



Landbird Monitoring Strategy for Oregon and Washington

**Version 1.0
October 2011**

Produced for Oregon/Washington Partners in Flight

Jaime L. Stephens
Klamath Bird Observatory
P.O. Box 758
Ashland, OR 97520

Recommended Citation:

Stephens, J. L. 2011. Landbird monitoring strategy for Oregon and Washington. Version 1.0. Oregon-Washington Partners in Flight and Klamath Bird Observatory. Ashland, OR.

Summary

An extensive amount of landbird research and monitoring has been undertaken in Oregon and Washington over the last several decades. Results from monitoring have served to inform land management decisions and conservation actions. However, information gaps limit our ability to fully understand population status and trends, the drivers of population trends, habitat relationships, and bird response to natural and anthropogenic stressors. The need for additional information limits conservation delivery in the bi-state area. The objective of this strategy is to develop a comprehensive approach to identifying and meeting monitoring priorities in Oregon and Washington. This strategy aligns with national monitoring goals of Partners in Flight and the North American Bird Conservation Initiative (NABCI), as well as with the priorities and guiding documents of numerous federal and state agencies, non-governmental organizations, Joint Ventures, and Landscape Conservation Cooperatives. Guided by the four monitoring priorities of NABCI, this strategy identifies seven monitoring goals and associated short and long-term measurable actions. A single monitoring goal within this strategy may include one or more of the following activities: data collection, data management, data summary or analysis, and delivery of findings. The seven monitoring goals have been further prioritized for the purposes of 1) identifying opportunities for collaboration, 2) guiding resource allocation, and 3) identifying the most pressing regional needs for furthering bird conservation in the bi-state area. A number of established long-term monitoring programs have met, and continue to meet, the monitoring needs identified in this strategy. This strategy will be useful in identifying links between organizational and regional priorities, assessing existing monitoring programs and developing new monitoring programs, and for scaling programs up to contribute to regional information needs.

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Acknowledgements

The development of this document was funded through a grant provided by the Bureau of Land Management's Oregon and Washington State Office. I would like to thank the following individuals for their contributions to the strategy: Dan Casey, American Bird Conservancy and Intermountain West Joint Venture; Bob Altman, American Bird Conservancy and Pacific Coast Joint Venture; Barb Bresson, Bureau of Land Management and U.S. Forest Service; Gary Slater, Ecostudies Institute; Phil Nott and Rodney Siegel, The Institute for Bird Populations; John Alexander, Felicity Newell, and Liz Williams, Klamath Bird Observatory; Mary Mahaffy and Sean Finn, Landscape Conservation Cooperatives; Mark Huff, Sean Mohren, and Tom Rodhouse, National Park Service; Jeremy Maestas, Natural Resources Conservation Service; Andrea Hanson, Ann Kreager, Susan Barnes, Martin Nugent, and Julie Schneider, Oregon Department of Fish and Wildlife; Douglas Robinson, Oregon State University; Katy Weil, Portland Metro; Aaron Holmes, PRBO Conservation Science; Joan Hagar, U.S. Geological Survey; Brian Root, Jenny Barnett, Kevin Kilbride, Mike Green, and Randy Hill, U.S. Fish and Wildlife Service; and Joe Buchanan, Washington Department of Fish and Wildlife.

Introduction

Statement of need

An extensive amount of landbird research and monitoring has been undertaken in Oregon and Washington over the last several decades. Available data, in conjunction with state, national, and international Partners in Flight (PIF) conservation plans, provide a framework for implementing bird conservation. However, much remains to be understood about population status and trends as well as drivers behind population trends. Birds serve as excellent indicators of various ecological elements (Bryce 2006, Carignan and Villard 2002, Hutto 1998). As a taxa with habitat specialists that cross broad ecological gradients, birds can be effectively used in conservation planning as surrogates for the biodiversity of other taxa as it relates to ecosystem function (Lewandowski et al. 2010). Because they respond relatively quickly to external stressors, and each species responds uniquely to changes in the environment, birds serve as good indicators for environmental change. Combined with existing long-term data, information generated from bird monitoring is at the forefront of improving our understanding of the natural world and preserving habitats needed for birds, other wildlife, and the people that are dependent on those systems. The objective of this strategy is to develop a comprehensive approach to identifying and meeting monitoring priorities in Oregon and Washington, and to align existing and future monitoring programs to increase efficiencies.

