (see below).

## What Does Priority Status Mean?

It is critical to note that not all priority species will require immediate conservation attention. PIF assessments are proactive and may identify common species as priorities due to regional stewardship responsibility, future threats and breadth of range. If populations are considered secure, continued long-term monitoring will be recommended to ensure populations remain secure. Priority species with declining populations or distributions, high threats or vulnerability and/or unknown population status will be considered for further conservation action. Some of these species may be selected as focal species (see below), and their habitat needs used to help guide management recommendations (Figure 2-4).

## Linking Priority Species with Conservation

### The Focal Species Approach

PIF BC and Yukon uses the focal species approach (Lambeck 1997) to set biological objectives and link priority species with specific conservation recommendations. It is a multi-species approach in which the ecological requirements of a suite of focal species are used to define an “ideal landscape” to maintain the range of habitat conditions and ecological processes required by landbirds and many other taxa (Figure 2-3, 2-4). Focal species are considered most sensitive to or limited by certain ecological processes (e.g. fire or nest predation) or habitat attributes (e.g. patch size or snags) (Figure 2-3, 2-4). The requirements of a **suite** of focal species are then used to help guide management activities. For those species that clearly possess unique requirements (e.g. burrowing owl), we also include species-specific objectives and recommendations as appropriate.

### Selecting Focal Species

PIF selects focal species by grouping priority species according to potential limiting factors or threats (e.g. habitat loss, changes in fire regime etc.) within each habitat category. The species thought to be most sensitive to or having the most stringent ecological requirements for the particular factor is usually identified as the focal species.

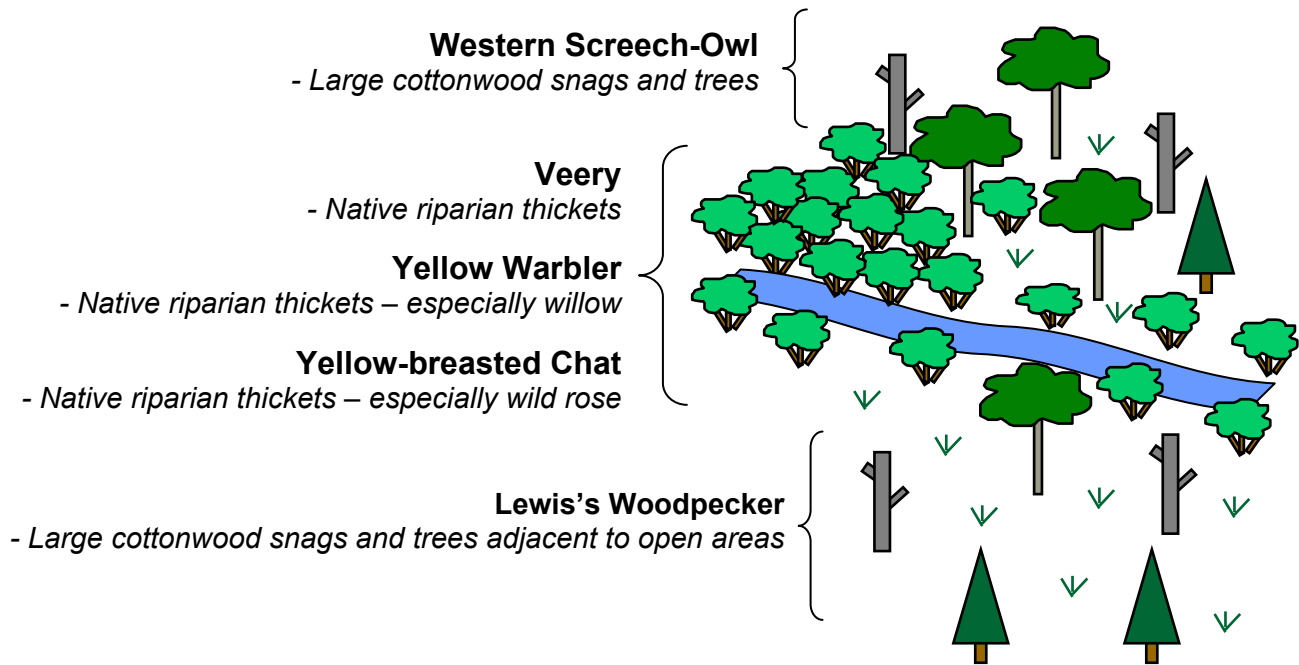
The following criteria are generally considered when selecting focal species:

- Strong requirement or sensitivity to a limited or threatened habitat feature or ecological process, requirements are more stringent than and encompass those of other species;
- Relatively common breeder throughout habitat and region to allow for adequate sampling to monitor and evaluate conservation actions. Species that cannot be monitored effectively (e.g. some at risk species) may be paired or replaced with more abundant or widespread species with similar ecological requirements;
- Actual or perceived decline in population or historic breeding range, indicating the need for action to ensure persistence.
- Together, the suite of focal species in all habitats should represent the full range of successional stages, spatial and habitat attributes, and management regimes representative of a healthy ecosystem.



Some at-risk “Priority Species” like the Burrowing Owl are no longer common enough to be effective “Focal Species” (Photo to right: Christian Artuso). Other priority species like the Rufous Hummingbird may not be selected as focal species because their needs are already represented by one or more other selected focal species (Photo to left: Andy M. Bezener).





**Figure 2-3. Example of the focal species approach applied to lowland riparian habitat in Canada's Great Basin.** The needs of this suite of focal species are used to help guide conservation recommendations for lowland riparian habitat.

## Setting Conservation Objectives

### *Population Objectives*

Once identified, the needs of focal species are used to set population and habitat objectives and recommend conservation activities (Figure 2-3). Population objectives will reflect our current knowledge of the population status of each species (Appendix 4). Qualitative trend or distribution objectives (e.g. stabilize and reverse declining trend) are often more appropriate than quantitative population size objectives, as data on population status, habitat capability, demographics and viability are limited for most species.

### *Habitat Objectives*

Habitat objectives and corresponding management recommendations are based on the best available knowledge of the requirements of focal species. The underlying assumption is that managing for a suite of focal species, each of which have the most demanding requirements, the needs of other priority species and the larger landbird community may be met. Objectives and recommendations provide general information on the composition, structure, quantity and distribution of habitat patches thought necessary to achieve population objectives. However, the purpose of this document is not to provide site-specific, quantitative management prescriptions and best management practices. Such information will vary markedly across Canada's Great Basin, and will be done in close consultation with local stakeholders and land managers.

## Evaluation of Conservation Action and the Focal Species Approach

Proper evaluation and adaptive management are keys to any successful conservation strategy. All conservation activities should be tracked and conducted in conjunction with effective habitat and species monitoring programs to determine if recommendations were implemented, and if biological objectives were met (Figure 2-3). In Chapter 3 we provide general recommendations for designing such programs and for using research and monitoring results to re-evaluate and improve conservation activities.

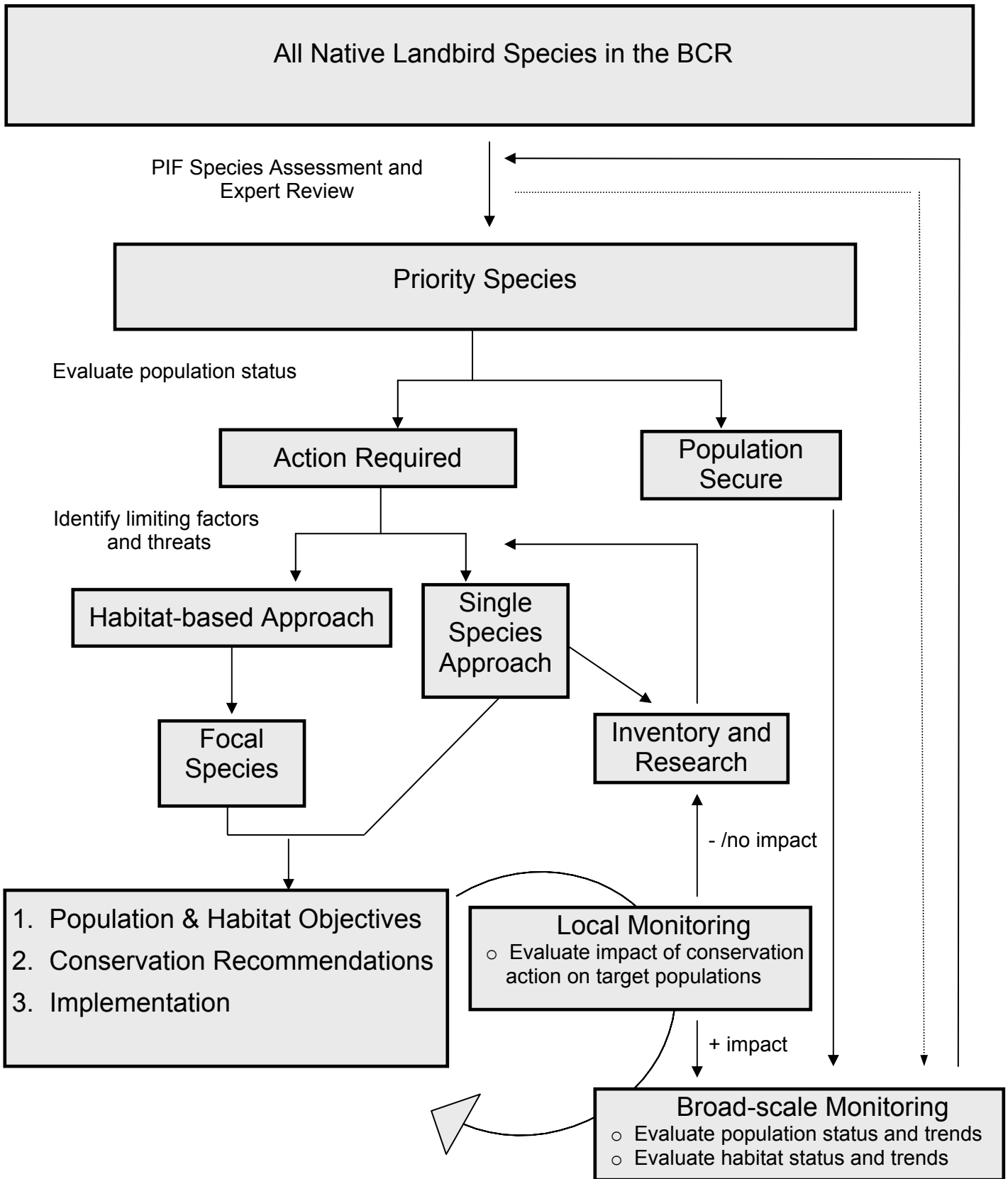
In addition to the above, the focal species choices and overall effectiveness of the focal species approach also require evaluation. The focal species approach is advantageous in that it addresses a broad range of ecological conditions, processes and scales; documents and links species with specific threats and habitat needs; and provides a systematic framework for deriving and evaluating tangible management recommendations. However, like all such planning approaches, it is not without flaw, and is best viewed as a hypothesis to be tested (see Lindenmayer et al. 2002, Hannon and McCallum 2003).

Data on factors limiting landbird populations are extremely limited and it is possible that focal species identified do not possess the most demanding requirements, nor may they effectively encompass the needs of other species. Therefore, we recommend that management activities and approaches vary across the landscape, monitoring programs measure the response of both focal species and the larger landbird community, and that focal species and the efficacy of the focal species approach itself are re-evaluated as data become available.



Evaluation of conservation planning and implementation efforts will be an essential and ongoing component of PIF BC/Yukon's Great Basin Program.  
Photos: Andy M. Bezener; Map: British Columbia Ministry of Environment, Lands and Parks 1999.





**Figure 2-4. Partners in Flight process for assessing priorities, setting objectives and evaluating success.**

## Chapter 3

# Conservation of Canada's Great Basin

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### The Region

The Great Basin is a vast, arid, cold northern desert extending south from south-central British Columbia through portions of six states: central and southeastern Washington, central and southeastern Oregon, southern Idaho, northeastern and east-central California, most of Nevada and western Utah (Bird Studies Canada 2001). The region's dryness is due to its position in the rainshadow between the Cascade Range and the Sierra Nevada to the west and the Rocky Mountains of the Continental Divide to the east (Brussard et al. 1995; Bird Studies Canada 2001). Most precipitation in the Great Basin falls in the form of snow during the winter months. Harsh, cold winters and hot, dry summers with high evaporation rates support the domination of drought-tolerant grasses and shrubs. Sagebrush in particular dominates flat lowlands and plateaus, with dry piñon-juniper woodlands and open ponderosa pine/Douglas-fir forests on higher, moister slopes. Moister coniferous lodgepole pine, spruce and subalpine fir forests, typical of northern montane-boreal forests, occur at higher elevations, particularly on moister and cooler north-facing slopes and at higher latitudes (Bird Studies Canada 2001).

The cumulative impacts of agricultural conversion, including sagebrush eradication programs, widespread overgrazing by livestock, urban development, altered fire regimes and invasion of non-native plants have severely degraded the integrity of natural Great Basin landbird habitats. As a result, a number of Great Basin habitat and ecosystem types have been identified as critically endangered by federal, state and provincial authorities (Ritter 2000).



British Columbia's Southern Interior Ecoprovince represents the Canadian portion of the Great Basin Bird Conservation Region where moist montane-boreal communities converge with semi-arid Sonoran Desert communities. Dominant physiographic features of the ecoprovince include higher-elevation mountains and plateaus (e.g. the Pavilion Ranges, eastern slopes of the Coast Mountains, Thompson Plateau) and prominent lowland valleys and basins (e.g. Okanagan and Similkameen,

Nicola and Thompson valleys), which serve as reservoirs for semi-arid grasslands, shrubsteppe and dry woodland communities (Lloyd et al. 1990; BC Ministry of Water, Land and Air Protection 2001). It is characterized by three dominant biogeoclimatic zones: the semi-arid Bunchgrass Zone, confined to low elevation basins and dry lower-elevation slopes, and characterized by a dominant cover of drought-tolerant perennial grasses, shrubs and forbs; the Interior Douglas-fir Zone distributed along low- to mid-elevation plateau slopes, and dominated by open- to closed-canopy Ponderosa Pine and Interior Douglas-fir woodlands; and the Montane Spruce Zone, located on plateaus at higher elevations, and dominated by coniferous forests of lodgepole pine and white/hybrid spruce (Lloyd et al. 1990; BC Ministry of Water, Land and Air Protection 2001). Other zones which contribute toward the high biodiversity of the ecoprovince include: the moist coniferous Engelmann Spruce–Subalpine Fir Zone, occurring at higher elevations among plateaus and highlands; the Alpine Tundra Zone, confined to the highest slopes of the Okanagan and Clear mountain ranges; the Ponderosa Pine Zone, interspersed among mid-elevation slopes above large, dry basins; and the moist Interior Cedar–Hemlock Zone, distributed among upper slopes in the northeastern portion of the ecoprovince (BC Ministry of Water, Land and Air Protection 2001; Lloyd et al. 1990).



**Figure 3-1. Canadian Portion of the Great Basin Bird Conservation Region (BCR 9).**

## Priority Species in Canada's Great Basin

Regional experts gathered at the Partners in Flight Workshop in Kelowna (March 2000) to identify 51 priority landbird species (out of 173 regularly occurring landbirds) and associated habitat needs within each of four broad habitat classes in Canada's Great Basin (Table 3-1).

**Table 3-1. Priority landbirds in Canada's Great Basin.**

(Focal species in **bold**. Priority species requiring specific action in *italics*.)

<u>Riparian</u>	<u>Grassland</u>
<i>Peregrine Falcon</i> <sup>1, 2</sup>	<i>Swainson's Hawk</i> <sup>2</sup>
<b>Western Screech-Owl</b> <sup>1,2</sup>	<i>Ferruginous Hawk</i> <sup>1,2</sup>
<i>Vaux's Swift</i>	<i>Prairie Falcon</i> <sup>2</sup>
<i>White-throated Swift</i> <sup>2</sup>	<b>Sharp-tailed Grouse</b> <sup>2</sup>
Rufous Hummingbird	<i>Greater Sage Grouse</i> <sup>1, 2</sup>
<b>Lewis's Woodpecker</b> <sup>1,2</sup>	<b>Long-billed Curlew</b> <sup>1,2</sup>
<b>Red-naped Sapsucker</b>	<i>Barn Owl</i> <sup>1,2</sup>
<b>Pacific-slope Flycatcher</b>	<i>Short-eared Owl</i> <sup>1,2</sup>
<i>Northern Rough-winged Swallow</i>	<i>Burrowing Owl</i> <sup>1,2</sup>
<b>Veery</b>	<i>Sage Thrasher</i> <sup>1,2</sup>
<b>Yellow Warbler</b>	<b>Brewer's Sparrow</b> <sup>2</sup>
<b>Yellow-breasted Chat</b> <sup>1,2</sup>	<b>Lark Sparrow</b> <sup>2</sup>
	<b>Grasshopper Sparrow</b> <sup>2</sup>
	<b>Bobolink</b> <sup>2</sup>
<u>Dry Woodland</u>	
American Kestrel	<b>Western Meadowlark</b>
<b>Flammulated Owl</b> <sup>1,2</sup>	
Common Poorwill	<u>Moist Coniferous Forest</u>
<b>Calliope Hummingbird</b>	<b>Blue Grouse</b>
White-headed Woodpecker <sup>1,2</sup>	Spotted Owl <sup>1,2</sup>
<b>Lewis's Woodpecker</b> <sup>1,2</sup>	<b>Boreal Owl</b>
Gray Flycatcher <sup>2</sup>	Black Swift
Dusky Flycatcher	<b>Williamson's Sapsucker</b> <sup>2</sup>
Mountain Chickadee	<b>Black-backed Woodpecker</b>
Rock Wren	<b>Olive-sided Flycatcher</b>
Canyon Wren <sup>2</sup>	<b>Hammond's Flycatcher</b>
<b>Chipping Sparrow</b>	Cassin's Vireo
Lazuli Bunting	Golden-crowned Kinglet
Cassin's Finch	MacGillivray's Warbler

<sup>1</sup> – COSEWIC-listed (extirpated, endangered, threatened or special concern) (May 2003)

<sup>2</sup> – Red/Blue-listed (British Columbia Conservation Data Centre 2003)

Following the Kelowna workshop, regional experts in Canada's Great Basin identified suitable suites of focal species and their related conservation focuses.

**Table 3-2. Conservation focuses for Canada's Great Basin.**

	Habitat	Conservation Focuses	
		Habitat Conservation Focuses	Focal Species
Riparian	Lowland Riparian	Large cottonwood trees and snags.	<ul style="list-style-type: none"> <li>• Lewis's Woodpecker</li> <li>• Western Screech-Owl</li> </ul>
		Native deciduous shrub cover: <ul style="list-style-type: none"> <li>- moist, shady shrub understory</li> <li>- willows and water birch</li> <li>- wild rose thickets.</li> </ul>	<ul style="list-style-type: none"> <li>• Veery</li> <li>• Yellow Warbler</li> <li>• Yellow-breasted Chat</li> </ul>
	Montane Riparian	Deciduous trees and snags, especially aspen, birch, small cottonwoods and alder.	• Red-naped Sapsucker
		Moist and shady low- to mid-elevation riparian habitat.	• Pacific-slope Flycatcher
Grassland	Grassland	Flat native bunchgrass-dominated grassland with little or no shrub cover, and connected to wetlands or seepages.	• Long-billed Curlew
		Native bunchgrasses with little or no shrub cover.	• Grasshopper Sparrow
	Grassland-Shrubsteppe	Large areas of bunchgrass-dominated grassland or shrubsteppe with flat, exposed areas and scattered tree copses and woodlands.	• Sharp-tailed Grouse
		Native bunchgrasses with moderate to no shrub cover.	• Western Meadowlark
		Low elevation shrubsteppe, especially antelope brush, tall sagebrush and early seral sites with open, sparse understory.	• Lark Sparrow
	Shrubsteppe	Large areas of big sagebrush with forb rich understory.	• Brewer's Sparrow
	Agricultural Fields	Moist, tall grassy meadows and hayfields left fallow or with delayed harvest.	• Bobolink

**Table 3-2. Conservation focuses for Canada's Great Basin, con't...**

	Habitat	Conservation Focuses	
		Habitat Conservation Focuses	Focal Species
<b>Dry Woodland</b>	Dry Woodland	Open, mature to old multi-layered stands of ponderosa pine/Douglas-fir forest with: - large snags - patches of dense regenerating conifers.	• Flammulated Owl
		Flowering understory vegetation within open, mature stands of ponderosa pine/Douglas-fir forest.	• Calliope Hummingbird
		Snags within open, mature stands of ponderosa pine/Douglas-fir forest.	• Lewis's Woodpecker
		Shrubs and regenerating conifers in or adjacent to open dry woodland stands, greater than 10 km from cattle yards, tables, or other potential cowbird feeding sites.	• Chipping Sparrow
<b>Moist Coniferous Forest</b>	Moist Coniferous Forest	Open coniferous forests, and adjacent grasslands, meadows and clearings with productive forb, grass and shrub layers.	• Blue-Grouse
		Large, unfragmented tracts of old-growth moist coniferous forest with snags containing cavities.	• Boreal Owl
		Large diameter snags and mature, western larch dominated forests.	• Williamson's Sapsucker
		Unsalvaged recent burns and mature to old conifer stands with abundant beetle prey. Maintenance of natural disturbance regimes.	• Black-backed Woodpecker
		Tall trees and snags, especially adjacent to clearings, moist sites, and recent burns with abundant insect prey.	• Olive-sided Flycatcher
		Large, tall trees, multiple canopy layers with openings in the sub- and mid-canopy in moist forest sites and edges.	• Hammond's Flycatcher

## General Conservation Recommendations

The following is a list of general conservation recommendations which could benefit all or many of the priority species and associated habitats identified throughout this document (habitat- and/or species-specific versions of some of these recommendations appear in latter sections). Implementation of these general recommendations will serve to advance the Partners in Flight Initiative in Canada's Great Basin by:

- 1) building productive partnerships with local and regional organizations.
- 2) integrating bird conservation priorities and on-the-ground projects across jurisdictional boundaries, including international boundaries.
- 3) raising the profile of birds, bird habitats and bird conservation issues within local communities.