How to use the strategy

The intended audience of this strategy is federal and state agencies, non-governmental organizations, Joint Ventures, and Landscape Conservation Cooperatives, all of which are partners within the Oregon/Washington Chapter of PIF (OR/WA PIF) and were involved in shaping this document. This diverse group of partners includes biologists, land managers, and decision makers who are charged with using the best available science to make adaptive resource management decisions. An integrated understanding of the effects of on-the-ground management and environmental stressors on ecological systems is necessary to evaluate the effectiveness of resource management and conservation actions. Monitoring is a key piece of this scientific process. There are numerous examples from the West of how monitoring data inform land management and improve conservation decisions (Stephens et al. 2011). The need for continued monitoring is evident, as bird populations continue to experience declines (NABCI 2009) and conservation challenges remain prevalent on public (NABCI 2011) and private lands (Altman 2000a, CalPIF 2002).

This strategy focuses on the most pressing information gaps that need to be filled in order to rapidly move bird conservation forward in Oregon and Washington. In order to fill the information gaps, this strategy addresses monitoring broadly, including the processes needed to not only gather the data, but also to produce results, and assure data are made widely available to answer additional questions. A single monitoring goal within this

strategy can thus include one or more of the following activities: data collection, data management, data summary or analysis, and delivery of findings.

The strategy can be used to identify opportunities for collaborative projects that will meet the needs of an individual partner, while contributing to regional monitoring needs. As information becomes more easily accessible (i.e. develop and populate an avian data center) and additional monitoring is completed (i.e. fill information gaps for priority species), all partners will be better poised to meet their individual missions.

There are several general approaches to using this strategy:

- 1) Recognize and acknowledge this strategy where your on-going monitoring projects or programs are compatible with the goals and objectives stated herein. For example, agencies or organizations conducting bird monitoring as part of restoration activities are directly supporting the goal to improve understanding of bird response to those activities.
- 2) When designing new monitoring programs, partners can evaluate both their own priorities and those identified in this strategy for potential overlap, and when possible, consider both within the study design. For example, if you are designing a monitoring program in Bird Conservation Region (BCR) 10, consider using the well-established grid-based design so that the program can also contribute to BCR-wide monitoring efforts.
- 3) Consider partnering as new monitoring programs are being developed to take advantage of efficiencies. For example, an adjacent National Forest and National Park may have the same information needs, and a joint monitoring program could allow them to answer management questions with limited funds.
- 4) Identify how your existing monitoring aligns with regional priorities and consider whether your program could better align while maintaining its integrity. For example, if you are currently operating a MAPS station during the breeding season, consider operating the station through fall migration.
- 5) Consider partnering to achieve top priorities. For example, it will take the dedication of a number of partners to develop a regional avian data center, and the contribution of data from all partners to bring the vision to fruition.

This strategy was developed through diverse partnerships and represents the interests of those partners as well as the priorities identified regionally and nationally by PIF and the North American Bird Conservation Initiative (NABCI). The development of the strategy was successful in engaging broad partner participation, but not every organization was able to be involved, or to be as involved as they would have liked. There are inevitable challenges to a joint effort such as this, and it is important to note such limitations. Generally, one to several individuals from each organization was involved in the development and review of this strategy, and those individuals were not necessarily able to represent their organization as a whole. To address such limitations, in conjunction with partner input, guiding documents were used as the basis for understanding the individual species and monitoring priorities of each organization. There is a need for improved communication across OR/WA PIF, and this strategy should serve as momentum for continued and new collaborations.

Background

Partners in Flight

Landbirds play an important ecological and economic role in our world. They contribute to ecological function in every terrestrial habitat by providing critical ecosystem services (Berlanga et al. 2010). Landbirds are also highly valued by people who engage in nature-based recreation, having a direct positive effect on local economies (Berlanga et al. 2010, NABCI 2009). In addition, the conservation of priority bird species is explicitly called for in the management documents of state and federal agencies (Berlanga et al. 2010, ODFW 2005, WDFW 2005).

Many bird populations are currently experiencing declines, especially birds of grasslands, aridlands, and forests (NABCI 2009). The causes of population declines are complex, and are driven by processes both here in the United States and across international borders. Habitat loss, degradation, and fragmentation have long been acknowledged as potential causes of declines. More recently, concerns have been raised about potential impacts of climate change on bird populations (NABCI 2009).

In response to concerns about bird populations, PIF; a voluntary, non-advocacy, international coalition, was formed in 1990. PIF seeks to 1) help landbird species at risk, 2) keep common birds common, and 3) facilitate voluntary partnerships for birds, habitats, and people (Rich et al. 2004). Shortly after the inception of PIF, regional and state working groups were formed. OR/WA PIF serves as a coordinating body to plan and facilitate implementation of conservation strategies for bird populations within the bi-state area. OR/WA PIF maintains consistency with national program goals by facilitating interagency, private, and public partnership efforts that advance management, monitoring, and research activities for landbirds within the bi-state area (Stephens 2008).

Guiding documents

In recent years, several key documents have been published which currently guide bird monitoring. The most notable is *Opportunities for Improving Avian Monitoring* published by NABCI (2007). This monitoring strategy draws heavily from its recommendations.

In addition, the priorities presented here also draw from the *PIF North American Landbird Conservation Plan* (Rich et al. 2004), *Saving our Shared Birds: Partners in Flight Tri-national Vision for Landbird Conservation* (Berlanga et al. 2010), the recent PIF monitoring needs assessment (Laurent and Pashley 2009), *Birds as indicators of long-term environmental change: National Bird Monitoring Recommendations (2010-2020)* (Laurent et al. 2010), *The Northeast Bird Monitoring Handbook* (Lambert et al. 2009), as well as the PIF bird conservation plans for Oregon and Washington (Altman 1999, Altman 2000a, Altman 2000b, Altman 2000c, Altman and Holmes 2000).

Legislative direction

Responsibility of maintaining healthy bird populations is tied to a number of legislative documents. This monitoring plan should improve state and federal agencies' abilities to abide by the legislative guidance included in the Migratory Bird Treaty Act (MBTA 1918), National Environmental Policy Act (NEPA 1969), Endangered Species Act (ESA 1973), Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds (Clinton 2001), and the Healthy Forests Restoration Act (HFRA 2003).

Partner strategies and priorities

This monitoring strategy seeks to align with the guiding documents and priority species lists of the following key partners. A summary of each partner's mission, guiding documents, current monitoring programs, and monitoring priorities are provided in Appendix A.

- Joint Ventures
- Landscape Conservation Cooperatives
- Portland Metro
- Oregon Department of Fish and Wildlife
- USDA Forest Service
- USDA Natural Resources Conservation Service
- USDI Bureau of Land Management
- USDI National Park Service
- US Fish and Wildlife Service
- US Geological Survey
- Washington Department of Fish and Wildlife

Bird Conservation Regions

There are two avifaunal biomes and three Bird Conservation Regions (BCRs) in Oregon and Washington. The Northern Pacific Rainforest BCR encompasses the entire area of the Pacific Avifaunal Biome in Oregon and Washington. The Great Basin and Northern Rocky BCRs encompass the Oregon and Washington portions of the Intermountain West Avifaunal Biome (Rich et al. 2004). The monitoring objectives and goals set forth in this strategy are applicable to all three BCRs, but actions within a goal may be specific to a single BCR or an otherwise limited geographic scope based upon need.