Table 3-3 provides a list of general characteristics of high-quality sites that may be used to identify priority sites for landbird conservation.

### **Research, Monitoring and Evaluation:**

- Increase knowledge of the ecology of priority landbird species to determine their conservation needs, including critical habitat components, responses to land uses, and the effects of abiotic environmental factors (e.g., climate change, drought, contaminants) on the regulation of priority bird populations.
- Compile existing regional occurrence records and research on all priority species and their habitat requirements.
- Map and/or model priority species habitats in Canada's Great Basin.
- Quantify threats against priority birds and habitats.
- Monitor and periodically assess the status and population trends of priority landbird species.
- Determine if patch size, configuration and connectivity of protected areas and other areas managed for landbirds adequately support priority species.
- Evaluate ability of focal species to represent the needs of viable populations of all landbird species.
- Design monitoring and research programs to effectively evaluate population status of landbirds before and after conservation action. Examine the efficacy of management actions to improve the productive capacity of habitats for priority landbirds.
- Ensure protocols for project-based monitoring are consistent and comparable with broad-based, longer-term monitoring used to evaluate the status of all landbirds
- Incorporate measures of vital rates (productivity, recruitment, survivorship, emigration, immigration) into monitoring and research programs to determine underlying mechanisms of population change, evaluate quality of habitat and evaluate effectiveness of conservation action.
- Using knowledge collected from the above mentioned programs or projects, develop quantitative objectives for all habitat types at a broad scale and specific quantitative objectives for all habitat conservation focuses.

**Habitat Securement:**

- Ensure no net loss of priority habitats (including permanent conversion or degradation that compromises ecological integrity).
- Identify and prioritize areas for increased protection.
- Assist with securement of new protected areas and conservation lands including: National Wildlife Areas, Provincial and National Parks, Wildlife Management Areas, Ecological Preserves, Riparian Reserve Zones, Lakeshore Management Areas, Wildlife Habitat Areas, Important Bird Areas, municipal and private bird sanctuaries, conservation land trusts and conservation easements/covenants.
- Encourage enforcement of 'wildlife only zones' within sensitive areas (e.g., nesting areas).
- Assist interested First Nations and Indian Bands to develop formal habitat protection initiatives.

**Habitat Management, Restoration and Enhancement:**

- Identify and prioritize areas requiring habitat management, restoration or enhancement.
- Assist with management of protected areas and conservation lands for priority species and habitats.
- Restore and/or maintain connectivity between priority habitat patches.
- Prevent and control invasion of exotic vegetation.
- Eliminate or minimize use of chemical pesticides in or adjacent to priority habitats, especially where there is potential for drift, runoff or leaching into water sources.
- Reduce the risk of nest predation and brood parasitism in areas managed for susceptible priority landbirds.

**Outreach and Education:**

- Increase community support of, and participation in landbird and habitat conservation opportunities. Encourage landowners and land managers, in particular, to participate in habitat protection, restoration and management opportunities.
- Develop, or expand and distribute existing outreach materials that explain the benefits of landbird and habitat conservation measures.
- Support development and implementation of cooperative extension research projects, education programs and workshops, and demonstration/pilot projects that showcase and promote the economic benefit of alternative management strategies and practices that benefit landbirds.
- Educate members of local communities to identify priority landbirds, priority habitats, critical habitat attributes and key ecological processes.
- Train and recruit skilled bird surveyors to conduct volunteer landbird monitoring surveys.

### **Policy and Legislation:**

- Work with municipal and provincial governments to develop and implement regional growth and development strategies to ensure adequate protection of landbirds, priority habitats, critical habitat attributes and key ecological processes.
- Participate in development and implementation of existing regional Land and Resource Management Plans to ensure adequate protection of landbirds, priority habitats, critical habitat attributes and key ecological processes.
- Support development of conservation incentive programs.
- Continue consultation with provincial foresters, range officers, range ecologists, agrologists, growers and other land managers to explore how Agriculture, Forest and Range Use Plans could be modified to include landbird priorities.
- Encourage the coordination of road development planning and implementation among industries and user groups. Encourage future de-activation of temporary access roads.



Photo: Andy M. Bezener

**Table 3-3. General characteristics of high-quality landbird conservation sites:**

- High abundance, productivity, survival, and richness of priority landbirds, especially focal species;
- High productivity and survival of priority landbirds with threatened or endangered status
- Large habitat areas with a high interior to edge ratio;
- Areas with a high proportion of connectivity to adjacent patches of priority habitat, especially adjacent patches managed for landbird conservation;
- Unimpaired natural ecological processes (e.g., natural hydrology ), or high potential to restore natural ecological processes;
- High feasibility for successful long-term conservation management;
- Absence of noxious weeds, and minimal potential for future weed invasion;
- Buffered from facilities and pastures that attract, and provide foraging for, Brown-headed Cowbirds;
- Buffered from existing or planned urban developments;
- Buffered from areas treated with pesticides that potentially lower the productivity and survival of landbirds.

## Chapter 4

# Conservation of Riparian Landbirds and Habitats

Riparian areas are interfaces between the aquatic and terrestrial ecosystems (Gregory et al. 1991). As an ecotone between aquatic and upland ecosystems, riparian areas have a unique microclimate, higher productivity (e.g., greater vegetation growth), and increased moisture availability compared to upland habitat or other terrestrial communities. These environmental conditions result in a structurally complex and diverse vegetation community typified by deciduous hardwood trees, high shrub cover, and relatively high densities of large snags (Patten 1998; Bunnell et al. 1999). Due to their association with watercourses, riparian areas tend to be linear and continuous features and are considered a key component in creating connectivity within a landscape (Knopf and Samson 1994).

Riparian areas are recognized as critical habitat for maintaining biological diversity and integrity. Although riparian habitat makes up less than 1% of North America's landmass, over 80% of the vertebrate species in a landscape are dependent on or regularly use riparian areas (Knopf 1985, Bunnell and Dupuis 1993). Numerous studies have demonstrated the importance of riparian habitat to landbird species in terms of greater abundance and diversity of species in comparison to upland habitat (Emmerich and Vohs 1982; Gates and Giffen 1991). For example, the multi-layered vegetation provides habitat for ground, shrub, and canopy nesting birds. Hardwoods, often restricted in their distribution to the riparian zone, are generally preferred nesting habitat for cavity nesting birds (e.g. Harested and Keisker 1989). Further, high densities of insectivorous birds (both canopy and ground-dwelling foragers) are found in riparian areas because of the abundant insect fauna that feed on the leaves and litter of the deciduous trees (Mueggler 1985; Bunnell et al. 1999). Many of these attributes may also make riparian areas attractive to landbirds during fall migration (Wiebe and Martin 1998) or as over-winter habitat in temperate regions. Although riparian areas cover a small percentage of the landbase, the structural and compositional diversity of vegetation in these zones create a variety of niches for landbirds.

The value of riparian habitat to wildlife is likely highest in arid regions (McGarigal and McComb 1992), such as Canada's Great Basin, where water availability is also a limiting factor for humans. Much of the riparian and wetland habitat in this region has been lost or degraded as a result of development, agriculture, grazing, timber harvest, mining hydroelectric projects and recreational use. In the south Okanagan Valley, for example, 85% of valley-bottom riparian habitat has been lost due to development and flood control with riparian and wetland habitat and is now reduced to less than 4% of the land area (British Columbia Ministry of Environment 1999). Riparian vegetation associated with floodplains evolved with a high degree of disturbance in flooding. Channelization and water regulation serve to control water levels and prevent flooding. This may allow for a new suite of plant species to invade these historical floodplains due to the altered disturbance regime, eliminating the deciduous component of the riparian areas.



Flood control measures including river channelization can contribute significantly toward degradation of natural riparian communities.

The presence of livestock has many potential effects on riparian zones that may have direct or indirect effects on birds. Livestock may reduce or eliminate the native vegetation through grazing, browsing and trampling directly affecting habitat availability for birds (Ammon and Stacey 1997; Powell et al. 2000). Indirect effects may be in the form of increased rates of predation or nest parasitism on disturbed sites (Goguen and Mathews 2000). Aspen habitat has been heavily grazed in the past and is likely severely altered from original condition (Meidinger and Pojar 1992). Both fire suppression and overgrazing limit the recruitment of young trees (Dobkin et al. 1995), therefore mature trees die and are not replaced. This may be of particular significance for cavity nesting birds due to their preference for deciduous trees, but particularly aspen for nesting (Harestad and Keisker 1989).

Two general riparian habitat categories relevant to focal landbirds are identified and described below: **lowland riparian** and **montane riparian**.

### Lowland Riparian

This riparian habitat type is associated with low-velocity flows, floodplains and gentle topography below 600 meters elevation. The lowland riparian zone is highly productive resulting in a complex structure with a canopy, subcanopy and a dense understory layer of shrubs and herbs. Common canopy species that characterize lowland riparian areas include black cottonwood, trembling aspen, paper birch and willows. The shrubby understory may include wild roses, red-osier dogwood, common snowberry, Douglas maple and waterbirch. The diverse herb layer may include pinegrass, star-flowered false Soleman's seal, asters, horsetails or poison-ivy. In areas where grasslands dominate, lowland riparian areas may be the only source of large trees and snags for several kilometres, providing habitat for species, such as cavity-nesting birds that would otherwise not be present. For example, the highest density of nesting Lewis's Woodpeckers is found in lowland riparian areas in the Okanagan Valley, compared with coniferous forests in the same area (Cannings et al. 1987).



A portion of the less than 15% of natural lowland riparian habitat remaining along the South Okanagan River (above), and the extent of floodplain development along a channelized portion of the same river and adjacent oxbow (below).

Photos: Andy M. Bezener

### Montane Riparian



Montane riparian areas occur at a wide range of elevations up to timberline. Montane riparian habitats are typically found in narrow canyons, drainages or in mountain meadows associated with lakes, ponds, seeps, bogs meadows, rivers, streams and springs. Mature seral stands usually consist of a combination of conifer species (e.g., interior Douglas-fir, lodgepole pine, hybrid spruce, western hemlock, western red-cedar), often interspersed by scattered patches of deciduous trees and shrubs. In some areas, however, particularly in early seral stands, aspen forms the dominant canopy cover creating purely deciduous stands or copses. Montane riparian stands may be quite dense with an open shrub layer of red-osier dogwood, thimbleberry, common snowberry and black gooseberry, and at wetter sites, willows and sedges. There is a diverse community of herbs present.

Riparian fencing can contribute to restoration efforts by excluding livestock from degraded montane riparian habitats like this aspen riparian stand.

Photo: Andy M. Bezener

The characteristic plant communities associated with montane riparian areas shift with increasing elevation and latitude, and become increasingly similar to the upland vegetation community (Patten 1998; Gyug 2000). While plant community composition may converge, riparian areas maintain greater structural diversity (e.g., higher densities of large snags) compared to the adjacent upland. This may benefit some bird species, such as cavity-nesting birds (Gyug 2000). Aspen stands in particular tend to have high structural diversity, providing habitat for canopy, shrub and ground nesters (Muegler 1985). Where present, aspen itself is preferred habitat by cavity-nesting birds due to its decay pattern and shorter life span as compared to conifers (Jones and DeByle 1985). Pure deciduous or mixed stands also support high insect density, important for insectivorous birds (Keisker 1987).

## Priority Landbirds

Twelve priority riparian landbirds have been identified in Canada's Great Basin (Table 4-1). Five of these species are also considered priorities in other portions of the Great Basin (4 in Washington/Oregon, 3 in Idaho, 3 in Nevada and 3 in California). Seven are considered focal species in Canada's Great Basin, representing a wide range of habitat conservation focuses in priority riparian habitats (Table 4-2). Four priority landbirds have been identified as species requiring conservation action, but have special ecological requirements or conservation needs that preclude them from serving as focal species. Finally, Rufous Hummingbirds will benefit from conservation action for the focal species and do not appear to require additional actions at this time (current Breeding Bird Survey data indicates numbers are increasing in Canada's Great Basin) other than monitoring to ensure their continued viability. Continued and improved long-term monitoring is required for all priority riparian landbirds.

**Table 4-1. Priority riparian landbirds of Canada's Great Basin.**





Focal Species	Species Requiring Specific Action		Monitor Only
<b>Western Screech-Owl</b>	Peregrine Falcon	<i>Implement Recovery Plan</i>	Rufous Hummingbird
<b>Lewis' Woodpecker</b>	Vaux's Swift	<i>Assess status &amp; needs</i>	
<b>Pacific-slope Flycatcher</b>	White-throated Swift	<i>Assess status &amp; needs</i>	
<b>Red-naped Sapsucker</b>	Northern Rough-winged Swallow	<i>Assess status &amp; needs</i>	
<b>Yellow Warbler</b>			
<b>Yellow-breasted Chat</b>			
<b>Veery</b>			

## Conservation Focuses, Focal Species and Recommended Actions





We have identified riparian **habitat conservation focuses** that represent the most limiting or threatened riparian habitat attributes, ecological processes or habitat configurations. These habitat conservation focuses and representative **focal species** are proposed as the 'focus' of immediate conservation effort. Table 4-2 identifies each focal species, including current biological information, and suggested population objectives to be used to evaluate the success of conservation efforts directed at these focal species and their linked habitat conservation focuses.

Table 4-3 provides a list of specific conservation actions which should benefit one or more riparian priority species and their habitat. See the General Conservation Recommendations (pp. 18-20) for more recommended conservation actions that apply to all priority species and habitats. Prioritization of these conservation actions by local and regional conservation partners, and scheduling of timelines for completion is an important next step.





**Table 4-2. Riparian focal species of Canada's Great Basin: conservation issues and objectives.**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<b>Lewis's Woodpecker</b> <i>Melanerpes lewis</i> LEWO  <p>Photo: Laure Neish</p>	<b>Status <sup>b</sup>:</b> BC: Blue-listed CAN: Special Concern <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend; Slow anecdotal decline. GB: ↓ <b>Size Estimate:</b> 700-1200 (Siddle and Davidson 1991) [accuracy rating - moderate] <sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%	Loss of riparian habitat adjacent to open woodland. Loss of large cottonwood & snags for nesting and perching to forestry & recreation. Reduction of insects/fruit due to fire suppression & habitat conversion to non-native plant species.	<b>Throughout BC's Great Basin, from 275 to 1100 m elevation:</b> Nests in large-diameter black cottonwood snags and trees, especially those with dead tops or heartrot. Prefers previously excavated cavities. Requires adjacent grassland habitat or open dry woodland habitat with a shrubby understory (Campbell et al. 1990; Forest Practices Code of BC 1997; Cooper 1997 in Fraser et al. 1990; Sousa 1989).	<b><u>LOWLAND RIPARIAN</u></b> <b>Conservation Focus:</b> Large cottonwood snags and trees adjacent to open areas.  <p>Photo: Andy Bezener</p> <b>Habitat Objective:</b> To be determined.
<b>Western Screech-Owl</b> <i>Otus kennicottii</i> WESO  <p>Photo: Andy Bezener</p>	<b>Status <sup>b</sup>:</b> BC: Red-listed CAN: Endangered ( <i>macfarlanei</i> ssp.) <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend. <b>Size Estimate:</b> ~50-300 birds: most in Okanagan Valley (Dick Cannings, unpubl. data 2003) [accuracy rating - fair] <sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.	Loss of habitat area (riparian areas >300m in length). Loss of large live trees and snags (especially cottonwoods) with cavities used for nesting and/or roosting. Direct mortality from collisions with vehicles. ↓ prey base (domestic cats reduce food base).	<b>In the Okanagan, lower Similkameen, Boundary and Nicola watersheds, below 1000 m elevation:</b> Nests in existing cavities in large live trees or snags, especially cottonwoods. May forage in adjacent grassland habitat or open dry woodland habitat (Campbell et al. 1990).	<b><u>LOWLAND RIPARIAN</u></b> <b>Conservation Focus:</b> Large cottonwood snags and trees.  <p>Photo: Andy Bezener</p> <b>Habitat Objective:</b> To be determined.



**Table 4-2. Riparian focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Yellow-breasted Chat</b> <i>Icteria virens</i> YBCH</p>  <p><small>Photo: Andy Bezener</small></p>	<p><b>Status <sup>b</sup>:</b> BC: Red-listed CAN: Endangered (<i>auricollis</i> ssp. - BC population) <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend. <b>Size Estimate:</b> 30-35 breeding pairs in South Okanagan watershed (C.A. Bishop and T. Morgan, unpubl. data 2003) [accuracy rating - good]<sup>d</sup> <b>Objective:</b> Adopt population recovery objective from Recovery Action Plan (in progress)</p>	<p>Loss of riparian areas and native shrub thickets due to urbanization, agriculture (including overgrazing), water management. Reduced reproductive success due to nest predation and brood parasitism. Use of pesticides reducing insect prey base.</p>	<p><b>In the south Okanagan and lower Similkameen valleys, below 800 m elevation:</b> Nests in dense, impenetrable wild rose thickets, often within lowland cottonwood or water birch woodlands (Campbell et al. 2001; Cadman and Page 1994).</p>	<p><b><u>LOWLAND RIPARIAN</u></b> <b>Conservation Focus:</b> Native riparian thickets – especially wild rose.</p>  <p><small>Photo: Andy Bezener</small></p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Veery</b> <i>Catharus fuscescens</i> VEER</p>  <p><small>Photo: Andy M. Bezener</small></p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. Other: Declining globally. <b>Trend <sup>c</sup>:</b> BC GB: ↑ <b>Size Estimate <sup>d</sup>:</b> 100,000 [accuracy rating – fair]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 10%.</p>	<p>Loss of native riparian thickets due to agriculture (including overgrazing) and urban development. Low reproductive success due to high parasitism and nest predation rates.</p>	<p><b>Throughout Canada's Great Basin:</b> Nests on or near the ground in dense, moist and shady undergrowth of deciduous riparian woodlands (Campbell et al. 1997; Moskoff 1995).</p>	<p><b><u>LOWLAND RIPARIAN</u></b> <b>Conservation Focus:</b> Native riparian thickets – especially cottonwood understory.</p>  <p><small>Photo: Andy Bezener</small></p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 4-2. Riparian focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Yellow Warbler</b> <i>Dendroica petechia</i> YWAR</p>  <p>Photo: Andy M. Bezener</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: -3.1%/yr* GB: ↓ <b>Size Estimate <sup>d</sup>:</b> 100,000 [accuracy rating - fair] <b>Objective <sup>d</sup>:</b> Double current population.</p>	<p>Loss of riparian areas and native shrubs, especially willows due to urbanization, agriculture (including overgrazing), water management. Low reproductive success due to high levels of nest parasitism and nest predation Use of pesticides reducing insect prey base.</p>	<p><b>Throughout Canada's Great Basin, below 900 m elevation:</b> Nests in dense deciduous riparian vegetation, especially short trees or tall shrubs, especially willows, usually adjacent to a source of water (Campbell et al. 2001).</p>	<p><b>LOWLAND RIPARIAN Conservation Focus:</b> Native riparian thickets – especially willow.</p>  <p>Photo: Andy Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Red-naped Sapsucker</b> <i>Sphyrapicus nuchalis</i> RNSA</p>  <p>Photo: Laure Neish</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend. <b>Size Estimate <sup>d</sup>:</b> 60,000 [accuracy rating – fair] <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Removal of nest trees for pulp &amp; paper industry, aesthetics, urbanization. Low recruitment of deciduous trees and snags due to overgrazing &amp; fire suppression.</p>	<p><b>Throughout Canada's Great Basin, below 1300 m elevation:</b> Excavates nest cavities in large, preferably live, aspen, birch, alder, cottonwoods and other deciduous trees, with a dbh of &gt;23 cm (Campbell et al. 1990).</p>	<p><b>MONTANE RIPARIAN Conservation Focus:</b> Deciduous trees and snags, especially aspen, birch, small cottonwoods and alder.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 4-2. Riparian focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Pacific-slope Flycatcher</b> <i>Empidonax difficilis</i> PSFL</p>  <p>Photo: M. Barry Lancaster</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: -3.9%/yr (-11.1 to 3.9). <b>Size Estimate <sup>d</sup>:</b> 30,000 [accuracy rating – poor]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Loss of habitat area due to forestry, overgrazing and urbanization. Low reproductive success due to predation.</p>	<p><b>Throughout Canada's Great Basin:</b> Nests on ground, especially on sheltered ledges, in moist, shady riparian areas (Campbell et al. 2001).</p>	<p><b><u>MONTANE RIPARIAN</u></b> <b>Conservation Focus:</b> Moist and shady low-mid elevation riparian habitat.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

<sup>a</sup> Partners in Flight database (Panjabi et al. 2001) and/or Partners in Flight BC/Yukon Southern Interior Workshop (March 1999).

<sup>b</sup> Population status from British Columbia Conservation Data Centre ([srmwww.gov.bc.ca/atrisk/toolintro.html](http://srmwww.gov.bc.ca/atrisk/toolintro.html)) and Environment Canada ([www.speciesatrisk.gc.ca/search/default\\_e.cfm](http://www.speciesatrisk.gc.ca/search/default_e.cfm)).

<sup>c</sup> Population trends from Breeding Bird Survey data from 1976 – 2000 for the Southern Interior Ecoprovince (SOI), and on the longest run of data for the Great Basin Bird Conservation Region (GB). Anecdotal information from Cannings (pers. comm. 2000). BC listing from BC Ministry of Sustainable Resource (2001) and Canadian listing from Committee on the Status of Endangered Wildlife in Canada (May 2001).