Focal and priority species

This strategy is framed in the context of focal species and priority species. Focal species are birds identified by PIF or others to be representative of a given habitat or ecological component (e.g. snags within coniferous forest) (Chase and Geupel 2005), whereas priority species are typically of concern because of a lack of information, declining population, or specific threats (Rich et al. 2004, Berlanga et al. 2010). The OR/WA PIF focal species and the relevant priority species lists (USFWS, ODFW, WDFW, BLM,

USFS, PCJV, IWJV, Great Northern LCC) are included in Appendix B (Altman 1999, Altman 2000a, Altman 2000b, Altman 2000c, Altman and Holmes 2000, Casey 2011, ISSSSP 2011, ODFW 2005, ODFW 2011, PCJV 2011, Pers. Comm. Sean Finn, Rich et al. 2004, USFWS 2008, USFWS 2011, WDFW 2005, WDFW 2011). The monitoring goals identified in this strategy include specific actions for focal and priority species, but within those actions, it is unlikely that every focal and/or priority species will be covered by a given monitoring program. In instances where further prioritization is desirable, the list of focal and priority species (Appendix B) can be used to identify species that are of priority to multiple organizations. For example, an organization initiating a new monitoring program to gather data on a few priority species could look to this strategy to determine whether the species are also on other lists, and thus identify potential partners for collaborative efforts. This list will prove especially useful as the avian data center is populated, and visualizations and decision support tools can be developed for priority species that cross the largest number of organizations.

Objectives, Goals, and Actions

Objectives

Objectives of the monitoring strategy for Oregon and Washington align with the four overarching goals put forth in *Opportunities for Improving Avian Monitoring* (NABCI 2007):

- Fully integrate monitoring into bird management and conservation practices and ensure that monitoring is aligned with management and conservation priorities.
- Coordinate monitoring programs among organizations and integrate them across spatial scales to solve conservation or management problems effectively.
- Increase the value of monitoring information by improving statistical design.
- Maintain bird population monitoring data in modern data management systems. Recognizing legal, institutional, proprietary, and other constraints provide greater availability of raw data, associated metadata, and summary data for bird monitoring programs.

Goals

Each of the seven monitoring goals included in this strategy are accompanied by a list a measurable actions. Actions are separated as short-term (one to five years) or long-term (five to ten years).

Archive existing and current bird monitoring data and make them easily accessible

Existing data have the potential to address a number of information gaps, but access to the data is limited by logistical constraints. Assuring that existing data are archived and easily accessible is an efficient and effective use of resources and will allow further identification of information gaps that are limited by a lack of data. To achieve data archiving and data delivery specific to the needs identified in this strategy, a regional node to the Avian Knowledge Network (AKN) should be developed to cover the bi-state area. The avian data center (i.e. regional node) will archive existing datasets, serve as a data clearinghouse, provide data entry and data management tools, facilitate the use of existing data in analyses, and generate web-based decision support tools that inform conservation efforts.

In order to increase our ability to prioritize new programs and identify opportunities for collaboration, all bird monitoring and research projects in the bi-state area should be catalogued in a central database. Use of the Conservation Registry (www.conservationregistry.org), an established database for tracking conservation projects, will serve this need. The Conservation Registry was designed to provide information about the context, distribution, and effectiveness of restoration projects undertaken by multiple partners. Using this system to track avian monitoring in Oregon

and Washington will both serve the needs of this strategy as well as contribute to the value of the Conservation Registry.

Short-term Actions

- Establish data management and integration strategies at the onset of new monitoring projects
- Showcase existing systems (e.g. California Avian Data Center) and benefits to get multi-organization buy-in and support
- Explore the feasibility of scaling up the Klamath Bird Observatory - Redwood Sciences Laboratory (KBO/RSL) Avian Data Center to meet the needs of Oregon and Washington
- Develop a bi-state avian data center and integrate with existing regional data nodes if needed
- Develop tools and visualizations to address the most pressing information needs (Alexander et al. 2010, Stephens and Sullivan 2008)
- Compile a list of available data for all priority species and identify information gaps
- Encourage use of the Conservation Registry to track monitoring projects
- Compile a list of available bird monitoring data related to important management issues and identify gaps

Long-term Actions

- Encourage all federal and state agencies and their consultants to contribute their bird monitoring data to the avian data center
- Archive existing point count datasets along with associated metadata in the avian data center
- Archive additional avian datasets along with associated metadata in the avian data center
- Determine the potential benefits of incorporating vegetation data associated with avian data

Improve understanding of current and future species distribution and abundance

Our ability to conduct land management planning and conservation delivery will be improved by an increased understanding of current and future species distribution and abundance. Models that predict numbers of birds for current and projected habitat conditions are needed for focal and priority species at the bi-state level. Through the integration of data, analyses, model development, and preparation of maps for focal and priority species, we can better assess the current distribution and abundance of these species and project future scenarios related to climate change and other land use/management related stressors. This information will contribute to land management planning and the prioritization of conservation actions.