<sup>d</sup> See Appendix 4 for methods and description of accuracy ratings.

<sup>e</sup> Other data sources include: Birds of the Okanagan Valley, British Columbia (Cannings et al. 1987); Rare Birds of British Columbia (Fraser et al. 1999); Birds of British Columbia, Volumes II & III (Campbell et al. 1990) & IV (Campbell et al. 2001); Habitat atlas for wildlife at risk: south Okanagan and lower Similkameen (British Columbia Ministry of Environment, Lands and Parks 1999); Riparian Bird Conservation Plan (CA PIF & RHJV 2000); Siddle and Davidson 1991; Orville Dyer (pers. comm. 2000); Dick Cannings (pers. comm. 2000; unpubl. data 2003); Rick Howie (pers. comm. 2000); Christine A. Bishop and Tawna Morgan (unpubl. data 2003); Birds of North America accounts: Yellow-breasted Chat (Eckerle et al. 2001); Veery (Moskoff 1995); COSEWIC Status Reports and Updates: Yellow-breasted Chat (Cannings 2000); Western Screech-Owl (Chaundy-Smart 2001).

**Table 4-3. Recommended actions for riparian focal species and habitat conservation focuses.**

Benefiting Focal Species						
LEWO	WESO	YBCH	VEER	YEWA	RNSA	PSFL

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Research, Monitoring and Evaluation:**

√	√	√	x	x	x	x	Inventory focal species and critical habitat attributes, including compilation of existing occurrence records, in areas of conservation interest.
x	x	√	x	x	x	x	Complete region-wide mapping of riparian habitats, including assessment of canopy and understory composition and condition (1:20,000 or finer scale preferred).
√	x	√	x	x	x	x	Initiate demographic research to confirm population status and determine regionally specific habitat requirements.
?			√	√	√	√	Continue tracking population trend using Breeding Bird Survey.
	√						Continue tracking population trend using BC Nocturnal Owl Survey.
x		x	x	x	x	x	Expand riparian bird and habitat monitoring program to track population trends of priority and focal species.
x	x	x					Develop localized or species-specific bird monitoring program to track population trend.
√			x	x			Evaluate focal species productivity in Riparian Reserve Zones and Riparian Management Zones established under the BC Forest Practices Code, and in existing protected areas, particularly Wildlife Habitat Areas.
x	x	√					Ground truth existing habitat models, including assessment of existing suitable and potentially restorable habitat.
x	x	x	x	x	x	x	Initiate long-term Monitoring Avian Productivity and Survivorship programs in conjunction with nest searching and point counts to measure indices of productivity, survivorship, and abundance and compare results using different methodologies.

**Table 4-3. Recommended actions for riparian focal species and habitat conservation focuses, con't...**

Benefiting Focal Species						
LEWO	WESO	YBCH	VEER	YEWA	RNSA	PSFL

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Securement:**

x	x	√	x	x	x	x
x	x	√	x	x	x	x
√	√	√				

Develop habitat securement objectives using results of demographic research.

Identify and prioritize known productive riparian habitat to be formally protected or conserved through stewardship using results of inventory, mapping and demographic research.

Nominate Wildlife Habitat Areas on provincial Crown Lands for focal species included in the BC Identified Wildlife Management Strategy.

**Habitat Management, Restoration and Enhancement:**

x	x	x	x	x	x	x
x	x	?	x		x	x
x	x	?	x	x	x	x
			x			x
		x	x	x		x
		x	x	x		x
x	x					
x	x					
√	√	√	√	x	√	x

Restore or maintain wide riparian corridors of native habitat which encompass the entire natural floodplain and are subject to natural floodplain hydrology.

Retain large diameter deciduous trees and snags (>23 cm dbh), especially aspen, birch, small cottonwoods and alder.

Encourage recruitment of regenerating deciduous trees in understory.

Retain mature canopy and shrubby understory along full natural extent of riparian zones to maintain cool and shady microclimate.

Retain native deciduous shrub cover.

Restore native deciduous shrub cover where it has been removed in the past by promoting natural regeneration processes or by planting.

Retain all existing cottonwood trees and snags, especially those bordering native grassland or dry woodland habitats.

Restore black cottonwoods where they have been removed in the past by promoting natural regeneration processes (e.g., flooding) or by planting.

Prevent and control invasion of exotic vegetation.

**Table 4-3. Recommended actions for riparian focal species and habitat conservation focuses, con't...**

Benefiting Focal Species						
LEWO	WESO	YBCH	VEER	YEWA	RNSA	PSFL

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Management, Restoration and Enhancement con't:**

?	?	?	?	?	?	?
x	x	x	x	x	x	x

Eliminate or minimize use of chemical pesticides in or adjacent to riparian habitats, especially where there is potential for drift, runoff or leaching into water systems.

Restore and maintain connectivity between riparian patches, and to adjacent habitats.

**Outreach and Education:**

x	x	x	x	x	x	x
x	x	x				
x	x	x	x	x	x	x

Promote focal species and their habitat requirements as priorities for private landowner stewardship.

Complete and implement Species At-Risk communication strategy.

Assist private landowners, First Nations, forestry licencees and other land managers to learn to identify focal species and their required habitats.

**Policy and Legislation:**

x	x	x	x	x	x	x
x	x	x	x	x	x	x
			x	x	x	x
x	x	x	x	x	x	x
√	x	√				

Work with municipal and provincial governments to develop and/or implement regional growth and development strategies to ensure adequate protection of natural riparian habitats.

Participate in development and implementation of existing regional Land and Resource Management Plans.

Work with professional foresters to develop best management practices guidelines for forestry operations, particularly in Riparian Reserve Zones and Riparian Management Zones that incorporate protection of focal species and their habitats.

Encourage development and enforcement of construction regulations that prohibit or restrict development in or through riparian areas.

Assist with development or revision, where necessary, of Wildlife Habitat Area criteria for provincial Crown Lands.

## Chapter 5

# Conservation of Grassland Landbirds and Habitats

Characterized by the dominance of drought-tolerant grasses, shrubs and forbs, and the absence of trees, these communities are a product of dry, warm to hot summers with high evaporation rates, moist, mild to moderately cold winters, sporadic and relatively low annual precipitation, frequent low-intensity fires, and long-term irregularities in climatic pattern. It is largely the availability of moisture and the frequency and intensity of disturbance that creates the complex mosaic of grassland and shrubsteppe habitats, each varying in size, structure and composition. Moisture levels and disturbance regimes are determined by local variation of elevation, slope aspect, soil type, grazing pressure, fire history and climate (Altman and Holmes 2000; Paige and Ritter 1999; Parish *et al.* 1996; Forest Practices Code of British Columbia 1995; Lloyd *et al.* 1990; Medin 1986; McLean and Marchand 1968). Although avian diversity is relatively low here compared with forest and riparian habitats (Wiens and Rotenberry 1985), the natural mosaic of grassland areas supports uniquely adapted bird communities that do not exist elsewhere (Schuler *et al.* 1993).

Open range grassland (including shrubsteppe) communities occupy approximately 500,000 hectares of Canada's Great Basin, extending along narrow, semi-arid basins at low elevations and on mid-elevation plateaus between 250 and 1000 m elevation, bordered by riparian corridors and dry woodlands. These communities are confined to the middle Fraser and lower Chilcotin River Valleys (~160,000 ha, from their junction south to Lillooet), the Thompson River Valley (~125,000 ha, from Spences Bridge east to Pritchard), the Nicola River Valley (~95,000 ha), the Okanagan River Valley (~70,000 ha, south of Summerland, and in the Vernon-Kelowna area), the Similkameen Valley (~25,000 ha, south from Keremeos, and in the Princeton area) and the Boundary area (~20,000 ha) (Grasslands Conservation Council of British Columbia, pers. comm. 2001; Lloyd *et al.* 1990).



The diversity of topography, soil conditions and moisture regimes in Canada's Great Basin combine to create a number of distinct grassland communities. Photo: Andy M. Bezener

There are a large number of threats to grassland communities. Urbanization is the most damaging threat, making the landscape unusable to native grassland- or shrubsteppe-adapted birds (Paige and Ritter 1999; Cannings *et al.* 1987). The increasing sprawl of development and intensification of agricultural practices destroys natural grassland and shrubsteppe areas, attracting a completely different bird community better adapted to human-modified environments (Schuler *et al.* 1993). Additional research is needed to determine how, and to what extent, the application of pesticides, herbicides and fungicides in croplands affect grassland and shrubsteppe birds in terms of prey availability, productivity, and long-term survival (Sinclair and Elliot 1993).

High intensity management and harvesting of croplands, particularly the practice of short-rotation haying, lowers or completely prevents productivity of the few bird species adapted to using hayfields. Changes in rural building architecture, improved grain storage practices and more effective methods to control pests have eliminated critical habitat components, including available prey, for many grassland species that once benefitted from agricultural practices (Paige and Ritter 1999). Urbanization and cropland development combined are the greatest cause of habitat loss and fragmentation in the grasslands of Canada's Great Basin. Fragmentation increases the edge to interior ratio of natural habitats, potentially exposing core-dependent species to higher rates of depredation and brood parasitism, increased

competition for resources from introduced plant and animal species, higher levels of disturbance, and increased mortality during dispersal from core habitat areas (Paige and Ritter 1999; Paczek 2002).



A biodiversity conservation approach to ranching can be beneficial to both livestock producers and some sagebrush dependent focal species.

Photo: Andy M. Bezener

In contrast, some agricultural activities are highly compatible with the maintenance of healthy grassland communities, protecting them from more damaging threats of urbanization and fragmentation. Unequal and uneven livestock grazing pressure applied across the broader landscape can help to create and maintain a healthy mosaic of grassland habitats capable of supporting the full range of grassland- and shrubsteppe-adapted birds with divergent habitat requirements (Dale *et al.* 1999; Paczek 2002). However, grazing systems that result in excessive vegetation manipulation (overgrazing) and weed invasion across the majority of the landscape can severely degrade the productivity of native grasslands (Schuler *et al.* 1993; Rotenberry and Wiens 1980; McLean and Marchand 1968). Extensive livestock

grazing in Canada's Great Basin since the late nineteenth century has left few areas untouched by the influence of commercial grazing (Krannitz and Rohner 1999; vanWoudenberg 1994). Furthermore, the development and intensified management of hayfields, and planting of exotic forage plants (e.g., crested wheatgrass), is closely linked to the demands of livestock production (Paige and Ritter 1999; Lloyd *et al.* 1990).

Native grasslands in Canada's Great Basin are also negatively impacted by the invasion of introduced plants, tree encroachment and fire suppression. A growing list of noxious weeds are colonizing disturbed grassland and shrubsteppe areas. Weed invasion is facilitated by development (e.g., pipelines, powerlines, transportation corridors, residences) and several vectors including: vehicles (particularly off-road vehicles), livestock, wildlife, humans, wind and water. Noxious weeds have no or few natural predators, and are very efficient in removing soil nutrients and water. They not only out-compete native species, but are not used by most native insects, birds or other animals. In less than a century, cheatgrass, diffuse and spotted knapweed, sulphur cinquefoil, dalmatian toadflax and many other invasive plant species have severely degraded the productive capacity of native grassland habitats for native wildlife and livestock in Canada's Great Basin (A. McLean pers. comm. 2002; Cranston *et al.* 1996; Powell *et al.* 1994).

The encroachment of ponderosa pine and interior Douglas-fir into grassland and shrubsteppe habitats also threatens native bird communities. More predatory corvids and parasitic Brown-headed Cowbirds and fewer native landbird species are encountered in grassland and shrubsteppe habitats with higher densities of trees (Krannitz and Rohner 2000). Modern suppression of natural fire cycles has contributed to increasing tree encroachment (Turner and Krannitz 2001). Fire suppression combined with intensive grazing has also resulted in an increase in coverage of sagebrush steppe at the expense of shrubless grassland habitat (A. McLean pers. comm. 2002).

Four grassland categories relevant to focal landbirds are identified and described below: **grassland**, **sagebrush steppe**, **antelope-brush steppe** and **agricultural fields**.

## **Grassland**

High-quality grassland communities in Canada's Great Basin are dominated by native perennial bunchgrasses interspersed with a variety of native forbs and a protective ground layer of mosses, lichens, algae and bacteria known as cryptogamic crust. These open grassland communities generally occur in areas where various combinations of wildfire regime, soil-moisture, temperature and growing-season prevent the establishment of both trees and shrubs:

The 'upper grasslands' or 'Bluebunch wheatgrass -- Rough fescue site' are generally moister 'true' grasslands distributed from about 700 to 1000 meters elevation. This grassland type dominates northern portions of the region, but is generally confined to moist north-facing slopes at higher elevations in southern portions of the region (McLean and Marchand 1968). Undisturbed examples of these grasslands are typically dominated by a combination of bluebunch wheatgrass, rough fescue and/or Idaho fescue. Dense plant cover, a greater diversity and abundance of forb species, increased height growth of grasses, and little or no shrub cover also characterize undisturbed sites. Moist draws and swales interspersed across the landscape support aspen copses and clusters of deciduous shrubs including wild rose, saskatoon, choke cherry and snowberry. Heavily grazed or disturbed areas contain a higher percent cover of herbaceous 'increaser' species, such as Columbia needlegrass, junegrass, Sandberg's bluegrass, Kentucky bluegrass, pasture sage and silky lupine, as well as 'invader' species, particularly cheatgrass and diffuse knapweed (McLean and Marchand 1968; Lloyd et al. 1990).

The 'lower grasslands' or 'Big sagebrush -- Bluebunch wheatgrass site' represent the most drought-tolerant example of grass-dominant habitat in the region, existing where low moisture levels prevent the establishment of trees. This grassland type exists most often in sporadic pockets between 250 and 700 meters elevation, especially in the southernmost portions of the region where human development, sagebrush steppe, and occasionally, antelope-brush steppe, dominate the landscape (McLean and Marchand 1968; Lloyd et al. 1990; P. Krannitz pers. comm. 2002). Grass-dominant examples of this grassland type tend to occur only at sites where reduced or no grazing pressure, combined with frequent wildfire (surface fires at 4 to 50 year intervals, and stand-initiating crown fires at intervals of 150 to 250 years or more), allow bunchgrasses to outcompete drought-tolerant shrubs (A. McLean pers. comm. 2002; Paige and Ritter 1999; Forest Practices Code of British Columbia 1995). Bluebunch wheatgrass, and occasionally, needle-and thread, dominate over an understory of native forbs and a protective ground layer cryptogamic crust at such sites. Some moist sites and lower slopes contain Kentucky bluegrass, porcupine grass and giant wildrye. Recently disturbed sites and sites with unstable sandy soils are dominated by needle-and-thread, and pioneer species and/or increasers such as sand dropseed, red three-awn, Sandberg's bluegrass, Indian ricegrass, low pussytoes and rabbitbrush. Invading noxious weeds including spotted and diffuse knapweed, cheatgrass and dalmatian toadflax are often abundant in areas subjected to disturbance (McLean and Marchand 1968; Lloyd et al. 1990). Very little 'lower grassland' remains, particularly at lower elevations in the south Okanagan and lower Similkameen valleys. Agricultural and residential development has destroyed most habitat, while fire suppression and heavy grazing pressure over the last century have served to increase densities of big sagebrush, trees and noxious weeds to create weedy, ecotonal sagebrush steppe and antelope-brush steppe habitats (Cannings et al. 1987).



Photo: Andy M. Bezener

Some areas of Canada's Great Basin between 600 and 800 meters elevation support a transitional grassland steppe community, often referred to as the 'middle grasslands' or the 'Bluebunch wheatgrass -- Sandberg's Bluegrass site' (McLean and Marchand 1968). This transitional grassland steppe combines

varying components of both 'lower grasslands' and 'upper grasslands' depending on site-specific characteristics (A. McLean pers. comm. 2002).

### **Sagebrush Steppe**

Sagebrush steppe habitats dominate much of the 'lower grasslands' or 'Big sagebrush -- Bluebunch wheatgrass sites' between 250 and 700 m elevation that have been subjected to disturbance other than fire (A. McLean pers. comm. 2002). The dominant shrub is big sagebrush, although threetip sagebrush may be dominant in moister sites in the south Okanagan and lower Similkameen valleys below 600 m elevation. Sage density, structure and growth rate, as well as understory composition and structure, are highly variable depending on the fire history, amount of grazing/browsing pressure and moisture regime of each location. The understory of lightly to moderately disturbed sites is dominated by rabbitbrush, native perennial bunchgrasses (bluebunch wheatgrass, needle-and-thread), forbs (low pussytoes), cryptogamic crust and bare ground.



Photo: Andy M. Bezener

Heavily disturbed sites often reveal much exposed mineral soil, little or no cryptogamic crust, few or no native perennial forbs, 'increaser' grasses (sand dropseed, Sandberg's bluegrass, needle-and-thread), an abundance of annual forbs, and especially rampant growth of noxious weeds such as spotted and diffuse knapweed, cheatgrass and Russian thistle (McLean and Marchand 1968). Some moist, higher elevation sites (over 1,150 m) in the south Okanagan and lower Similkameen watershed are dominated by Vasey's sagebrush, a subspecies of big sagebrush (Parish et al. 1996).

### **Antelope-brush Steppe**

In British Columbia, antelope-brush (bitterbrush) steppe is found only on deep, coarse soils (e.g., sandy and gravel soils) in the south Okanagan valley below 600 m elevation, within the 'lower grasslands' (P. Krannitz pers. comm. 2002; Parish et al. 1996). The abundance of Antelope-brush may range from a dominant species to sparsely scattered individuals, and is influenced by elevation, climate, soil type, and the frequency and intensity of wildfire. Co-dominant shrubs often include big sagebrush and rabbitbrush, especially under disturbed conditions. Bluebunch wheatgrass, needle-and-thread and forbs, including bitterroot and arrow-leaved balsamroot, form a sparse to dense understory at undisturbed or lightly disturbed sites. Sand dropseed, red three-awn, Indian ricegrass, exposed mineral soil, prickly-pear cactus and little or no native forb growth characterize recently or heavily disturbed sites, or very hot dry sites at low elevations (P. Krannitz pers. comm. 2002).



Antelope-brush Steppe is a globally imperilled plant community. In BC, this community is confined to the South Okanagan valley. Photo: Andy M. Bezener

Where antelope-brush grows scattered among undisturbed rock outcrops, cryptogamic crust may dominate the ground cover. Anthropogenic disturbances in antelope-brush steppe have catalyzed rampant invasion of noxious weed species including spotted and diffuse knapweed, cheatgrass, and dalmatian toadflax.

Of the approximately 7,400 ha of antelope-brush steppe that once existed in the south Okanagan, over 40% (~3000 ha) has been replaced by orchards, vineyards or other agricultural or residential developments. Of the less than 60% that remains, only 9% remains relatively undisturbed by invasive weeds (British Columbia Ministry of Environment, Lands and Parks 1999; O. Dyer pers. comm. 2002).

## Agricultural Fields

The 'agricultural fields' category includes cultivated lands maintained by various methods of plowing, seeding, fertilization, irrigation and harvesting, that have replaced native grasslands, but still provide some habitat for some priority grassland landbirds if managed for this complementary use (Paige and Ritter 1999; Wiens and Rotenberry 1985). Examples include hayfields and other plantings of domestic grasses and legumes (e.g., crested wheatgrass, perennial ryegrass, orchard grass, timothy, alfalfa, white clover) that have been established as forage crops for livestock, or as cover crops for fallow croplands (Lloyd et al. 1990). Some agricultural structures (e.g., old barns, grain storage facilities, fencelines) typically found adjacent to agricultural fields, provide nesting, roosting or perch sites. Some agricultural fields provide critical habitat for prey of some grassland birds. This agricultural field category does not include orchards, vineyards and vegetable crops, which are generally managed in such a manner as to render them unsuitable for grassland birds.

## Priority Landbirds

Fifteen priority grassland landbirds have been identified in Canada's Great Basin (Table 5-1). Fourteen of these birds are also considered priorities in other portions of the Great Basin (10 in Washington/Oregon, 11 in Idaho, 9 in Nevada and 4 in California). Seven are considered focal species for a wide range of conservation focuses (Table 5-2). Five priority grassland landbirds have special ecological requirements and conservation needs that require assessment and action beyond the recommendations for focal species. Finally, three priority grassland landbirds will benefit from conservation action for focal species and do not appear to require additional actions at this time other than monitoring to ensure their continued viability. Continued and improved long-term monitoring is required for all priority grassland landbirds.

**Table 5-1. Priority grassland landbirds of Canada's Great Basin.**





<b>Focal Species</b>	<b>Species Requiring Specific Action</b>		<b>Monitor Only</b>
<b>Sharp-tailed Grouse</b>	Prairie Falcon	<i>Assess status &amp; needs</i>	Ferruginous Hawk
<b>Long-billed Curlew</b>	Greater Sage Grouse	<i>Assess status &amp; needs</i>	Swainson's Hawk
<b>Brewer's Sparrow</b>	Barn Owl	<i>Assess status &amp; needs</i>	Short-eared Owl
<b>Lark Sparrow</b>	Burrowing Owl	<i>Implement Recovery Plan</i>	
<b>Grasshopper Sparrow</b>	Sage Thrasher	<i>Implement Recovery Plan</i>	
<b>Bobolink</b>			
<b>Western Meadowlark</b>			

## Conservation Focuses, Focal Species and Recommended Actions





We have identified grassland **habitat conservation focuses** that represent the most limiting or threatened grassland habitat attributes, ecological processes or habitat configurations. These habitat conservation focuses and representative **focal species** are proposed as the 'focus' of immediate conservation effort. Table 5-2 identifies each focal species, including current biological information, and suggested population objectives to be used to evaluate the success of conservation efforts directed at these focal species and their linked habitat conservation focuses.

Table 5-3 provides a list of specific conservation actions which should benefit one or more grassland priority species and their habitat. See the General Conservation Recommendations (pp. 18-20) for more recommended conservation actions that apply to all priority species and habitats. Prioritization of these conservation actions by local and regional conservation partners, and scheduling of timelines for completion is an important next step.





**Table 5-2. Grassland focal species of Canada's Great Basin: conservation issues and objectives.**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Long-billed Curlew</b> <i>Numenius americanus</i> LBCU</p>  <p>Photo: Andy M. Bezener</p>	<p><b>Status <sup>b</sup>:</b> BC: Blue-listed CAN: Special Concern <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: ↑ <b>Size Estimate:</b> ~ 500 (Cannings 1999) [accuracy rating – moderate]<sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of areas &gt;30 ha to intensive agriculture and urbanization. Loss (from urbanization, intensive agriculture &amp; fire suppression) of large, open nest areas with short vegetation &amp; low shrub density. Disturbance of nest sites from recreation (e.g., ATV use). Loss of connectivity between dry nesting and moist brooding habitats to urbanization &amp; fragmentation. Increased nest predation. Use of insecticides and herbicides ↓ prey abundance.</p>	<p><b>Throughout Canada's Great Basin, below 1220 m elevation:</b> Nests among flat patches of low profile native bunchgrass cover &lt;30 cm tall, in large native grassland areas connected to wetlands or seepages (Campbell et al. 1990; Forest Practices Code of BC 1997; Fraser et al. 1990).</p>	<p><b>GRASSLAND Conservation Focus:</b> Flat native bunchgrass-dominated grassland with little or no shrub cover, and connected to wetlands or seepages.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Grasshopper Sparrow</b> <i>Ammodramus savannarum</i> GRSP</p>  <p>Photo: Andy Bezener</p>	<p><b>Status <sup>b</sup>:</b> BC: Red-listed CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: ↓ <b>Size Estimate:</b> &lt; 100 (Paczek 2002; P. Krannitz unpubl. data 2003) [accuracy rating – moderate]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Loss of tall bunchgrass habitat with low shrub density for nesting cover owing to agriculture &amp; urbanization. ↑ grazing activity (continuous and/or intensive) ↑ shrub density &amp; ↓ availability of tall, dense grasses for nesting. Seeding of rangelands with non-native grass species (e.g., crested wheatgrass) ↓ native bunchgrass cover. Use of insecticides and herbicides ↓ prey abundance.</p>	<p><b>In the Okanagan and lower Similkameen valleys, from 300 to 1160 m:</b> Nests among dense perennial bunchgrass cover, including grass litter, in dry, ungrazed to moderately grazed native grassland with little or no shrub cover (Campbell et al. 2001; Forest Practices Code of BC 1997; Fraser et al. 1990).</p>	<p><b>GRASSLAND Conservation Focus:</b> Native bunchgrasses with little or no shrub cover.</p>  <p>Photo: Andy Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>



**Table 5-2. Grassland focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Sharp-tailed Grouse</b> <i>Tympanuchus phasianellus</i> STGR</p>  <p>Photo: Christian Artuso</p>	<p><b>Status <sup>b</sup>:</b> BC: Blue-listed (<i>columbianus</i> ssp.) CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate:</b> 2500-5000 in grasslands, mostly concentrated in the Thompson-Nicola (E. Leupin pers. comm. 2003) [accuracy rating – fair] <sup>d</sup> <b>Objective <sup>d</sup>:</b> Restore productive populations to historic range.</p>	<p>Loss of 200 to 400 ha (2 km<sup>2</sup>) traditional leks, nesting habitat and wintering habitat to agriculture and urbanization. Recreation and development activities causing disturbance of traditional leks leading to abandonment. Loss of adequate native bunchgrass nesting cover owing to heavy grazing. Loss of forage &amp; cover in tree copses &amp; riparian woodlands from damage to understory cover by livestock. Increased nest predation. Small remnant populations vulnerable to local extirpation.</p>	<p><b>Throughout Canada's Great Basin, below 1220 m elevation:</b> Large areas of native grassland with patches of flat ground and/or flattened ridgetops of low profile native bunchgrasses (&lt;30 cm tall and &lt;5% mean cover of native shrubs), and connected to riparian corridors and/or scattered tree copses (Campbell 2001; Fraser et al. 1990).</p>	<p><b>GRASSLAND-SHRUBSTEPPE</b> <b>Conservation Focus:</b> Large areas of bunchgrass-dominated grassland or shrubsteppe with flat, exposed areas and scattered tree copses and woodlands.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Western Meadowlark</b> <i>Sturnella neglecta</i> WEME</p>  <p>Photo: US F&amp;W / John &amp; Karen Hollingsworth</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: ↓ GB: ↑ <b>Size Estimate <sup>d</sup>:</b> 120,000 [accuracy rating – moderate] <sup>d</sup> <b>Objective <sup>d</sup>:</b> Double current population.</p>	<p>Loss of suitable breeding territories &gt;10 ha to agriculture &amp; urbanization. Loss of nesting cover to overgrazing (continuous and/or intensive). Use of insecticides &amp; herbicides ↓ prey abundance.</p>	<p><b>Throughout Canada's Great Basin, under 1200 m elevation:</b> Nests among tall, dense native grass cover, including grass litter, in ungrazed to moderately grazed native grassland with moderate to no shrub cover (Campbell et al. 2001).</p>	<p><b>GRASSLAND-SHRUBSTEPPE</b> <b>Conservation Focus:</b> Native bunchgrasses with moderate to no shrub cover.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 5-2. Grassland focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Lark Sparrow</b> <i>Chondestes grammacus</i> LASP</p>  <p>Photo: Christian Artuso</p>	<p><b>Status <sup>b</sup>:</b> BC: Red-listed CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: ↓ <b>Size Estimate:</b> &lt; 1000 (P. Krannitz unpubl. data 2003, Paczek 2002, R.J. Cannings pers. comm.) [accuracy rating – moderate]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Loss of grasslands &gt;6 ha with scattered tall shrubs (in low densities) for nesting to agriculture and urbanization. Use of insecticides &amp; herbicides ↓ prey abundance.</p>	<p><b>In the south Okanagan and lower Similkameen valleys, below 600 m elevation:</b> Nests at base of shrubs in open, disturbed and/or ecotonal shrubsteppe habitat, especially tall antelope-brush and/or sagebrush on poor sand-gravel soils, with an open or sparsely vegetated understory including bare soil, sand dropseed grass and/or cryptogamic crust (Campbell et al. 2001; Fraser et al. 1990; Paczek 2002).</p>	<p><b>GRASSLAND-SHRUBSTEPPE</b> <b>Conservation Focus:</b> Low elevation shrubsteppe, especially antelope brush, tall sagebrush and early seral sites with open, sparse understory.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Brewer's Sparrow</b> <i>Spizella breweri</i> BRSP</p>  <p>Photo: Steve R. Cannings</p>	<p><b>Status <sup>b</sup>:</b> BC: Red-listed (<i>breweri</i> ssp.) CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: ↑ <b>Size Estimate:</b> 1100-1300 breeding pairs (mean = 1184 pairs) in southern Okanagan Valley (N. Mahony unpubl. data 2002) [accuracy rating – good]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Double current population.</p>	<p>Loss of suitable breeding territories (6 to 225 ha) to agriculture and urbanization (including shrub removal). Loss of large patches of Big Sagebrush (&gt; 60 cm tall) with dense understory of shrubs and forbs. ↓ insect prey when intensive grazing activity decreases understory vegetation, especially native perennial forbs</p>	<p><b>In the Okanagan and lower Similkameen valleys, from 340 to 1860 m elevation:</b> Nests in big sagebrush. Requires extensive tracts of sagebrush cover with a forb-rich understory of large tufted perennials, especially lupine and parsnip-flowered buckwheat, and adjacent or nearby aspen copses with a dense understory, aspen-snowberry gullies and/or large deciduous shrubs (Campbell et al. 2001; Fraser et al. 1990; N. Mahony unpubl. data 2002; Paczek 2002).</p>	<p><b>SAGEBRUSH STEPPE</b> <b>Conservation Focus:</b> Large areas of big sagebrush with forb rich understory.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 5-2. Grassland focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<b>Bobolink</b> <i>Dolichonyx oryzivorus</i> BOBO  <p>Photo: Steve R. Cannings</p>	<b>Status <sup>b</sup>:</b> BC: Blue-listed CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend; Historic range expansion? GB: ↓ <b>Size Estimate:</b> ~250 (Dick Cannings pers. comm. 2003) [accuracy rating – fair] <sup>d</sup> <b>Objective <sup>d</sup>:</b> Double current population.	Loss of natural moist, ungrazed meadows with suitable nesting cover owing to urbanization and conversion from grass to alfalfa hay crops. Reduced productivity owing to increasing intensification of hay harvesting practices (i.e., hay-cropping during incubation and early nestling stage results in 100% mortality of offspring) (Martin and Gavin 1995). Use of insecticides & herbicides ↓ prey abundance.	<b>Throughout Canada's Great Basin, below 950 m elevation:</b> Open, contiguous moist meadows, pastures, weedy fields and hayfields with tall grasses, high accumulations of grass litter, high grass-to-legume ratios and no or delayed harvest (Campbell et al. 2001; Fraser et al. 1990).	<b><u>AGRICULTURAL FIELDS</u></b> <b>Conservation Focus:</b> Moist, tall grassy meadows and hayfields left fallow or with delayed harvest.  <p>Photo: Andy M. Bezener</p>
				<b>Habitat Objective:</b> To be determined.

<sup>a</sup> Partners in Flight database (Panjabi et al. 2001) and/or Partners in Flight BC/Yukon Southern Interior Workshop (March 1999).

<sup>b</sup> Population status from British Columbia Conservation Data Centre ([srmwww.gov.bc.ca/atrisk/toolintro.html](http://srmwww.gov.bc.ca/atrisk/toolintro.html)) and Environment Canada ([www.speciesatrisk.gc.ca/search/default\\_e.cfm](http://www.speciesatrisk.gc.ca/search/default_e.cfm)).

<sup>c</sup> Population trends from Breeding Bird Survey data from 1976 – 2000 for the Southern Interior Ecoprovince (SOI), and on the longest run of data for the Great Basin Bird Conservation Region (GB). Anecdotal information from Cannings (pers. comm. 2000). BC listing from BC Ministry of Sustainable Resource (2001) and Canadian listing from Committee on the Status of Endangered Wildlife in Canada (May 2001).

<sup>d</sup> See Appendix 4 for methods and description of accuracy ratings.

<sup>e</sup> Other data sources include: Conservation Strategy for Landbirds in the Columbia Plateau of Eastern OR & WA (Altman and Holmes 2000); Birds in a Sagebrush Sea (Paige and Ritter 1999); Rare Birds of British Columbia (Fraser et al. 1999); Managing identified wildlife: procedures and measures, Volume 1 [and Attachment] (Forest Practices Code of British Columbia 1999a & b); Species and Plant Community Accounts for Identified Wildlife, Volume 1 (Forest Practices Code of British Columbia 1997); Habitat Atlas for Wildlife at Risk: South Okanagan and Lower Similkameen (British Columbia Ministry of Environment, Lands and Parks 1999); The Birds of British Columbia, volumes II (Campbell et al. 1990) & IV (Campbell et al. 2001); Birds of the Okanagan Valley, British Columbia (Cannings et al. 1987); Cannings 1999; Paczek 2002; Leupin 2003; Ernest Leupin pers. comm. 2003; Nancy Mahony unpubl. data. 2002; Pam Krannitz unpubl. data 2003; Orville Dyer (pers. comm. 2001); Dick Cannings (pers. comm. 2003); Rick Howie (pers. comm. 2000); Birds of North America accounts: Grasshopper Sparrow (Vickery 1996); Sharp-tailed Grouse (Connelly et al. 1998); Western Meadowlark (Lanyon 1994); Lark Sparrow (Martin and Parrish 2000); Brewer's Sparrow (Rotenberry et al. 1999); Bobolink (Martin and Gavin 1995).

**Table 5-3. Recommended actions for grassland focal species and habitat conservation focuses.**

Benefiting Focal Species						
LBCU	GRSP	STGR	WEME	LASP	BRSP	BOBO

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Research, Monitoring and Evaluation:**

√		√			√	X	Complete inventory of focal species and critical habitat attributes, including compilation of existing occurrence records.
x	x	x	x	x	√	x	Complete region-wide mapping of grassland habitats, including assessment of species composition and condition (1:20,000 or finer scale preferred).
x	√	√	x	√	√	x	Expand demographic research partnerships to confirm population status and determine regionally specific habitat requirements.
?		?	√			?	Continue tracking population trend using Breeding Bird Survey.
x	x	x	x	x	x	x	Expand grassland bird and habitat monitoring program to track population trends of priority and focal species
?	x	x		x	x	?	Develop localized or species-specific bird monitoring program to track population trend.
x	x	x		x	√	x	Evaluate focal species productivity in existing protected areas, particularly Wildlife Habitat Areas.
x	x			x	√		Ground truth existing habitat models, including assessment of existing suitable and potentially restorable habitat.
x	x	x	x	x		x	Determine the impact of agriculture on focal landbirds.

**Habitat Securement:**

x	x	x	x	x	√	x	Develop habitat securement objectives using results of demographic research.
√	x	x	x	x	√	x	Identify and prioritize known productive grassland habitat areas to be formally protected or conserved through stewardship using results of inventory, mapping and demographic research.
√	√	√		√	√	x	Nominate Wildlife Habitat Areas on provincial Crown Lands for focal species included in the BC Identified Wildlife Management Strategy.

**Table 5-3. Recommended actions for grassland focal species and habitat conservation focuses, con't...**

Benefiting Focal Species						
LBCU	GRSP	STGR	WEME	LASP	BRSP	BOBO

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Management, Restoration and Enhancement:**

√	√	x	√	√	√	?	Prevent and control invasion of exotic vegetation.
x	x	x	x	x			Increase and maintain native grass and forb cover, including standing litter, in grassland habitats.
		x	x	x	x		Increase and maintain native shrub and forb cover in shrubsteppe habitats.
?	?	?	?	?	?	?	Eliminate or minimize use of chemical pesticides in or adjacent to grassland areas.
x	x	x	x	x	x	x	Adjust timing and/or duration of livestock grazing to eliminate or minimize adverse livestock impacts to grassland/shrubsteppe birds.
x						x	Adjust timing of haying operations to eliminate or minimize adverse impacts.
x		x			x		Restore and maintain connectivity between grassland patches, and to adjacent riparian habitats.

**Outreach and Education:**

x	x	x	x	x	x	x	Promote focal species and their habitat requirements as priorities for private landowner stewardship.
x							Complete and implement Species At-Risk communication strategy.
x	x	x	x	x	x	x	Assist private landowners, First Nations, ranchers and other land managers to learn to identify focal species and their required habitats.

**Table 5-3. Recommended actions for grassland focal species and habitat conservation focuses, con't...**

Benefiting Focal Species						
LBCU	GRSP	STGR	WEME	LASP	BRSP	BOBO

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Policy and Legislation:**

x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x		x	x	x

Work with municipal and provincial governments to develop and/or implement regional growth and development strategies to ensure adequate protection of natural grassland habitats.

Participate in development and implementation of existing regional Land and Resource Management Plans.

Work with ranchers, recreational associations and conservation partners to develop best management practices guidelines that incorporate protection of focal species and their habitats.

Assist with development or revision, where necessary, of Wildlife Habitat Area criteria for provincial Crown Lands.

## Chapter 6

# Conservation of Dry Woodland Landbirds and Habitats

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The dry woodland ecosystem is composed of grassland and open, park-like forest dominated by ponderosa pine and interior Douglas-fir (Lloyd et al. 1990) and historically shaped by frequent understory fires (Hope et al. 1991a, 1991b). Typical fires in this habitat burn primarily the understory (including regenerating young trees), leaving large trees with their thick, fire-resistant bark, behind. This fire regime creates multi-aged forests with old growth-like characteristics (e.g. snags and veteran trees), an open understory and low shrub cover (Cannings 1995). Currently, dry woodlands in British Columbia are structurally complex. Many dry woodlands are dominated by dense patches of smaller, regenerating trees interspersed with larger, canopy trees and snags. This complexity is due to past diameter-limit harvesting, combined with fire suppression and insect out-breaks (Daigle 1996, Marshall 1996, Armleder 1999).

Dry woodlands in Canada's Great Basin dominate sites from lower elevational grasslands to the moister, subalpine zone (Lloyd et al. 1990). These areas are characterized by long, warm summers, and relatively short, cool winters with moderate snowfall. There are a variety of habitat niches in dry woodlands as a result of the dry, warm microclimate, and the juxtaposition of conifer forest and grassland. For example, the vertical structure of the woodlands allows for nesting on the ground, in shrubs, or in conifers. The open habitat is suitable for a number of sit-and-wait or hawking-type predators that require space for capturing prey on the wing (McCallum 1994; Sterling 1999). The old-growth structural characteristics, such as snags, are essential components for nesting and roosting of some landbird species. Large trees tend to produce more cones that are critical for seed-eating species. Dry woodlands support a diversity of insects whose activity is enhanced by the dry, warm microclimate (van Woudenberg 1999), providing a high density of food for insectivorous bird species. Thus the dry woodland habitat mosaic can provide high quality habitat for a wide range of landbirds with different life-history requirements.



Prescribed burning is increasing used as a tool for restoring natural fire regimes to improve habitat for some wildlife species and protect human communities by eliminating unnaturally high fuel loads. Photo: Andy M. Bezener

There are many conflicting land uses in BC's dry woodland. They include agriculture and urban development at lower elevations, livestock grazing, timber harvesting, firewood cutting, recreation, and wildlife habitat. Interior Douglas-fir forests are used for sawlog and pulpwood production, a convenient source of firewood, and for recreational activities such as hiking, horseback riding and cross-country skiing. Pure stands of ponderosa pine forests have little commercial value for forestry, but like interior Douglas-fir forests, they have been grazed heavily and are also subject to firewood cutting. In the Okanagan Valley, favourable soil types in ponderosa pine forests are used for orchards and vineyards (Hope et al. 1991a). All these uses of the land are a direct threat to the dry woodland habitat. These land uses, in conjunction with fire suppression, are altering the structural characteristics and composition of this habitat type

(Daigle 1996, Armleder 1999, Gray and Riccus 1999, van Woudenberg 1999). Both the density of trees and canopy closure are increasing. The causes and rates of mortality of the canopy trees have also changed from historical values. In some areas, the native shrub layer is declining. These habitat alterations are relatively recent phenomena, and consequences to birds that live in this habitat type are unknown.

An additional threat to both ponderosa pine and interior Douglas-fir forests is current fire suppression regimes. Prior to European settlement, low intensity wildfires, or fires set by First Nations people, burnt through dry woodland forests every 5-20 years (Daigle 1996), generally in patches less than 50 ha in size. These burns destroyed the understory of shrubs and young trees, as well as ground litter including fallen needles and branches, while leaving large live trees and snags and large pieces of coarse woody debris intact (British Columbia Ministry of Forests 1996). Furthermore, fire also rejuvenated many herb and shrub species while selecting against other, less fire resistant species (Daigle 1996).

Fire intensity and frequency varied considerably thereby producing a mosaic of uneven aged forests interspersed with grassy and shrubby openings (Daigle 1996), as well as areas containing dense thickets of understory trees, particularly Douglas-fir (Armleder 1999). Low intensity fires were more common in low elevation ponderosa pine stands, hot and dry Douglas-fir stands, and moisture deficient sites in wetter, higher elevation Douglas-fir forests (Gray and Riccus 1999). High intensity fires have historically burned through areas every 150-250 years (British Columbia Ministry of Forests 1996). This type of fire destroys the entire stand leaving room for trees such as lodgepole pine to act as the seral species, resulting in an even-aged pine stand.

Changes in dry woodland forests, created largely by modern fire suppression practices, have resulted in fewer lower intensity fires and more frequent high intensity fires. These changes include a general increase in tree density, a change in species composition from shade tolerant to shade intolerant species, an increase in litter accumulation, and a change in forest floor litter from a leaf, herb and needle mix to a dominant needle and twig mix. Other changes include forest encroachment in some grasslands, loss of understory forage, poor tree growth, increased susceptibility to, and increased severity of, both insect attacks and damage caused by disease, increased burn areas, and increased probability of stand-replacing crown fires instead of less severe surface fires (British Columbia Ministry of Forests and British Columbia Ministry of Environment, Lands and Parks 1995, Daigle 1996, Armleder 1999). In general, fire suppression results in more homogeneous landscapes and stands, and a decrease in the abundance of open-structured forests with shrubby understories – a habitat necessary for many of the priority birds listed here.

Two dry woodland categories relevant to focal landbirds are identified and described below: **ponderosa pine forest** and **interior Douglas-fir forest**.

### **Ponderosa Pine Forest**

Ponderosa pine forests are located at lower elevations (300-900 m) in very dry valleys. Late successional stands are characterized by open, park-like stands interspersed with grassland communities (Lloyd et al. 1990). Ponderosa pine is the dominant tree in the forest canopy with bluebunch wheatgrass and fescue common in the understory, along with arrow-leaved balsamroot, timber-milk vetch, and yarrow.

### **Interior Douglas-fir Forest**

Located at higher elevation than ponderosa pine, Douglas-fir dominates mature forest canopies, but where fires have occurred, it may be mixed with varying amounts of ponderosa pine at lower elevations and lodgepole pine at higher elevations. Hybrid white spruce also occurs throughout this forest type but is most commonly found at higher elevations, or on wetter sites. There is moderate to high cover of pinegrass in the understory with less common plant species including birch-leaved spirea, heart-leaved arnica, falsebox, twinflower, and kinnikinnick. Interior Douglas-fir forests support of diverse array of bird species that feed on conifer seed, bark insects, and small mammals.