Short-term Actions

- Implement current distribution and abundance modeling for priority and focal species across Oregon and Washington
- Implement projected future distribution and abundance modeling for priority and focal species across Oregon and Washington

Long-term Action

- Integrate non-priority species into models
- Identify model limitations and gather additional data as needed
- Develop demographic models for priority and focal species

Determine limiting factors for priority species with declining trends

Understanding the drivers that are causing population declines is critical to reversing those trends. Limiting factors should be identified for priority species with declining trends (Berlanga et al. 2010). Demographic data are needed to provide insight into proximate causes of trends documented by the Breeding Bird Survey (BBS) (Saracco et al. 2008). Analyses that will answer these questions should occur where data exist. Continued demographic monitoring is needed in each ecoregion's priority habitats. Monitoring should be initiated for priority habitats with existing data gaps (Pyle et al. 2005).

Short-term Actions

- Compile a list of priority species for which adequate data are available in each ecoregion and identify priority species for which additional data are needed
- Complete analyses to identify limiting factors for select priority species
- Continue monitoring where appropriate and begin monitoring where needed to fill information gaps identified for priority species

Long-term Actions

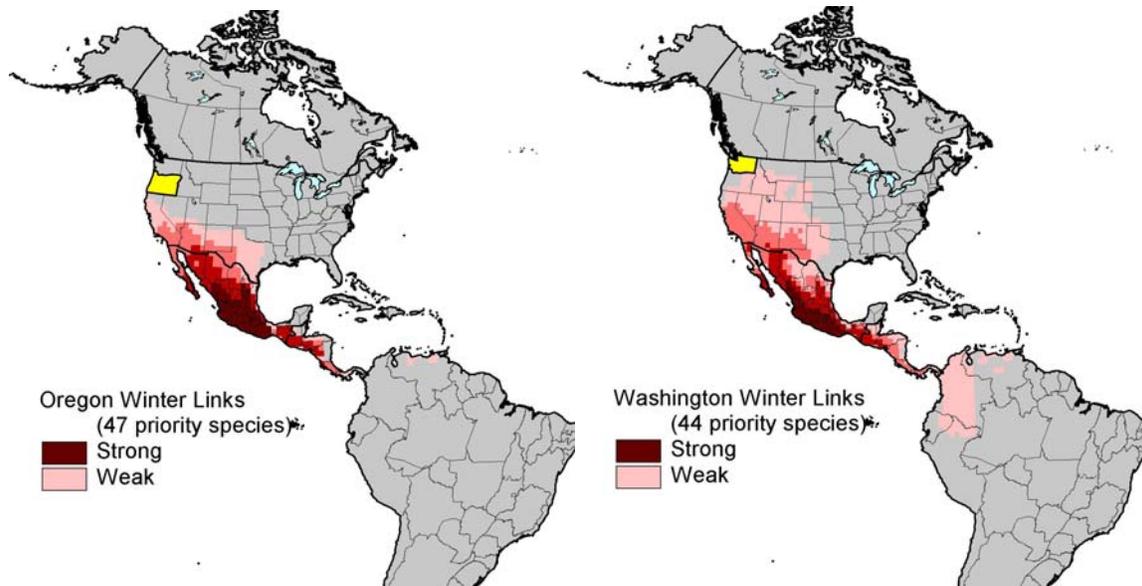
- Compile existing banding data into the avian data center, beginning with the largest datasets and datasets that address current information gaps

Evaluate full life cycle stewardship responsibility

Bird populations are limited at a variety of temporal and spatial scales. In order to prioritize conservation actions, a greater understanding of when and where bird populations are limited is needed. For both resident and migratory species, more information is needed on post breeding dispersal and wintering ecology. Information is also needed on species distribution throughout the annual cycle and on spatial connectivity between the different components of annual cycles (Berlanga et al. 2010, Faaborg et al. 2010, PIF National Strategic Plan, Pers. Comm. J.D. Alexander).