Restoration of ponderosa pine stands with old-growth attributes is a priority for conservation action in BC's dry woodlands. Photo: Andy M. Bezener

## Priority Landbirds

Fourteen priority dry woodland landbirds have been identified in Canada's Great Basin (Table 6-1). Seven of these birds are also considered priorities in other portions of the Great Basin (2 in Washington/Oregon, 6 in Idaho, 5 in Nevada and 1 in California). Four are considered focal species for a wide range of conservation issues (Table 3-2). One priority dry woodland landbird has special ecological requirements and conservation needs that require assessment and action beyond the recommendations for focal species. The remaining nine priority dry woodland landbirds will benefit from conservation action for the focal species and do not appear to require additional actions at this time other than monitoring to ensure their continued viability. Continued and improved long-term monitoring is required for all priority dry woodland landbirds.

**Table 6-1. Priority dry woodland landbirds of Canada's Great Basin.**





Focal Species	Species Requiring Specific Action		Monitor Only
Flammulated Owl Calliope Hummingbird Lewis's Woodpecker Chipping Sparrow	White-headed Woodpecker	<i>Implement Recovery Plan</i>	American Kestrel Common Poorwill Gray Flycatcher Dusky Flycatcher Mountain Chickadee Rock Wren Canyon Wren Lazuli Bunting Cassin's Finch

## Conservation Focuses, Focal Species and Recommended Actions





We have identified dry woodland **habitat conservation focuses** that represent the most limiting or threatened dry woodland habitat attributes, ecological processes or habitat configurations. These habitat conservation focuses and representative **focal species** are proposed as the 'focus' of immediate conservation effort. Table 6-2 identifies each focal species, including current biological information, and suggested population objectives to be used to evaluate the success of conservation efforts directed at these focal species and their linked habitat conservation focuses.

Table 6-3 provides a list of specific conservation actions which should benefit one or more dry woodland priority species and their habitat. See the General Conservation Recommendations (pp. 18-20) for more recommended conservation actions that apply to all priority species and habitats. Prioritization of these conservation actions by local and regional conservation partners, and scheduling of timelines for completion is an important next step.

**Table 6-2. Dry Woodland focal species of Canada's Great Basin: conservation issues and objectives.**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Flammulated Owl</b> <i>Otus flammeolus</i> FLOW</p>  <p>Photo: Richard J. Cannings</p>	<p><b>Status <sup>b</sup>:</b> BC: Blue-listed CAN: Special Concern <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate:</b> &lt; 1200 pairs (Kirk and Hyslop 1998) [accuracy rating – poor]<sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of large Douglas-fir and ponderosa pine wildlife trees and snags used for cavity nesting owing to logging, silvicultural practices, firewood cutting. Reduction of mosaic structure and open canopy owing to fire suppression. Potential loss of dense thickets for roosting and foraging due to thinning. Reduction in insect diversity and abundance (through grazing).</p>	<p><b>Throughout Canada's Great Basin:</b> Nests in mature to old, multi-layered Ponderosa Pine and/or Douglas-fir forests with large snags containing cavities. Uses forest openings for foraging and adjacent patches of dense regenerating Douglas-fir and/or large trees used for cover. (van Woudenberg and Kirk 1999, Campbell et al. 1990; Fraser et al. 1990).</p>	<p><b>Conservation Focus:</b> Open, mature to old multi-layered stands of ponderosa pine/Douglas-fir forest with: - large snags; - patches of dense regenerating conifers.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Calliope Hummingbird</b> <i>Stellula calliope</i> CAHU</p>  <p>Photo: Andy M. Bezener</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate <sup>d</sup>:</b> 20,000 [accuracy rating – poor]<sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of open areas for foraging owing to fire suppression.</p>	<p><b>Throughout Canada's Great Basin:</b> Nests in open, mature Ponderosa Pine, Douglas-fir and other open, mixed coniferous forests. Forages for insects and nectar in openings with flowering vegetation (Campbell et al. 1990; Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Flowering understory vegetation within open, mature stands of ponderosapine/Douglas-fir forest.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 6-2. Dry Woodland focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Lewis's Woodpecker</b> <i>Melanerpes lewis</i> LEWO</p>  <p>Photo: Andy M. Bezener</p>	<p><b>Status <sup>b</sup>:</b> BC: Blue-listed CAN: Special Concern <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend; Slow anecdotal decline. GB: ↓ <b>Size Estimate:</b> 700-1200 (Siddle and Davidson 1991) [accuracy rating – moderate]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Loss of large Douglas-fir and ponderosa pine wildlife trees for nesting as a result of harvesting, firewood cutting, urbanization. Loss of open foraging habitat owing to fire suppression, conversion.</p>	<p><b>Throughout Canada's Great Basin, from 275 to 1100 m elevation:</b> Nests in large-diameter ponderosa pine and Douglas-fir snags and trees, especially those with dead tops. Prefers previously excavated cavities. Requires open dry woodland habitat with a shrubby understory (Campbell et al. 1990; Forest Practices Code of BC 1997; Fraser et al. 1990).</p>	<p><b>Conservation Focus:</b> Snags within open, mature stands of ponderosa pine/Douglas-fir forest.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Chipping Sparrow</b> <i>Spizella passerina</i> CHSP</p>  <p>Photo: Dana Seaman</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: ? GB: ↓ <b>Size Estimate <sup>d</sup>:</b> 600,000 [accuracy rating – fair]<sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>↓ Reproductive success due to predation and parasitism.</p>	<p><b>Throughout Canada's Great Basin:</b> Nests in open dry woodland and coniferous forests, forest edges and clearings with shrubby understory, especially regenerating conifers. Sites greater than 10km from Brown-headed cowbird feeding sites may be more productive. (Campbell et al. 2001; Middleton 1998, Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Shrubs and regenerating conifers within or adjacent to open stands of ponderosa pine, Douglas-fir and/or lodgepole pine. Minimum of 10 km from cattle yards, or other potential cowbird feeding sites.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

<sup>a</sup> Partners in Flight database (Panjabi et al. 2001) and/or Partners in Flight BC/Yukon Southern Interior Workshop (March 1999).

<sup>b</sup> Population status from British Columbia Conservation Data Centre ([srmwww.gov.bc.ca/atrisk/toolintro.html](http://srmwww.gov.bc.ca/atrisk/toolintro.html)) and Environment Canada ([www.speciesatrisk.gc.ca/search/default\\_e.cfm](http://www.speciesatrisk.gc.ca/search/default_e.cfm)).

<sup>c</sup> Population trends from Breeding Bird Survey data from 1976 – 2000 for the Southern Interior Ecoprovince (SOI), and on the longest run of data for the Great Basin Bird Conservation Region (GB). Anecdotal information from Cannings (pers. comm. 2000). BC listing from BC Ministry of Sustainable Resource (2001) and Canadian listing from Committee on the Status of Endangered Wildlife in Canada (May 2001).

<sup>d</sup> See Appendix 4 for methods and description of accuracy ratings.

<sup>e</sup> Other data sources include: Birds of the Okanagan Valley, British Columbia (Cannings et al. 1987); Rare Birds of British Columbia (Fraser et al. 1999); The Birds of British Columbia, volumes II (Campbell et al. 1990), III (Campbell et al. 1997), and IV (Campbell et al. 2001); Cooper and Gilles 1999; Siddle and Davidson 1991.

**Table 6-3. Recommended actions for dry woodland focal species and habitat conservation focuses.**

Benefiting Focal Species					
FLOW	CAHU	LEWO	CHSP		

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Research, Monitoring and Evaluation:**

x		√			
x	x	x	x		
x	x	√	x		
	√		√		
√					
x	x	x	x		
?	?	√			
x	x	√	x		
x		x			

Complete inventory of focal species and critical habitat attributes, including compilation of existing occurrence records.

Complete region-wide mapping of dry woodland habitats, including assessment of species composition and condition (1:20,000 or finer scale preferred).

Initiate demographic research to confirm population status and determine regionally specific habitat requirements.

Continue tracking population trend using Breeding Bird Survey.

Continue tracking population trend using BC Nocturnal Owl Survey.

Expand dry woodland bird and habitat monitoring program to track population trends of priority and focal species

Develop localized or species-specific bird monitoring program to track population trend.

Evaluate focal species productivity in existing protected areas, particularly Wildlife Habitat Areas.

Ground truth existing habitat models, including assessment of existing suitable and potentially restorable habitat.

**Table 6-3. Recommended actions for dry woodland focal species and habitat conservation focuses, con't...**

Benefiting Focal Species					
FLOW	CAHU	LEWO	CHSP		

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Securement:**

x	x	x	x		
√	x	√	x		
√		√			

Develop habitat securement objectives using results of demographic research.

Identify and prioritize known productive dry woodland habitat to be formally protected or conserved through stewardship using results of inventory, mapping and demographic research.

Nominate Wildlife Habitat Areas on provincial Crown Lands for focal species included in the BC Identified Wildlife Management Strategy.

**Habitat Management, Restoration and Enhancement:**

x	x	x	x		
x	x	x	x		
x			x		
x		x			
x	x	x	x		
x	x	x	x		
x	x	x	x		

Increase and maintain open-structured, multi-aged and multi-canopied stands with a mix of age classes within both Douglas-fir and ponderosa pine woodlands.

Retain open, mature stands of ponderosa pine/Douglas-fir forest. Remove sapling trees in understory to prevent forest in-growth and encroachment in some, but not all stands using prescribed burning and/or thinning.

Retain some patches of dense shrubs and regenerating conifers.

Retain larger diameter trees and snags, especially those >50 cm dbh. Discourage cutting of large trees and snags for firewood or for salvage.

Adjust timing and/or duration of livestock grazing to eliminate or minimize adverse livestock impacts to dry woodland birds: exclude livestock, or reduce grazing pressure in some stands to preserve understory shrub and forb layer, and to reduce rates of cowbird brood parasitism.

Restore and maintain connectivity between dry woodland patches, and to adjacent riparian habitats.

Prevent and control invasion of exotic vegetation.

**Table 6-3. Recommended actions for dry woodland focal species and habitat conservation focuses, con't...**

Benefiting Focal Species						
FLOW	CAHU	LEWO	CHSP			

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Outreach and Education:**

√	x	√	x			
x		x				
√	x	√	x			

Promote focal species and their habitat requirements as priorities for private landowner stewardship.

Complete and implement Species At-Risk communication strategy.

Assist private landowners, First Nations, ranchers and other land managers to learn to identify focal species and their required habitats.

**Policy and Legislation:**

x	x	x	x			
x		x				
x	x	x	x			

Modify fire management policies to restore, where feasible, or mimic natural fire regimes.

Assist with development or revision, where necessary, of Wildlife Habitat Area criteria for provincial Crown Lands.

Work with ranchers, recreational associations and conservation partners to develop best management practices guidelines for grazed dry woodlands that incorporate protection of focal species and their habitats.

## Chapter 7

# Conservation of Moist Coniferous Forest Landbirds and Habitats

In Canada's Great Basin, the moist coniferous forest habitat type is comprised of lodgepole pine and mixed conifer forests at mid to high elevations (> 1280m). These forests are generally found at elevations above the Interior Douglas-fir Biogeoclimatic Zone (Lloyd et al. 1990). Moist coniferous forests are characterized by a relatively short growing season and a moderate to high snow accumulation (Lloyd et al. 1990). Lodgepole pine and Douglas-fir are found at lower elevations and on warmer, drier slopes. Engelmann spruce, hybrid white spruce and subalpine fir are more common at high elevations or in cooler, moister areas. Deciduous trees are rare except in riparian areas. The natural disturbance regime is dominated by fire and bark beetle outbreaks (Parish et al. 1999). Natural disturbance intervals range from a mean of 150 years in drier regions to >350 years in moister areas along the western and north-eastern portions of the Southern Interior (Lloyd et al. 1990, British Columbia Ministry of Forests and British Columbia Ministry of Environment, Lands and Parks 1995). Much of the landscape has been shaped by these natural disturbance events, creating a heterogeneous mixture of young and old seral forests of various sizes.

The natural mosaic of seral stages and stand composition in moist coniferous forests provide habitat for a variety of landbird species in Canada's Great Basin. Mid-to-late seral stage forests in particular provide structural attributes commonly associated with many forest birds. These attributes include large, live trees; vertical stratification of vegetation; increased bark surface area; volume of coarse woody debris, and large diameter snags. Larger, older trees often produce more seeds than those in younger seral stages, providing abundant food for seed-eating bird species (Benkman 1993). Canopy gaps, also characteristic of older forests, release understory shrub growth, providing foliage cover for foraging and nesting. Gaps within and underneath the canopy also provide aerial foragers with unobstructed air space to capture insects on the wing (Hutto 1995, Altman and Sallabanks 2000). Large trees of climax species such as spruce and fir provide greater canopy volume and bark substrate for a variety of insectivorous birds. Large snags and downed woody debris provide critical nesting and foraging sites for cavity nesters (Klenner and Huggard 1997, Gyug 2000), ground nesters (Pelren and Crawford 1999) and raptors (Nurdyke and Buskirk 1991, Tallmon and Mills 1994). Some raptors and cavity nesting birds may require large areas of forest in these conditions.



British Columbia's southern interior forests are intensively managed for multiple use.

Several landbirds are associated with habitat conditions created by natural disturbance events such as fire or bark beetle infestations (Hutto 1995, Hobson and Schieck 1999, Imbeau et al. 1999). A variety of insectivorous species, most notably woodpeckers, benefit from abundant prey found in insect infested and dead wood and in residual large trees and snags remaining after fire. The "biological legacies" from the previous stand, such as large, live trees, and snags (DeLong and Kessler 2000), add structural complexity to the next seral stage and in the interim provide critical perch sites for raptors and aerial foragers such as Olive-sided Flycatchers (Altman and Sallabanks 2000) and nest sites for cavity nesting birds (Hutto 1995). Ground foragers such as blue grouse also can be attracted to the flush of understory growth and associated insect community following natural disturbance.

Forest practices and fire suppression are the largest threats to moist coniferous forest habitat in Canada's Great Basin. Recreational development (e.g., ski resorts) and grazing also threaten habitat for moist coniferous landbirds through permanent loss of habitat, increased human access and disturbance. Forest harvesting results in direct habitat loss and can also decrease the quality of remaining forest habitat for landbirds. Current harvesting rotations in moist coniferous forests are generally shorter than the 150 to > 350 year intervals of natural disturbance events. The shift in disturbance from primarily fire to harvesting therefore shifts the distribution of seral stages toward a landscape dominated by younger, more uniformly spaced and less complex stands. Harvesting also increases the edge to interior ratio of remaining forest patches and can isolate these forest fragments on the landscape. Depending on the landscape context, this can increase predation levels for forest-dwelling birds (Paton 1994, Thompson et al. 1995), decrease foraging and nesting habitat for 'interior forest' and area-sensitive species (Rotenberry et al. 1995; Thompson et al. 1995), and deter movement and dispersal of forest birds on the landscape (Desrochers and Hannon 1997). Harvesting can also have indirect impacts on birds by increasing road access and subsequent human disturbance from recreation.

Although there have been efforts to modify harvesting practices to better emulate natural disturbance events (e.g., retaining snags and some live trees), naturally disturbed stands may contain critical attributes and processes missing in harvested stands. For example, fire itself may increase the suitability of snags and live trees as nesting and foraging sites for insectivorous and cavity nesting species (Murphy and Lehnhausen 1998). It is possible that some harvested areas may be acting as an ecological sink for certain landbirds, despite their structural similarity to burned sites (Altman and Sallabanks 2000). The long-term consequences of the loss of natural disturbance regimes, older seral stages, and stand complexity for landbirds in coniferous forest ecosystems are unknown.

Three moist coniferous forest categories relevant to focal landbirds have been identified and are described below: **montane spruce forest**, **engelmann spruce-subalpine fir forest** and **interior cedar-hemlock forest**.

### **Montane Spruce Forest**

Montane spruce forest can be considered transitional forest between interior Douglas-fir forest located at lower elevation and Engelmann spruce-subalpine fir forests located above, possessing vegetation characteristics of both forest types (Lloyd et al. 1990; Hope et al. 1991c). Understory species that help define this forest type include Utah honeysuckle and grouseberry. Shrubs present include falsebox and black huckleberry. Heart-leaved arnica, twinflower, one-sided wintergreen, and red-stemmed feather moss are often present in the herb/moss layer. One of the characteristic features of this forest type is the extensive stands of lodgepole pine that have formed following wildfire. Stand-replacing fires have had a strong influence on this zone such that subalpine fir and hybrid white spruce, which are the climax canopy species, are rarely dominant. Many landbirds take advantage of the beetle-killed lodgepole pine and the seed production of these conifer forests for foraging (Hope et al. 1991c).

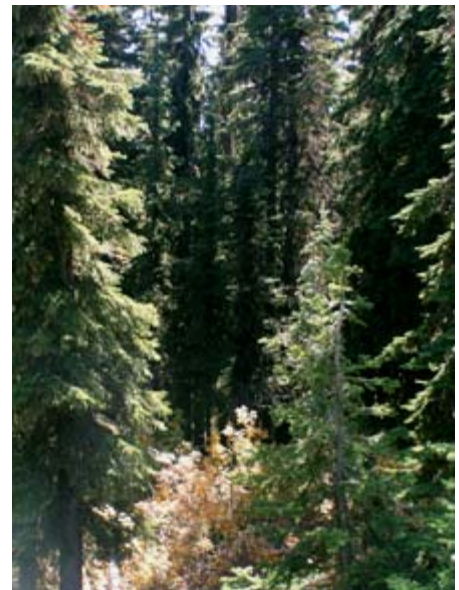


Photo: Andy M. Bezener

## **Engelmann Spruce-Subalpine Fir Forest**

Engelmann-spruce and subalpine fir form a mostly continuous forest at elevations ranging from 1500-2300 m in Canada's Great Basin (Lloyd et al. 1990). As spruce is the longer-lived species, it often is the dominant canopy species with subalpine fir prevalent in the understory. In areas that have been disturbed by fire, lodgepole pine is present as a seral species. At upper elevations, this zone forms a parkland of heath and subalpine meadows interspersed with clumps of trees. White rhododendron and black huckleberry are characteristic shrubs of this forest type. Herbs that may be present include grouseberry, five-leaved bramble, mountain arnica, and Sitka valerian. Moss cover is generally high. The Engelmann Spruce-Subalpine Fir zone provides habitat for bird species associated with old-growth forest attributes and species dependent on conifer seeds (Coupe et al. 1991).



Photo: Andy M. Bezener

## **Interior Cedar-Hemlock Forest**



Photo: Andy M. Bezener

The Interior Cedar-Hemlock forest makes up a small component of the moist coniferous habitat in Canada's Great Basin and is found primarily at the eastern border of the region. Relatively warm summers and a wet climate contribute to the high diversity of tree species found within this forest type (Lloyd et al. 1990; Ketcheson et al. 1991). Owing to a substantial snow pack, there is often a moisture surplus even during the summer months. Western redcedar and western hemlock dominate mature, climax forests, though white spruce, Engelmann spruce, hybrid white spruce, and subalpine fir may also be present. Common seral species include western larch, Douglas-fir, lodgepole pine, trembling aspen and paper birch. Species characteristic of the shrub layer include bunchberry, queen's cup, black huckleberry, and

twinflower. The herb/moss layer is prevalent, with step moss, knight's plume, oak fern and rosy twisted stalk most common. Bird species found in this habitat rely on conifer seeds, canopy and bark-dwelling insects, other birds, and small mammals that are abundant within these forests.

## **Priority Species**

Eleven priority moist coniferous forest landbirds have been identified in Canada's Great Basin (Table 7-1). Eight of these birds are also considered priorities in other portions of the Great Basin (none in Washington/Oregon, 7 in Idaho, 2 in Nevada and 4 in California). Six are considered focal species for a wide range of conservation issues (Table 7-2). Two priority moist coniferous forest landbirds have special ecological requirements and conservation needs that require assessment and action beyond the recommendations for focal species. The remaining three priority moist coniferous forest landbirds will benefit from conservation action for the focal species and do not appear to require additional actions at this time other than monitoring to ensure their continued viability. Continued and improved long-term monitoring is required for all priority moist coniferous forest landbirds.

**Table 7-1. Priority moist coniferous forest landbirds of Canada's Great Basin.**





<b>Focal Species</b>	<b>Species Requiring Specific Action</b>		<b>Monitor Only</b>
<b>Blue Grouse</b>	Spotted Owl	Assess status & needs	Cassin's Vireo
<b>Boreal Owl</b>	Black Swift	Assess status & needs	Golden-crowned Kinglet
<b>Williamson's Sapsucker</b>			MacGillivray's Warbler
<b>Black-backed Woodpecker</b>			
<b>Olive-sided Flycatcher</b>			
<b>Hammond's Flycatcher</b>			

## Conservation Focuses, Focal Species and Recommended Actions





We have identified moist coniferous forest **habitat conservation focuses** that represent the most limiting or threatened moist coniferous forest habitat attributes, ecological processes or habitat configurations. These habitat conservation focuses and representative **focal species** are proposed as the 'focus' of immediate conservation effort. Table 7-2 identifies each focal species, including current biological information, and suggested population objectives to be used to evaluate the success of conservation efforts directed at these focal species and their linked habitat conservation focuses.

Table 7-3 provides a list of specific conservation actions which should benefit one or more moist coniferous forest priority species and their habitat. See the General Conservation Recommendations (pp. 18-20) for more recommended conservation actions that apply to all priority species and habitats. Prioritization of these conservation actions by local and regional conservation partners, and scheduling of timelines for completion is an important next step.





**Table 7-2. Moist Coniferous focal species of Canada's Great Basin: conservation issues and objectives.**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Blue Grouse</b> <i>Dendragapus obscurus</i> BUGR</p>  <p>Photo: Laure Neish</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend; GB &amp; Global: ↓ <b>Size Estimate:</b> Data deficient <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of open or high quality mature forests adjacent to openings. Loss of larger, mature conifers with atypical growth or stress.</p>	<p><b>Throughout Canada's Great Basin, over a wide range of elevations:</b> Breeding habitat includes open coniferous forests and forest openings (including low elevation grasslands) with productive shrubs, forbs and grasses. Wintering habitat includes moderate to dense coniferous forests, usually at higher elevation, with larger trees with atypical growth for foraging/roosting (Zwickel, 1992, Campbell et al. 1990; Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Open coniferous forests, and adjacent grasslands, meadows and clearings with productive forb, grass and shrub layers.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Boreal Owl</b> <i>Aegolius funereus</i> BOOW</p>  <p>Photo: Christian Artuso</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not At Risk. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate:</b> Data deficient <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of large, mid-to-high elevation mature and old growth mixed conifer stands. Loss of snags with cavities. Fragmentation, loss of old-growth structure may reduce availability of small mammal prey.</p>	<p><b>Throughout Canada's Great Basin, at mid to high elevations:</b> Nests in snags or trees with cavities in large patches of mature to old Englemann spruce, subalpine fir, mixed conifer or mixed-wood forests. Open understory may aid in hunting for small mammal prey. Downed wood may help support prey populations (Hayward and Hayward 1993, Campbell et al. 1990; Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Large, unfragmented tracts of old-growth moist coniferous forest with snags containing cavities.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 7-2. Moist Coniferous focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Williamson's Sapsucker</b> <i>Sphyrapicus thyroideus</i> WISA</p>  <p>Photo: Les Gyug</p>	<p><b>Status <sup>b</sup>:</b> BC: Blue-listed (<i>thyroideus</i> ssp.) CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate:</b> 100-200 pairs (L. Gyug 2003, pers. comm.), 114 pairs (Gyug and Peatt 2000) [accuracy rating – moderate]<sup>d</sup> <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of open Douglas-fir, western larch and other mixed coniferous stands. Loss of large snags &amp; stands with high densities of snags. Loss of large diameter conifers (Douglas-fir) for sap trees.</p>	<p><b>Throughout Canada's Great Basin, between 310-1425 m elevation:</b> Nests in mature to old western larch dominated stands, and some mixed coniferous and mixed-wood stands with large diameter snags and trees. (Campbell et al. 1990; Fraser et al. 1990).</p>	<p><b>Conservation Focus:</b> Large diameter snags and mature, western larch dominated forests.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Black-backed Woodpecker</b> <i>Picoides arcticus</i> BBWO</p>  <p>Photo: Christian Artuso</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: No BBS trend <b>Size Estimate:</b> Data deficient <b>Objective <sup>d</sup>:</b> At minimum, maintain current distribution and habitat until data deficiencies (i.e., population size and habitat requirements) are determined.</p>	<p>Loss of burned forests due to fire suppression. Loss of burned or beetle infested trees due to salvage logging.</p>	<p><b>Throughout Canada's Great Basin, usually at mid to high elevations.</b> Nests and forages in recently burned or mature coniferous stands and forest edges with abundant wood-boring or bark beetle prey (Dixon and Saab 2000, Campbell et al. 1990, Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Unsalvaged recent burns and mature to old conifer stands with abundant beetle prey. Maintenance of natural disturbance regimes.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

**Table 7-2. Moist Coniferous focal species of Canada's Great Basin: conservation issues and objectives, con't...**

Focal Species <sup>a</sup>	Population Data and Objective	Potential Conservation Concerns <sup>a, e</sup>	Habitat Description <sup>e</sup>	Conservation Focus <sup>a, e</sup> and Habitat Objective
<p><b>Olive-sided Flycatcher</b> <i>Contopus cooperi</i> OSFL</p>  <p>Photo: Dan Derbyshire / Rocky Point Bird Observatory</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: No BBS trend GB: ↓ <b>Size Estimate <sup>d</sup>:</b> 70,000 [accuracy rating – fair]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Double current population.</p>	<p>Loss of tall snags and wildlife trees due to fire suppression and silvicultural practices. ↓ Food source.</p>	<p><b>Throughout Canada's Great Basin, above 600-900 m elevation:</b> Nests in mature, open coniferous or mixed-wood stands, forest edges and burns with tall snags and trees (Altman and Sallabanks 2000, Campbell et al. 1997; Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Tall trees and snags, especially adjacent to clearings, moist sites, and recent burns with abundant insect prey. Uneven edges and variable canopy openings.</p>  <p>Photo: Andy M. Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>
<p><b>Hammond's Flycatcher</b> <i>Empidonax hammondii</i> HAFL</p>  <p>Photo: Dan Derbyshire / Rocky Point Bird Observatory</p>	<p><b>Status <sup>b</sup>:</b> BC: Yellow (Not at Risk). CAN: Not Assessed. <b>Trend <sup>c</sup>:</b> BC GB: ↓ GB: ↑ <b>Size Estimate <sup>d</sup>:</b> 100,000 [accuracy rating – fair]<sup>d</sup> <b>Objective <sup>d</sup>:</b> Increase current population by 50%.</p>	<p>Loss of mature and old growth forests, with well-developed, shaded canopy. Loss of tall, large diameter trees for nesting and foraging, especially adjacent to small, wet openings.</p>	<p><b>Throughout Canada's Great Basin, at mid to high elevations:</b> Nests in mature, shady, usually moist coniferous forests with large tall trees. Shaded areas of the mid to upper canopy are used for fly-catching. (Campbell et al. 1997; Sedgwick 1994; Cannings et al. 1987).</p>	<p><b>Conservation Focus:</b> Large, tall trees, multiple canopy layers with openings in the sub- and mid-canopy. Moist forest sites and edges.</p>  <p>Photo: Andy Bezener</p> <p><b>Habitat Objective:</b> To be determined.</p>

<sup>a</sup> Partners in Flight database (Panjabi et al. 2001) and/or Partners in Flight BC/Yukon Southern Interior Workshop (March 1999).

<sup>b</sup> Population status from British Columbia Conservation Data Centre ([srmwww.gov.bc.ca/atrisk/toolintro.html](http://srmwww.gov.bc.ca/atrisk/toolintro.html)) and Environment Canada ([www.speciesatrisk.gc.ca/search/default\\_e.cfm](http://www.speciesatrisk.gc.ca/search/default_e.cfm)).

<sup>c</sup> Population trends from Breeding Bird Survey data from 1976 – 2000 for the Southern Interior Ecoprovince (SOI), and on the longest run of data for the Great Basin Bird Conservation Region (GB). Anecdotal information from Cannings (pers. comm. 2000). BC listing from BC Ministry of Sustainable Resource (2001) and Canadian listing from Committee on the Status of Endangered Wildlife in Canada (May 2001).

<sup>d</sup> See Appendix 4 for methods and definitions of accuracy ratings

<sup>e</sup> Other data sources include: Birds of the Okanagan Valley, British Columbia (Cannings et al. 1987); Rare Birds of British Columbia (Fraser et al. 1999); The Birds of British Columbia, volumes II (Campbell et al. 1990) and III (Campbell et al. 1997); Altman and Sallabanks 2000; Dixon and Saab 2000; Gyug 2000; Gyug and Peatt 2000; Kirk 1999; Dobbs et al. 1997; Ingold and Galati 1997; Pitocchelli 1995; Sedgwick 1994; Hayward and Hayward 1993; Les Gyug pers. comm.

**Table 7-3. Recommended actions for moist coniferous forest focal species and habitat conservation focuses.**

Benefiting Focal Species					
BLGR	BOOW	WISA	BBWO	OSFL	HAFI

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Research, Monitoring and Evaluation:**

x	x	√	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
					x
√	√				
x	?	x	x	x	
x	x	x	x	x	x
x			x	x	

Inventory focal species and critical habitat attributes, including compilation of existing occurrence records in areas of conservation interest.

Complete and/or compile mapping of priority moist coniferous forest habitats, including assessment of canopy and understory composition and condition (1:20,000 or finer scale preferred).

Initiate demographic research to confirm population status and determine regionally specific habitat requirements.

Continue tracking population trend using Breeding Bird Survey.

Continue tracking population trend using BC Nocturnal Owl Survey.

Develop localized or species-specific bird monitoring program to track population trend.

Test alternative silvicultural and grazing strategies through demonstration/pilot projects.

Test focal species response to post-harvest prescribed burning.

**Habitat Securement:**

		√			
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Nominate Wildlife Habitat Areas on provincial Crown Lands for focal species included in the BC Identified Wildlife Management Strategy.

**Table 7-3. Recommended actions for moist coniferous forest focal species and habitat conservation focuses, con't...**

Benefiting Focal Species					
BLGR	BOOW	WISA	BBWO	OSFL	HAFI

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Management, Restoration and Enhancement:**

x	x	x	x			Increase and maintain large, unfragmented, unharvested tracts of mature to old montane spruce, Engelmann spruce-subalpine fir, and interior cedar-hemlock forest.
			x	x		Encourage the retention of some burned and insect infested forest stands.
	x	x	x	x		Increase and maintain old growth attributes, native vegetation and ecological processes in managed montane spruce, Engelmann spruce-subalpine fir, and interior cedar-hemlock forests.
	x	√	x	x		Retain and manage for larger diameter, tall trees and snags, especially those >50 cm dbh, snags and trees should be managed in a clumped distribution in some areas.
x				x	x	Manage for presence of multi-canopied stands and a variety of canopy openings.
x	x	x	x	x	x	Retain and manage for a diversity of canopy tree species, especially western larch, trembling aspen Englemann spruce and sub-alpine fir.
x	x			x	x	Retain and manage for native understory species and structure both within the forest and at forest edges by avoiding the use of herbicides, retaining downed woody debris, and excluding livestock, or reducing grazing pressure to preserve understory shrub and forb layer.
x			x	x		Maintain, restore or mimic natural fire regimes. Avoid or limit salvage logging of burned or insect infested trees and snags.
		x	x	?	?	Eliminate or minimize use of chemical pesticides, especially where there is potential for drift, runoff or leaching into adjacent riparian zones or water bodies. Encourage the use of preventative measures in the management of bark-beetle populations, and discourage the use of herbicides (e.g., MSMA) and pesticides.

**Table 7-3. Recommended actions for moist coniferous forest focal species and habitat conservation focuses, con't...**

Benefiting Focal Species					
BLGR	BOOW	WISA	BBWO	OSFL	HAFI

**Conservation Actions**

(√ = actions completed or underway; x = actions to be initiated; ? = actions to be assessed)

**Habitat Management, Restoration and Enhancement, con't:**

x	x			x	x
x	x	x	x	x	x
x	x	x	x	x	x

Adjust timing and/or duration of livestock grazing to eliminate or minimize adverse livestock impacts to moist coniferous forest birds: exclude livestock, or reduce grazing pressure in some stands to preserve understory shrub and forb layer, and to reduce rates of cowbird brood parasitism.

Encourage the coordination of road planning among industries and user groups, and de-activate and replant old roads.

Restore and maintain connectivity between moist coniferous forest patches, especially between old, unharvested coniferous stands and/or mature to old high quality managed stands, and to adjacent riparian habitats. Ensure connectivity between high and low elevation forests.

**Outreach and Education:**

x	x	√	x	x	x
x	x	√	x	x	x

Promote priority and focal species and their habitat requirements for forest licensee stewardship.

Assist private landowners, First Nations, ranchers and other land managers to learn to identify focal species and their required habitats.

**Policy and Legislation:**

x	x	x	x	x	x
		x			

Work with forest licensees, forestry companies, ranchers and conservation partners to develop best management practices guidelines for activities in moist coniferous forest habitats that incorporate protection of focal species and their habitats.

Assist with development or revision, where necessary, of Wildlife Habitat Area criteria for provincial Crown Lands.

## Chapter 8

# Implementation Strategy

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This plan was developed with extensive regional participation and consultation. Successful implementation will require the allocation of financial resources and extensive multi-partner cooperation from different levels of government, industry, first nations, environmental non-government organizations, academic and research institutions and private landowners will be essential.

Partners in Flight BC and Yukon will implement this plan through its Great Basin Program Manager and Great Basin Steering Committee whose main roles will be to:

- 1) Produce an annual implementation schedule that will include tasks, responsibilities, timelines, funding and a list of pre-identified potential problems and solutions;
- 2) Identify local initiatives, projects and organizations capable of working as local partners to achieve conservation objectives and recommendations stated in this plan;
- 3) Identify shared priorities for habitat securement, habitat management, research, monitoring and evaluation, and outreach and education;
- 4) Identify site-specific projects, and appropriate groups and organizations to carry out those projects for each of the priority actions;
- 5) Foster the integration of this plan with existing regional and international conservation initiatives, incorporating landbird conservation actions. This could include recovery strategies, management plans for other taxa, and development of strategic alliances to identify funding alternatives;
- 6) Define a list of quantifiable indicators for each recommendation to facilitate regular evaluation of this plan.

An important and positive new development encompassing the Canadian portions of both the Great Basin and the Northern Rockies Bird Conservation Regions is the formation of the Canadian Intermountain Joint Venture. This partnership embraces an all-bird, all-habitat conservation approach and encompasses many of the organizations working on bird and habitat conservation in Canada's Great Basin, including Partners in Flight BC and Yukon. Therefore, the Canadian Intermountain Joint Venture, and other existing partnerships, such as the South Okanagan–Similkameen Conservation Program, offer exciting opportunities for implementing significant portions of this conservation plan.



CIJV Technical Working Group Meeting. Photo: Andy M. Bezener

## Chapter 9

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## Appendices

### Appendix 1. Priority Species in Canada's Great Basin.

Common name	Scientific name	Common name	Scientific name
Swainson's Hawk	<i>Buteo swainsoni</i>	Brewer's Sparrow	<i>Spizella breweri</i>
Ferruginous Hawk	<i>Buteo regalis</i>	Lark Sparrow	<i>Chondestes grammacus</i>
American Kestrel	<i>Falco sparverius</i>	Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Prairie Falcon	<i>Falco mexicanus</i>	Lazuli Bunting	<i>Passerina amoena</i>
Peregrine Falcon	<i>Falco peregrinus</i>	Bobolink	<i>Dolichonyx oryzivorus</i>
Blue Grouse	<i>Dendragapus obsucurus</i>	Western Meadowlark	<i>Sturnella neglecta</i>
Sharp-tailed Grouse	<i>Tympanuchus phasianellus</i>	Cassin's Finch	<i>Carpodacus cassinii</i>
Sage Grouse	<i>Centrocercus urophasianus</i>		
Long-billed Curlew	<i>Numenius americanus</i>		
Barn Owl	<i>Tyto alba</i>		
Short-eared Owl	<i>Asio flammeus</i>		
Spotted Owl	<i>Strix occidentalis</i>		
Western Screech-Owl	<i>Otus kennicottii</i>		
Flammulated Owl	<i>Otus flammeolus</i>		
Boreal Owl	<i>Aegolius funereus</i>		
Burrowing Owl	<i>Athene cunicularia</i>		
Common Poorwill	<i>Phalaenoptilus nuttallii</i>		
Black Swift	<i>Cypseloides niger</i>		
Vaux's Swift	<i>Chaetura vauxi</i>		
White-throated Swift	<i>Aeronautes saxatalis</i>		
Calliope Hummingbird	<i>Stellula calliope</i>		
Rufous Hummingbird	<i>Selasphorus rufus</i>		
White-headed Woodpecker	<i>Picoides albolarvatus</i>		
Lewis's Woodpecker	<i>Melanerpes lewis</i>		
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>		
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>		
Black-backed Woodpecker	<i>Picoides arcticus</i>		
Olive-sided Flycatcher	<i>Contopus cooperi</i>		
Hammond's Flycatcher	<i>Empidonax hammondii</i>		
Gray Flycatcher	<i>Empidonax wrightii</i>		
Dusky Flycatcher	<i>Empidonax oberholseri</i>		
Pacific-slope Flycatcher	<i>Empidonax difficilis</i>		
Cassin's Vireo	<i>Vireo cassinii</i>		
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>		
Mountain Chickadee	<i>Poecile gambeli</i>		
Rock Wren	<i>Salpinctes obsoletus</i>		
Canyon Wren	<i>Catherpes mexicanus</i>		
Golden-crowned Kinglet	<i>Regulus satrapa</i>		
Veery	<i>Catharus fuscescens</i>		
Sage Thrasher	<i>Oreoscoptes montanus</i>		
Yellow Warbler	<i>Dendroica petechia</i>		
MacGillivray's Warbler	<i>Oporornis tolmiei</i>		
Yellow-breasted Chat	<i>Icteria virens</i>		
Chipping Sparrow	<i>Spizella passerina</i>		

## Appendix 2: Additional PIF priority species in the Great Basin Bird Conservation Region

Common name	Scientific name	Not present in SOI
American Dipper	<i>Cinclus mexicanus</i>	
Band-tailed Pigeon	<i>Columba fasciata</i>	
Black Rosy-Finch	<i>Leucosticte atrata</i>	*
Black-backed Woodpecker	<i>Picoides arcticus</i>	
Black-billed Magpie	<i>Pica pica</i>	
Bohemian Waxwing	<i>Bombycilla garrulous</i>	
California Quail	<i>Callipepla californica</i>	
Golden Eagle	<i>Aquila chrysaelos</i>	
Juniper Titmouse	<i>Baeolophus inornatus</i>	*
Killdeer	<i>Charadrius vociferous</i>	
Le Conte's Thrasher	<i>Toxostoma lecontei</i>	*
Lesser Goldfinch	<i>Carduelis psaltria</i>	*
Loggerhead Shrike	<i>Lanius ludovicianus</i>	
Long-eared Owl	<i>Asio otus</i>	
Marsh Wren	<i>Cistothorus palustris</i>	
Merlin	<i>Falco columbarius</i>	
Mountain Quail	<i>Oreortyx pictus</i>	*
Northern Harrier	<i>Circus cyaneus</i>	
Northern Shrike	<i>Lanius excubitor</i>	
Nuttall's Woodpecker	<i>Picoides nuttallii</i>	*
Pigmy Nuthatch	<i>Sitta pygmaea</i>	
Red-breasted Sapsucker	<i>Sphyrapicus rubber</i>	
Sage Sparrow	<i>Amphispiza belli</i>	casual
Spotted Towhee	<i>Pipilo maculatus</i>	
Tri-colored Blackbird	<i>Agelaius tricolor</i>	*

### Appendix 3. Scientific names for plant and fungus species identified in Canada's Great Basin Landbird Conservation Plan.

Common Name	Scientific Name
Alfalfa	<i>Medicago sativa</i>
Alkali Saltgrass	<i>Distichlis stricta</i>
Alsike Clover	<i>Trifolium hybridum</i>
Antelope-Brush (Bitterbrush)	<i>Purshia tridentata</i>
Arrow-Leaved Balsamroot	<i>Balsamorhiza sagittata</i>
Aster	<i>Aster sp.</i>
Big Sagebrush	<i>Artemisia tridentata</i>
Birch-Leaved Spirea	<i>Spiraea betulifolia</i>
Bitterroot	<i>Lewisia rediviva</i>
Black Cottonwood	<i>Populus trichocarpa</i>
Black Gooseberry	<i>Ribes lacustre</i>
Black Huckleberry	<i>Vaccinium membranaceum</i>
Blue Wildrye	<i>Elymus glaucus</i>
Bluebunch Wheatgrass	<i>Agropyron spicatum</i>
Brittle Prickly-Pear Cactus	<i>Opuntia fragilis</i>
Bull Thistle	<i>Cirsium vulgare</i>
Bulrush	<i>Scirpus sp.</i>
Bunchberry	<i>Cornus canadensis</i>
Canada Thistle	<i>Cirsium arvense</i>
Cattail	<i>Typha latifolia</i>
Cheatgrass (Downy Brome)	<i>Bromus tectorum</i>
Chokecherry	<i>Prunus virginiana</i>
Columbia Needlegrass	<i>Stipa columbiana</i>
Common Crupina	<i>Crupina vulgaris</i>
Common Hound's-Tongue	<i>Cynoglossum officinale</i>
Common Snowberry	<i>Symphoricapos albus</i>
Common's Hound's Tongue	<i>Cynoglossum officinale</i>
Crested Wheatgrass	<i>Agropyron cristatum</i>
Cut-Leaved Fleabane	<i>Erigeron compositum</i>
Daisies (Native Sp.)	<i>Erigeron sp.</i>
Dalmatian Toadflax	<i>Linaria genistifolia dalmatica</i>
Diffuse Knapweed	<i>Centaurea diffusa</i>
Dog Pelt	<i>Peltigera canina</i>
Douglas-fir	<i>Pseudotsuga menziesii</i>
Douglas Maple	<i>Acer glabrum var. douglasii</i>
Elderberry	<i>Sambucus canadensis</i>
Engelmann Spruce	<i>Picea engelmannii</i>
Falsebox	<i>Paxistima myrsinites</i>
Fescue	<i>Festuca sp.</i>
Field Scabious	<i>Knautia arvensis</i>
Five-Leaved Bramble	<i>Rubus pedatus</i>
Foxtail Barley	<i>Hordeum jubatum</i>
Giant Wildrye	<i>Elymus cinereus</i>
Great Mullein	<i>Verbascum thapsus</i>
Grouseberry	<i>Vaccinium scoparium</i>

Common Name	Scientific Name
Hawthorn	<i>Crataegus spp.</i>
Heart-Leaved Arnica	<i>Arnica cordifolia</i>
Heart-Rot Fungus (White Heart-Rot)	<i>P. tremulae</i>
Hound's Tongue	<i>Cynoglossum officinale</i>
Hybrid White Spruce	<i>Picea engelmannii x glauca</i>
Idaho Fescue	<i>Festuca idahoensis</i>
Indian Ricegrass	<i>Stipa hymenoides (Oryzopsis hymenoides)</i>
Interior Douglas-fir	<i>Pseudotsuga menziesii var. glauca</i>
Junegrass	<i>Koeleria macrantha</i>
Kentucky Bluegrass	<i>Poa pratensis</i>
Kinnikinnick	<i>Arctostaphylos uva-ursi</i>
Knapweed	<i>Centaurea spp.</i>
Knight's Plume	<i>Ptilium crista-castrensis</i>
Lamb's-Quarters	<i>Chenopodium album</i>
Large-Fruited Desert-Parsley	<i>Lomatium macrocarpum</i>
Leafy Spurge	<i>Euphorbia esula</i>
Lodgepole Pine	<i>Pinus contorta var. latifolia</i>
Low Pussytoes	<i>Antennaria dimorpha</i>
Many-Spined Prickly-Pear Cactus	<i>Opuntia polyacantha</i>
Mountain Arnica	<i>Arnica latifolia</i>
Narrow-Leaved Desert-Parsley	<i>Lomatium triternatum</i>
Needle-And-Thread Grass	<i>Stipa comata</i>
Nootka Rose	<i>Rosa nutkana</i>
Nuttall's Alkaligrass	<i>Puccinellia nuttalliana</i>
Oak Fern	<i>Gymnocarpium dryopteris</i>
One-Sided Wintergreen	<i>Pyrola secunda</i>
Orange Hawkweed	<i>Hieracium aurantiacum</i>
Orchard Grass	<i>Dactylis glomerata</i>
Oxeye Daisy	<i>Chrysanthemum leucanthemum</i>
Paper Birch	<i>Betula papyrifera</i>
Pasture Sage	<i>Artemisia frigida</i>
Perennial Pepperweed	<i>Lepidium latifolium</i>
Perennial Ryegrass	<i>Lolium perenne</i>
Pinegrass	<i>Calamagrostis rubescens</i>
Pixie-Cup	<i>Cladonia pyxidata</i>
ponderosa pine	<i>Pinus ponderosa</i>
Poplar	<i>Populus spp.</i>
Porcupine Grass	<i>Stipa spartea</i>
Prairie Rose	<i>Rosa woodsii</i>
Prickly-Pear Cactus	<i>Opuntia fragilis</i>
Puncturevine	<i>Tribulus terrestris</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Quackgrass (Couchgrass)	<i>Agropyron repens</i>
Queen's Cup	<i>Clintonia uniflora</i>
Rabbitbrush	<i>Chrysothamnus nauseosus</i>
Red-Osier Dogwood	<i>Cornus stolonifera (Cornus sericea)</i>

Common Name	Scientific Name
Red-Stemmed Feather Moss	<i>Pleurozium schreberi</i>
Red Alder	<i>Alnus rubra</i>
Red Clover	<i>Trifolium pratense</i>
Red Three-Awn	<i>Aristida longiseta</i>
Redtop	<i>Agrostis stolonifera</i>
Reed Canarygrass	<i>Phalaris arundinacea</i>
Rocky Mountain Fescue	<i>Festuca saximontana</i>
Rosy Pussytoes	<i>Antennaria microphylla</i>
Rosy Twisted Stalk	<i>Streptopus roseus</i>
Rough Fescue	<i>Festuca campestris (Festuca scabrella major)</i>
Rush Skeletonweed	<i>Chondrilla juncea</i>
Russian Knapweed	<i>Centaurea repens</i>
Rusty Steppe Moss	<i>Tortula ruralis</i>
Sagebrush	<i>Artemisia tridentata</i>
Sagebrush Mariposa Lily	<i>Calochortus macrocarpus</i>
Sand Dropseed	<i>Sporobolus cryptandrus</i>
Sandberg's Bluegrass	<i>Poa secunda (Poa sandbergii)</i>
Saskatoon (Serviceberry)	<i>Amelanchier alnifolia</i>
Scentless Chamomile	<i>Matricaria perforata (Matricaria maritima)</i>
Sedges	<i>Carex spp.</i>
Selaginella	<i>Selaginella densa</i>
Selaginella Densa	<i>Selaginella densa</i>
Silky Lupine	<i>Lupinus sericeus</i>
Silver Moss	<i>Bryum argenteum</i>
Sitka Valerian	<i>Valeriana sitchensis</i>
Smooth Brome	<i>Bromus inermis inermis</i>
Snowberry	<i>Symphoricarpos alba</i>
Spotted Knapweed	<i>Centaurea maculosa</i>
Spreading Needlegrass	<i>Stipa richardsonii</i>
Star-Flowered False Solomon's Seal	<i>Maianthemum stellatum</i>
Step Moss	<i>Hylocomium splendens</i>
Stiff Needlegrass	<i>Stipa occidentalis</i>
Subalpine Fir	<i>Abies lasiocarpa</i>
Sulphur Cinquefoil	<i>Potentilla recta</i>
Sulphur Lupine	<i>Lupinus sulphureus</i>
Tansy Ragwort	<i>Senecio jacobeeae</i>
Thimbleberry	<i>Rubus parviflorus</i>
Threetip Sagebrush	<i>Artemisia tripartita</i>
Timber-Milk Vetch	<i>Astragalus miser</i>
Timothy	<i>Phleum pratense</i>
Trembling Aspen	<i>Populus tremuloides</i>
Twinflower	<i>Linnaea borealis</i>
Utah Honeysuckle	<i>Lonicera utahensis</i>
Vasey's Sagebrush	<i>Artemisia tridentata ssp. Vaseyana</i>
Vine Maple	<i>Acer circinatum</i>
Water Birch	<i>Betula occidentalis</i>

<b>Common Name</b>	<b>Scientific Name</b>
Western Hemlock	<i>Tsuga heterophylla</i>
Western Larch	<i>Larix occidentalis</i>
Western Red Cedar	<i>Thuja plicata</i>
White Clover	<i>Trifolium repens</i>
White Rhododendron	<i>Rhododendron albiflorum</i>
White Spruce	<i>Picea glauca</i>
White Sweet Clover	<i>Mellilotus alba.</i>
Wild Rose (Prickly Rose)	<i>Rosa acicularis</i>
Willow	<i>Salix spp.</i>
Yarrow	<i>Achillea millefolium</i>
Yellow Hawkweed	<i>Hieracium pratense</i>
Yellow Starthistle	<i>Centaurea solstitialis</i>

## Appendix 4. Criteria for Setting Initial Landbird Focal Species Population Objectives.

### A. Current Population Size Estimate

The status and biological objectives presented should be interpreted as coarse estimates only. Data on the status, trends, viability, and habitat requirements of most species are extremely limited. Explanations and sources for information are presented in Appendix 6. Population size estimates are based on expert opinion or published estimates where these sources exist. Where available, Breeding Bird Survey data is used to estimate population size (Dick Cannings pers. comm. 2003) using methods described in Rosenberg and Blancher (In prep.). Estimates based on BBS data are calculated as:

$$\text{Pop. Size} = \frac{\text{Avg. \# of birds per BBS route}}{\text{Effective area sampled (km}^2\text{)}} \times \text{Area of the Canadian Intermountain (km}^2\text{)} \times \text{Time of Day Correction} \times \text{Habitat Correction}$$

When average number of birds per route is calculated using 1990-1999 data from BBS routes in Canada's Great Basin, effective area sampled accounts for species-specific detection distances, time of day correction accounts for changes in species detection probability (e.g. changes in singing rates) over the BBS sampling period, and habitat correction is a species-specific correction that accounts for differences in the proportion of a species' habitat sampled by BBS routes vs. the proportion of a species' habitat available in Canada's Great Basin.

Habitat corrections presented here are based on Canada's Great Basin only and thus are preliminary calculations. Habitat corrections are determined by associating species with British Columbia's Broad Ecosystem Units (BC Ministry of Sustainable Resource Management 2002c) and by dividing the proportion of these habitats sampled by BBS routes by the proportion of these habitats in Canada's Great Basin.

Partners in Flight BC/Yukon landbird population experts assessed the accuracy of all population size estimates listed in Tables 4-2, 5-2, 6-2 and 7-2. Each estimate was assigned an accuracy rating (see table below), based on a system developed for the Partners In Flight North American Landbird Conservation Plan (Rich et al. in prep), with appropriate regional modifications.

### Accuracy of Estimate Ratings

Global Accuracy Rating	Word Equivalent	Meaning re Accuracy of Global Population Estimates
1	Guesstimate	Order of magnitude judgements made, because few data available on relative abundance, and/or very small proportion of global population sampled. Estimates expressed as a range, but may not be in correct order of magnitude.
2	Poor	Data available to calculate an estimate, but multiple limitations (some or all of: low sample size (present on 10-14 BBS routes), small portion of range sampled, inappropriate sampling methods / bias, high variance in counts). Estimates normally expected to be in correct order of magnitude.
3	Fair	Data available to calculate an estimate, but one or a few limitations increase uncertainty (low sample size (present on >14 BBS routes), small portion of range sampled, inappropriate sampling methods / bias, high variance in counts). Estimates expected to be in correct order of magnitude.
4	Moderate	Good coverage by BBS across range, and BBS methods appropriate. Or species-specific estimates using appropriate data representative of species range. Estimates likely to be well within correct order of magnitude.
5	Good	Estimates based on species-specific surveys of appropriate design; confidence limits possible.
6	Accurate	Most individuals censused, or accurate estimates are available from colour-marking most of global population. Applies to a few endangered species.

### B. Population Trends/ Percent Change in Population from 1970's.

Qualitative description of population trends are based on published estimates of long term trend or Bird Conservation Region-wide (US+Canada) BBS trend data from 1968-2000.

Probable declines are listed for those species showing >1.41 % decline per year based on data from BCR 9 (see Panjabi et al. 2001).

Percent (%) change from 1970's is based on 1968-2000 BBS trend data within Canada's Great Basin, where annual percent changes are extrapolated over 30 years to estimate percent population change since 1970.

### C. Population Objectives

Where population estimates are not possible due to lack of data, our objective is to ensure current numbers, distribution and habitat are maintained until status and requirements are better understood. Where current population estimates are possible and BBS trend data are available, we follow the Draft Partners In Flight North American Landbird Conservation Plan (Rich et al in prep.) and use the following generalizations, based on 1968-2000 BBS data, for initial population objectives:

- for species that show significant or severe declines of more than 50% over 30 years (i.e., those with Population Trend scores of 5, see Appendices 5 and 6) within Canada's Great Basin, or where sufficient data from Canada's Great Basin is not available, we suggest an initial objective of doubling current populations over the next 30 years;
- for species showing moderate declines of 15% - 50% over 30 years (as indicated by Population Trend scores of 4) we suggest an initial objective of increasing populations by 50% over the next 30 years;
- for species with uncertain or stable trends (Population Trend scores of 3), we suggest increasing populations by 10% over the next 30 years.

**Appendix 5: Suite of species and raw scores used to calculate Canada's Great Basin priority species.  
(See pages 6-8 for full explanation of criteria).**

NAME	G-BD	G-ND	G-RA	AI	PT	L-TB	L-TN
American Bittern	1	2	3	3	3	4	3
American Coot	1	1	1	4	3	2	1
American Crow	1	1	1	5	2	1	1
American Dipper	2	2	4	3	2	2	2
American Goldfinch	1	1	2	3	5	1	1
American Kestrel	1	1	2	5	5	3	1
American Pipit	1	1	2			2	2
American Redstart	1	2	2	2	5	3	2
American Robin	1	1	1	4	3	1	1
American Tree Sparrow	2	2	2			2	2
Anna's Hummingbird	4	4	2	1	3	2	1
Bald Eagle	2	1	3	1	2	3	3
Bank Swallow	1	1	2	5	1	2	2
Barn Swallow	1	1	1	4	3	1	2
Barn Owl							
Barred Owl	1	1	3	1	3	3	3
Belted Kingfisher	1	1	3	4	3	2	2
Black-backed Woodpecker	2	2	4	2	3	4	4
Black-billed Magpie	2	2	2	5	2	1	2
Black-capped Chickadee	1	1	2	3	2	2	1
Black-chinned Hummingbird	3	5	3	1		2	2
Black-headed Grosbeak	2	4	2	3	1	4	3
Black Swift	3	4	4	5	3	2	3
Blue Grouse	3	3	3	2	5	3	3
Bobolink	2	2	2	2	5	5	4
Bohemian Waxwing	2	2	3			2	2
Boreal Chickadee	1	1	3	1	5	2	2
Boreal Owl	2	2	4			4	3
Brewer's Blackbird	2	1	1	5	3	1	1
Brewer's Sparrow	3	3	1	5		4	2
Brown-headed Cowbird	1	1	1	5	2	1	1
Brown Creeper	1	1	3	2	5	4	4
Bullock's Oriole	1	4	2	4	2	3	2
Burrowing Owl	1	2	3	2	1	5	3
California Quail	4	4	2	4	2	1	2
Calliope Hummingbird	3	5	3	5	2	1	2
Canyon Wren	2	2	3	2	3	2	3
Cassin's Finch	3	2	2	5	3	3	2
Cassin's Vireo	3	3	3	3	3	3	3
Cedar Waxwing	1	1	2	3	2	2	2
Chestnut-backed Chickadee	4	4	2	2	3	2	2
Chipping Sparrow	1	2	2	5	5	2	1
Chukar	1	1	1	5	4	1	1
Clark's Nutcracker	2	2	3	4	2	2	2
Clay-colored Sparrow	2	3	2	1	3	4	3

**G-BD = Global Breeding Distribution**

**G-ND = Global Non-breeding Distribution**

**G-RA = Global Relative Abundance**

**AI = BCR-level Area Importance**

**PT = Global/BCR/Local Population Trend**

**L-TB = Global/BCR/Local Threats to Breeding**

**L-TN = Global/BCR/Local Threats to Non-breeding**

NAME	G-BD	G-ND	G-RA	AI	PT	L-TB	L-TN
Cliff Swallow	1	1	1	4	5	1	2
Common Loon	1	2	3	2	3	3	3
Common Nighthawk	1	1	2	4	2	2	2
Common Poorwill	2	3	3	4	3	3	3
Common Raven	1	1	2	5	2	1	1
Common Redpoll	1	2	2		4	2	2
Common Yellowthroat	1	2	1	2	2	2	2
Cooper's Hawk	1	1	3	3	3	3	2
Dark-eyed Junco	1	1	2	5	2	1	1
Downy Woodpecker	1	1	3	2	2	3	2
Dusky Flycatcher	3	4	3	5	4	2	2
Eared Grebe	1	1	2	5	1	3	2
Eastern Kingbird	1	2	2	3	2	3	2
European Starling	1	1	1	4	3	1	1
Evening Grosbeak	2	1	1	4	5	2	2
Ferruginous Hawk	2	3	4	4	2	5	3
Flammulated Owl	3	4	3			4	3
Fox Sparrow	1	2	2	2	4	3	2
Golden-crowned Kinglet	2	1	3	3	5	3	3
Golden-crowned Sparrow	3	4	3			2	1
Golden Eagle	1	1	4	5	2	3	3
Grasshopper Sparrow	1	2	2	3	3	4	3
Gray-crowned Rosy-Finch	3	2	2			1	2
Gray Catbird	1	3	2	2	1	3	2
Gray Flycatcher	4	4	3	5	1	1	2
Gray Jay	1	1	3	2	3	2	2
Gray Partridge	1	1	1	2	5	3	3
Great Blue Heron	1	1	2	3	4	2	2
Great Gray Owl	2	2	4			3	3
Great Horned Owl	1	1	3	3	3	1	1
Hairy Woodpecker	1	1	3	4	2	3	2
Hammond's Flycatcher	3	4	3	4	2	3	2
Hermit Thrush	1	2	2	4	2	3	3
Horned Grebe	1	2	3			3	2
Horned Lark	1	1	1	4	5	2	1
House Finch	1	1	1	5	2	1	1
House Sparrow	1	1	1	3	4	1	1
House Wren	1	1	2	4	1	2	1
Lapland Longspur	3	1	2			3	2
Lark Sparrow	1	3	2	4	4	4	2
Lazuli Bunting	2	5	2	5	2	2	2
Least Flycatcher	1	3	2	1	3	3	2
Lewis's Woodpecker	3	3	4	5	5	4	4
Lincoln's Sparrow	1	2	2	2	3	2	3
Long-eared Owl	1	1	3			3	3
MacGillivray's Warbler	3	3	2	4	3	2	3
Marsh Wren	2	2	2	5	1	3	4
Merlin	1	1	3	2	3	2	2
Mountain Bluebird	2	3	2	4	1	3	2

**G-BD = Global Breeding Distribution**

**G-ND = Global Non-breeding Distribution**

**G-RA = Global Relative Abundance**

**AI = BCR-level Area Importance**

**PT = Global/BCR/Local Population Trend**

**L-TB = Global/BCR/Local Threats to Breeding**

**L-TN = Global/BCR/Local Threats to Non-breeding**

NAME	G-BD	G-ND	G-RA	AI	PT	L-TB	L-TN
Mountain Chickadee	2	2	2	4	4	2	2
Mourning Dove	1	1	1	3	3	3	2
Nashville Warbler	2	4	2	3	3	3	1
Northern Flicker	1	1	2	5	2	2	1
Northern Goshawk	1	1	4			4	3
Northern Harrier	1	1	3	5	2	3	2
Northern Pygmy-Owl	2	2	3	2	3	2	2
Northern Rough-winged Swallow	1	3	2	5	5	2	2
Northern Saw-whet Owl	1	1	3			3	3
Northern Shrike	3	1	4			2	2
Northern Waterthrush	1	2	2	2	3	1	3
Olive-sided Flycatcher	1	2	3	3	5	4	1
Orange-crowned Warbler	1	2	2	3	4	2	3
Osprey	1	1	3	2	3	1	2
Pacific-slope Flycatcher	4	5	2		4	2	3
Peregrine Falcon	1	1	4	2		4	4
Pied-billed Grebe	1	1	2	3	2	3	2
Pileated Woodpecker	1	1	3	2	2	4	2
Pine Grosbeak	1	2	3	2	3	2	2
Pine Siskin	1	1	2	4	5	1	3
Prairie Falcon	2	2	4	5	5	4	4
Pygmy Nuthatch	3	3	2	2	2	3	3
Red-breasted Nuthatch	1	1	2	4	2	3	2
Red-eyed Vireo	2	2	1	2	5	3	3
Red-naped Sapsucker	3	3	3	4	3	2	2
Red-necked Grebe	1	2	3	1	3	3	1
Red-tailed Hawk	1	1	3	5	1	1	1
Red-winged Blackbird	1	1	1	3		2	1
Red Crossbill	1	1	2	4	3	2	2
Ring-necked Pheasant	1	1	1	5	5	1	1
Rock Dove	1	1	1	5	3	1	2
Rock Wren	1	2	3	5	2	2	2
Rough-legged Hawk	1	1	3			1	3
Ruby-crowned Kinglet	1	2	2	2	5	2	2
Ruffed Grouse	2	2	3	2	3	3	3
Rufous Hummingbird	3	5	3	3	5	1	3
Rusty Blackbird	1	2	3	1		3	1
Sage Grouse	3	3	4	4	5	5	5
Sage Thrasher	3	3	2	5		5	3
Sandhill Crane	2	4	3	4	4	4	1
Savannah Sparrow	1	2	1	5	2	2	2
Say's Phoebe	1	3	3	4	1	2	2
Sharp-shinned Hawk	1	1	3	3	2	3	2
Sharp-tailed Grouse	2	2	3	2	4	4	4
Short-eared Owl	1	1	4	4	2	4	4
Snow Bunting	2	1	3			2	1
Song Sparrow	1	1	1	4	2	2	1
Sora	1	1	2	2	2	2	2

**G-BD = Global Breeding Distribution**

**G-ND = Global Non-breeding Distribution**

**G-RA = Global Relative Abundance**

**AI = BCR-level Area Importance**

**PT = Global/BCR/Local Population Trend**

**L-TB = Global/BCR/Local Threats to Breeding**

**L-TN = Global/BCR/Local Threats to Non-breeding**

NAME	G-BD	G-ND	G-RA	AI	PT	L-TB	L-TN
Spotted Towhee	2	2	2	4	1	2	2
Spruce Grouse	1	1	3			3	3
Steller's Jay	2	2	2	3	3	2	1
Swainson's Hawk	2	3	3	3	2	4	3
Swainson's Thrush	1	2	1	4	2	2	3
Three-toed Woodpecker	1	1	4	1	4	4	4
Townsend's Solitaire	2	2	3	5	1	2	2
Townsend's Warbler	3	3	2	4	2	3	2
Tree Swallow	1	2	2	4	2	2	1
Turkey Vulture	1	1	2	2	2	1	2
Varied Thrush	2	4	2	3	2	3	3
Vaux's Swift	3	3	3	4	2	4	3
Veery	2	2	2	3	5	3	2
Vesper Sparrow	1	2	1	5	2	3	3
Violet-green Swallow	1	3	2	4	2	2	2
Virginia Rail	1	2	2	5	2	4	4
Warbling Vireo	1	4	2	4	1	3	2
Western Bluebird	3	3	3	2	1	3	2
Western Grebe	3	3	3			5	2
Western Kingbird	1	4	2	5	2	2	3
Western Meadowlark	1	2	1	4	4	3	2
Western Screech-Owl	2	2	3	4		4	4
Western Tanager	2	3	2	5	2	3	3
Western Wood-Pewee	1	2	2	5	2	2	2
White-breasted Nuthatch	1	1	3	2	3	3	1
White-crowned Sparrow	1	2	1	3	2	2	1
White-headed Woodpecker	4	4	3	2	3	4	4
White-tailed Ptarmigan	3	3	4			2	2
White-throated Swift	2	3	2	4	2	2	3
White-winged Crossbill	1	1	3	1	4	3	3
Wild Turkey	2	2	3	1		1	3
Williamson's Sapsucker	3	3	3	5	2	5	2
Willow Flycatcher	1	4	3			4	2
Wilson's Warbler	1	3	2	2	3	2	2
Winter Wren	1	1	2	3	2	2	3
Yellow-breasted Chat	1	3	2	2	1	5	3
Yellow-headed Blackbird	2	3	1	5	2	3	1
Yellow-rumped Warbler	1	1	2	5	2	1	1
Yellow Warbler	1	1	2	4	5	3	0

**G-BD = Global Breeding Distribution**

**G-ND = Global Non-breeding Distribution**

**G-RA = Global Relative Abundance**

**AI = BCR-level Area Importance**

**PT = Global/BCR/Local Population Trend**

**L-TB = Global/BCR/Local Threats to Breeding**

**L-TN = Global/BCR/Local Threats to Non-breeding**

### Appendix 6. Population data<sup>a</sup> and objectives for focal landbirds in Canada's Great Basin.

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>*</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
LOWLAND RIPARIAN	<b>Lewis's Woodpecker</b>							
	Increase current population by 50%.	BC GB: Insufficient data	WA/OR: 16.1 pairs/ha <sup>cxxv</sup>		CO: 60.2% (cottonwood-agriculture), 29.4% (cottonwood-oak woodland) <sup>i</sup> WY: 85% (burned P. pine) <sup>i</sup> ID: 81% <sup>ii</sup>	CO: 88% (overwinter) <sup>i</sup>	WA/OR: 1.0 -6.1 ha <sup>cxxv</sup>	To be determined.
	<b>Western Screech-Owl</b>							
	Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	CO: 3.0 – 4.0 birds/sq km <sup>iii</sup> CA: 0.4 pairs/ha <sup>iv</sup>	CA: 14 birds/6.4 km (along a river) <sup>v</sup>	ID: 89% <sup>vi</sup>			To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

<sup>\*</sup>0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>†</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
LOWLAND RIPARIAN	<b>Yellow-breasted Chat</b>							
	Adopt population recovery objective from Recovery Action Plan, <i>in progress</i> .	BC GB: Insufficient data	MD: 20 - 90 males/100 ha <sup>vii</sup> , 70 - 90 males/100 ha <sup>viii</sup> DE: 35 - 37 males/100ha <sup>ix</sup> TN/NC: 60 males/100ha <sup>x</sup> IN: 39 - 61 males/100ha <sup>xvi</sup> OK: 20 males/100ha <sup>xi</sup> CO: 2.4 - 7.5 males/100ha <sup>xii</sup> AZ: 150 - 225 males/100 ha <sup>xiii</sup> CA: 6.5 - 26.0 males/100 ha <sup>xiv</sup> ; 0.31, 0.15, 0.29 birds/0.78 ha <sup>xxxi</sup>		IN: 10.5% <sup>xv</sup> , 22% <sup>xvi</sup>		IN: 0.4 - 2.4 ha (avg: 1.2) <sup>xvi</sup> VA: 0.5 - 1.0 ha <sup>xvii</sup> IL: 0.35 - 1.75 ha <sup>xvii</sup>	To be determined.
	<b>Veery</b>							
	Increase current population by 10%.	BC GB: 1.1% (-3.3 to 5.8)			BC: 4/11 nests fledged <sup>cxvvi</sup> Unspecified: 64.6% (hatching success); 37.7% (nest success) <sup>xviii</sup>		CT: 0.10 ha - "few" ha <sup>xix</sup> ON: 0.25 ha <sup>xx</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>a</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
LOWLAND RIPARIAN	<b>Yellow Warbler</b>							
	Double current population.	BC GB: -3.1%* (-5.4 to -0.7)	MB: 0.7 pairs/ha <sup>xxi</sup> , 14.4 pairs/ha <sup>xxii</sup>  WI: 3.4 pairs/ha <sup>xxiii</sup>  IL: 4.6 pairs/ha <sup>xxiv</sup> , 7.2 pairs/ha <sup>xxv</sup>  CA: 1.71, 0.90, 0.75, 0.30 birds/0.78 ha <sup>xxxi</sup>	CA: 0.13, 33.2, 0.20 pairs/40 ha <sup>xxxii</sup>	BC: 46.0% <sup>xxvi</sup>  MB: 47.9% <sup>xxvii</sup>  AK/Boreal –MAPS: - 40.6%/yr (6.3)* <sup>xxviii</sup>  CA Sierra Nevada - MAPS: 39.8% young/catch <sup>cxlv</sup>	AK/Boreal - MAPS: - 16.3%/yr (9.6) <sup>xxviii</sup>  CA Sierra Nevada – MAPS: 0.804 (ann. surv. rate) <sup>cxlv</sup>	MB: 0.04 ha <sup>xxix</sup>  AB: 0.30 ha <sup>xxx</sup>  IA: 0.16 ha <sup>xxxi</sup>	To be determined.
MONTANE RIPARIAN	<b>Red-naped Sapsucker</b>							
	Increase current population by 50%.	BC GB: -3.8% (-12.9 to 6.3)						To be determined.
MONTANE RIPARIAN	<b>Pacific-slope Flycatcher</b>							
	Increase current population by 50%.	BC GB: -4.5% (-9.6 to 0.8).	CA: 1.3 birds/ha (old growth), 0.8 birds/ha (2 <sup>nd</sup> growth), 0.1 birds/ha (young growth) <sup>xxxii</sup>		BC coast: 50% <sup>xxvi</sup>  BC GB: 70% <sup>xxvi</sup>  CA Sierra Nevada - MAPS: 41.5% young/catch <sup>cxlv</sup>		BC: 1.0 - 3.5 ha (avg: 2.5) <sup>xxxiii</sup>	To be determined.
GRASSLAND	<b>Long-billed Curlew</b>							
	Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	Unspecified: 12 -112 birds/40 ha <sup>xxxiv</sup>  NV/OR: 12, 20, 112 birds/40 ha <sup>xxxv</sup>  MT: 40 birds/40 ha <sup>xxxvi</sup>					To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>†</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
GRASSLAND	<b>Grasshopper Sparrow</b>							
	Increase current population by 50%.	BC GB: Insufficient data		ND: 0.24 - 0.25 territories/ha <sup>xxxvii</sup> WI: 0.75 territories/ha <sup>xliv</sup>	ME: 40 - 50% <sup>xxxviii</sup> NE: 52% <sup>xxxix</sup> IL: 35% <sup>xl</sup> IA: 16% <sup>xl</sup>	FL: 60% <sup>xli</sup>	BC: 1.0 - 5.0 ha <sup>lxvi</sup> PA: 0.80 ha <sup>xlii</sup> ; 0.19 ha <sup>lxi</sup> CT: 0.66 ha; 0.78 ha <sup>xliii</sup> WI: 0.85 ha <sup>xliv</sup> MI: 1.4 ha <sup>xlii</sup> WV: 0.32 ha <sup>xlv</sup> CA: 0.37 ha <sup>lxiii</sup> GB: 0.49 - 1.34 ha <sup>lii</sup>	To be determined.
GRASSLAND-SHRUBSTEPPE	<b>Sharp-tailed Grouse</b>							
	Restore productive populations to historic range.	BC GB: Insufficient data	MB: 0.10 lek/sq km <sup>xlvi</sup> NE: 0.02 - 0.25 lek/sq km <sup>xlvii</sup> SD: 0.07 - 0.11 lek/sq km <sup>xlviii</sup>		NE/ID: 50 - 72% <sup>xlix</sup>	WA: 53% <sup>l</sup>	BC: 15 - 24 ha <sup>li</sup> GB: 0.72 - 2.52 ha <sup>lii</sup> <i>Home Range:</i> CO: 15 - 406 ha (avg: 103) <sup>liii</sup> ND: 32 - 200 ha <sup>liv</sup> WI (winter): 149 ha (females), 259 ha (males) <sup>lv</sup>	To be determined.
GRASSLAND-SHRUBSTEPPE	<b>Western Meadowlark</b>							
	Double current population.	BC GB: -4.3* (-6.6 to -2.0)			BC: 42% <sup>lvi</sup> , 31% <sup>xxvi</sup>		BC: 2.0 - 5.0 ha <sup>lxvi</sup> WI: 1.2 - 6.1 ha, 2.4 - 3.2 ha <sup>lvii</sup> IA: 4.0 - 13.0 ha <sup>lviii</sup> MB: 7.0 ha <sup>lix</sup> GB: 2.0 - 3.5 ha <sup>lii</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication. \*0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>†</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
GRASSLAND-SHRUBSTEPPE	<b>Lark Sparrow</b> Increase current population by 50%.	BC GB: Insufficient data	PA: 1.3 males/ha <sup>lx</sup> WV: 1.2 males/ha <sup>lxi</sup> MT/ND/SD/MN: 0.21 males/ha <sup>lxii</sup> CA: 0.55 males/ha <sup>lxiii</sup> , 0.39, 0.15, 0.03 birds/0.78 ha <sup>lxiv</sup> MT: 40 pairs/40 ha (greasewood-sagebrush), 5 pairs/40 ha (sagebrush-grassland), 18 pairs/40 ha (pine-juniper) <sup>lxv</sup> NV/OR (GB): 12, 112, 20 birds/40 ha <sup>xxxv</sup>	CA: 0.50, 2.3 pairs/40 ha <sup>lxiv</sup>	IL: 22.3% <sup>lxvii</sup>		BC: 1 - 5 ha <sup>lxvi</sup> KS: 66 sq m, 90 sq m, 248 sq m <sup>lxvii</sup>	To be determined.
SAGEBRUSH STEPPE	<b>Brewer's Sparrow</b> Double current population.	BC GB: Insufficient data	BC: 0.94 - 2.73 pairs/ha (avg: 1.81 pairs/ha) <sup>lxviii</sup> MT: 200 birds/sq km <sup>lxix</sup> ID: 116 - 192 birds/sq km <sup>lxx</sup> OR: 111 - 277 birds/sq km <sup>lxxi</sup> , 29 - 533 birds/sq km <sup>lxxii</sup> , 50-350 birds/sq km <sup>lxxiii</sup>		BC: 61% <sup>xxvi</sup> NV: 1% <sup>lxxiv</sup> ID: 14% <sup>lxxiv</sup> OR: 85% <sup>lxxiv</sup>		BC: 0.37 - 1.06 ha (avg: 0.55) <sup>lxviii</sup> OR/NV: 0.55 - 2.36 ha <sup>lxxv</sup> WA: 0.10 ha <sup>lxxvi</sup> ID: 0.52 ha <sup>lxxvii</sup> GB: 6.0 - 7.5 ha <sup>lii</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

<sup>†</sup>0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>a</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
AGRICULTURAL FIELDS	<b>Bobolink</b> Double current population.	BC GB: Insufficient data	NY: 33 males/sq km (mixed-grass prairie), 26 males/sq km (tall-grass prairie), 91 males/sq km (hay-fields) <sup>lxxxix</sup> 120 males/sq km <sup>lxxxviii</sup>		NY: 56.2%, 39.0%, 61.0% <sup>lxxxix</sup>	OR: 56.9% (males), 61.1% (females) <sup>lxxxiii</sup> WI: 62.8% (males), 33.9% (females) <sup>lxxx</sup> NY: 70% (males), 44% (females)	WI: 0.70 ha <sup>lxxxi</sup> , 2.0 ha <sup>lxxxii</sup> OR: 0.74 ha, 1.45 ha <sup>lxxxiii</sup>	To be determined.
DRY WOODLAND	<b>Flammulated Owl</b> Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	BC: 0.70 males/40 ha <sup>lxxxiv</sup> CA: 1.09 males/40 ha <sup>lxxxv</sup> CO: 5.0 nests/160 ha <sup>lxxxvi</sup>	OR: < 1 territory/40 ha <sup>lxxxvii</sup> CO: < 1 territory/40 ha <sup>lxxxviii</sup>	<i>Nesting success</i> NM: 96.5% <sup>lxxxvi</sup> CO: 89% <sup>lxxxix</sup> <i>Fledging rate</i> NM: 83% <sup>lxxxvi</sup> CO: 100% <sup>lxxxix</sup> <i>Nest failure rate</i> NM: 18% <sup>lxxxvi</sup> CO: 13% <sup>lxxxix</sup> <i>Prob. fledgling/egg</i> NM: 0.67 <sup>lxxxvi</sup> CO: 0.74 <sup>lxxxix</sup> <i>Prob fledgling/nest</i> NM: 1.5 <sup>lxxxvi</sup> CO: 2.3 <sup>lxxxix</sup> OR: 2.7 fledglings/9 successful nests <sup>lxxxvii</sup>	CO: 0.79 <sup>xc</sup> <i>Return rates</i> CO: 8/17 (males), 10/19 (females) <sup>lxxxviii</sup> <i>1<sup>st</sup> year survival</i> CO: 0.45 <sup>lxxxvi</sup> NM: 0.60 <sup>lxxxvi</sup> OR: 0.40 <sup>lxxxvii</sup>	BC: <i>Home range</i> CO: 8.5 – 24.0 ha (avg: 14.5 ha) <sup>lxxxvi</sup> (males) OR: 12.5 - 19.3 ha (avg: 15.9) (incubation period), 2.2 - 12.5 ha (avg: 7.9 ha) (nestling period), 0.4 - 7.2 ha (avg: 3.6) (fledgling period) <sup>lxxxvii</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>a</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
DRY WOODLAND	<b>Calliope Hummingbird</b> Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	BC: 0.86 males/ha <sup>xciv</sup> MT: 1.7 birds/ha <sup>xcv</sup> CA: 1.6 males/ha <sup>xcvi</sup> , 0.74 birds/ha <sup>xcvii</sup>				BC: 0.2 ha <sup>xcviii</sup> , 0.2 - 0.3 ha <sup>xcix</sup>	To be determined.
	<b>Lewis's Woodpecker</b> Increase current population by 50%	BC GB: Insufficient data						To be determined.
	<b>Chipping Sparrow</b> Maintain current distribution and habitat until data deficiencies are determined.	BC GB: 0.8 (-1.8 to 3.5)			BC: 31% (coast), 36% (interior) <sup>xxvi</sup> ON: 48.4% <sup>xcix</sup> , 63.0% <sup>xcvi</sup> MN: 17.4 – 50.0% <sup>xcvii</sup> MI: 62% <sup>xcviii</sup> CA Sierra Nevada – MAPS: 24.8% yg/catch <sup>cxlv</sup>		ON: 0.2 - 1.0 ha <sup>xcix</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>†</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
MOIST CONIFEROUS FOREST	<b>Blue Grouse</b> Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	BC interior: 3 adult males/sq km <sup>CV</sup>  BC coast: 89 – 103 adult males/sq km <sup>C</sup> , 12 - 20 <sup>ci</sup> , 4.0 <sup>cii</sup> , 17 – 33 <sup>civ</sup> , 6 - 10 <sup>ciii</sup> ; 21 - 29 birds/sq km <sup>CV</sup> , 26-83 <sup>civ</sup>  CO: 9 - 10 adult males/sq km, 9-12 birds/sq km <sup>CVI</sup>  WA: 13 adult males/sq km <sup>CXII</sup>  AB: 2 - 19 adult males/sq km <sup>CX</sup>		BC: 58%, 82% <sup>civ</sup> AB: 81% <sup>CV</sup> WA: 64% <sup>CV</sup> CO: 80% <sup>CVI</sup> MT: 71% <sup>CV</sup>	BC: 40% (juvenile) <sup>CVII</sup> , 21 - 35% (overwinter) <sup>CVIII</sup> , 66 - 75% (adult, males), 40 - 71% (adult females) <sup>CIX</sup>  AB: 52% (adult) <sup>CX</sup>	<i>Males:</i> BC: 0.4 - 3.2 ha (avg: 2.1) <sup>CXI</sup> , 0.9 - 2.8 ha (avg: 1.9) <sup>CXII</sup>  AB: 0.2 - 0.9 ha (avg: 0.6) <sup>CX</sup>  MT: 0.4 - 1.5 ha (avg: 0.8) <sup>CXIII</sup>  CO: 1.2 - 1.9 ha (avg: 1.5) <sup>CVI</sup>  <i>Females:</i> BC: 2.3 ha <sup>CXIV</sup> AB: 14.6 ha <sup>CX</sup>  <i>Brood Range</i> BC: 3.2 - 39.2 ha (avg: 12.9) <sup>CVIII</sup>	To be determined.
	<b>Boreal Owl</b> Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data	France: 0.6 - 1.3 nests/sq km <sup>CXV</sup>  Germany: 0.25 - 4.0 nests/sq km <sup>CXVI</sup>  Finland: 1 - 26 nests/100 sq km <sup>CXVII</sup>		ID: 37.5% <sup>CXVIII</sup>	ID: 46% <sup>CXVIII</sup>  Finland: 50% (first-year males), 67% (adult males) <sup>CXIX</sup> , 62% (adult males) <sup>CXX</sup>  Germany: 72% <sup>CXXI</sup>	<i>Home Range</i> CO: 1395 ha, 1576 ha <sup>CXXII</sup>  ID (winter): 320 - 3390 ha (avg: 1451 ha) <sup>CXXIII</sup>  ID (summer): 229 - 2386 ha (avg: 1182 ha) <sup>CXXIII</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

<sup>†</sup>0.01<p<0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>a</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
MOIST CONIFEROUS FOREST	<b>Williamson's Sapsucker</b>							
	Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data			AZ: 96.1% <sup>cxxiii</sup>		CO: 4.0 – 9.0 ha (avg: 6.75) <sup>cxxiv</sup> OR/WA: 4.0 ha <sup>cxxv</sup>	To be determined.
	<b>Black-backed Woodpecker</b>							
	Maintain current distribution and habitat until data deficiencies are determined.	BC GB: Insufficient data						To be determined.
	<b>Olive-sided Flycatcher</b>							
	Double current population.	BC GB: -2.2 (-9.2 to 5.3)			BC: 2/5 nests fledged <sup>cxxvi</sup> AK - Mayfield estimate: 27% <sup>cxxviii</sup> NW OR: 52% <sup>cxxvii</sup> W OR - Mayfield estimate: 49% (semiopen forest), 39% (harvested forest), 33% (edge), 62% (burned forest) <sup>cxxviii</sup>		Unspecified: 10 - 20 ha <sup>cxxix</sup> CA: 45 ha <sup>cxxx</sup> , 40 ha <sup>cxxxi</sup> , 25 ha <sup>cxxxii</sup> AK: 10.5-26.4 ha (avg:18.4) <sup>cxxxiii</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01 < p < 0.05

	Population Objective	Trend <sup>b</sup>	Point Count	Spot Map	Productivity <sup>†</sup>	Survival	Territory Size (mean ha)	Habitat Objective (ha)
MOIST CONIFEROUS FOREST	<b>Hammond's Flycatcher</b>							
	Increase current population by 50%.	BC GB: -4.5* (-7.3 to -1.6)	NW CA: 40 birds/sq km (old-growth), 20 birds/sq km (mature forest) <sup>cxliiv</sup> CO: 14 - 28 birds/sq km <sup>cxliiv</sup> W OR: 64.5 - 80.4 birds/sq km (young forest), 50.6 - 50.7 birds/sq km (mature forest), 14.5 - 20.2 birds/sq km (old-growth) <sup>cxliiv</sup>	CA: 39.0 territories/sq km <sup>cxliiv</sup> , 42.5 terr./sq km <sup>cxliiv</sup> , 17.5 terr/sq km <sup>cxliiv</sup> , 42.5 terr/sq km <sup>cxliiv</sup> , 59.0 terr/sq km <sup>cxli</sup> , 27.4 terr/sq km <sup>cxli</sup> , 22.4 terr/sq km <sup>cxlii</sup> , 27.5 terr/sq km <sup>cxliii</sup> W MT: 17.0 -17.3 males/sq km <sup>cxliiv</sup>	BC: 2/7 nests fledged <sup>cxliiv</sup> NW CA: 48% <sup>cxliiv</sup> CA Sierra Nevada - MAPS: 27.6% yg/catch <sup>cxliiv</sup>		MT: 0.61-1.54 ha (avg: 1.05) <sup>cxliiv</sup>	To be determined.

<sup>a</sup>All data reported as mean values. Data may not represent requirements of healthy, viable focal species populations. All habitat recommendations and assumptions must be rigorously tested.

<sup>b</sup>Breeding Bird Survey Trend in Canadian portion of Great Basin 1976-2000, B. Collins and C. Downes, Canadian Wildlife Service, personal communication.

\*0.01<p<0.05

<sup>i</sup> Tashiro-Vierling 1994

<sup>ii</sup> Saab and Dudley 1996

<sup>iii</sup> Levad 1989

<sup>iv</sup> Noble 1990

<sup>v</sup> Feusier 1989

<sup>vi</sup> Rains 1998

<sup>vii</sup> Stewart and Robbins 1958

<sup>viii</sup> Cheevers 1996

<sup>ix</sup> Hess et al. 2000

<sup>x</sup> Kendeigh and Fawver 1981

<sup>xi</sup> Baumgartner and Baumgartner 1992

<sup>xii</sup> Sedgwick and Knopf 1987

<sup>xiii</sup> Rosenberg et al. 1991

<sup>xiv</sup> Goldwasser 1978, Cardiff et al. 1984

<sup>xv</sup> Nolan 1963

<sup>xvi</sup> Thompson and Nolan 1973

<sup>xvii</sup> Dennis 1958

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- xviii Moskoff 1995  
xix Bertin 1975  
xx Martin 1960
- xxi Briskie 1995  
xxii Goossen and Sealy 1982  
xxiii Young 1949  
xxiv Brewer and Hardy 1950  
xxv Karr 1968  
xxvi Campbell et al. 2001  
xxvii DeSante and O'Grady 2001. MAPS: no. young captured 1997-1998 in AK and Canadian Boreal  
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