Information gaps are especially prevalent in our understanding of migratory birds, for which most of our knowledge is limited to the breeding season. The maps that follow; excerpted from Blancher et al. (2006), show that Oregon and Washington priority landbird species concentrate in western Mexico during the winter. Further information is

needed on migration timing, flight pathways, stopover habitat needs, and climate change impacts on migration patterns (Dunn et al. 2005, Faaborg et al. 2010).



(Blancher et al. 2006)

Short-term Actions

- Quantify regional stewardship responsibility based on a step-down of *The State of the Birds 2011: Report on Public Lands and Waters* (NABCI 2011) by quantifying the percent of species population by landowner for priority and focal species
- Evaluate whether OR/WA PIF focal species represent habitats shared by priority species, including those that are highlighted in the state Wildlife Action Plans
- Prioritize sites for intensive year-round eBird data collection

Long-term Actions

- Implement full life cycle monitoring in priority habitats (see below for priority habitats) in each ecoregion to answer questions about post-breeding dispersal and resident wintering habitat needs
- Implement full life cycle monitoring for priority species in priority habitats of each ecoregion to answer questions about migration timing, pathways, and stopover habitat
- Incorporate a demographic component and wintering grounds assessment into regional stewardship responsibility analyses

Improve understanding of bird response to natural and anthropogenic stressors

Monitoring bird response to natural and anthropogenic changes on the landscape is needed to inform land management planning through an adaptive management

framework. Effectiveness monitoring, which assesses the effectiveness of on-the-ground actions to meet ecological objectives, should be implemented for priority land management activities. Results from such monitoring can identify mechanisms to meet bird conservation goals within land management planning. Monitoring is needed to determine landbird status and trends relative to both management and stressors. The following management issues and/or stressors lack sufficient information about bird response and are considered high priority within the bi-state area:

- Energy development/energy corridors
- Anthropogenic sources of mortality (e.g. structures with windows lit at night)
- Wildfire (fire suppression) and fuel management
- Restoration
- Livestock grazing
- Farm Bill programs (e.g. Wetland Reserve Program)
- Commercial timber harvest
- River management
- Urban development
- Juniper expansion in shrub steppe
- Mitigation as mandated for specific land management activities
- Environmental change

Short-term Actions

- Compile a list of management topics and stressors for which adequate data are available in each ecoregion or across ecoregions, and identify management topics and stressors for which additional data are needed
- Complete analyses to inform land management decision making for species, issues, and ecoregion combinations as possible
- Continue monitoring where appropriate, and begin monitoring where needed, to fill data gaps identified from the above action
- Engage academia in implementing monitoring to inform land management

Long-term Actions

- Include broad scale management effects in range-wide monitoring
- Set measurable population targets and evaluate success of land management actions

Improve population status and trend information for priority and focal landbird species

BBS provides a wealth of occurrence and abundance data across broad regions for many landbird species. BBS is the primary data source for numerous publications documenting population trends, as well as the PIF Species Assessment Database, which is used to prioritize species for conservation. It is important that the BBS program continue and that coverage of Oregon and Washington is thorough.

However, some species are not adequately surveyed by BBS, including groups of species that do not conform to the survey protocol (e.g. nocturnal birds) as well as individual species that are undersampled. For these species, basic trend and habitat relationship information is lacking and targeted monitoring is warranted, particularly for species that are most at risk. Temperate breeders of high tri-national concern for which adequate information is not available include the Greater Sage-grouse, Northern Spotted Owl, Black Swift, Olive-sided Flycatcher, and Tricolored Blackbird. PIF's *Saving Our Shared Birds: Partners in Flight Tri-National Vision for Landbird Conservation* (Berlanga et al. 2010) calls for increased monitoring to determine population status, trends, distribution, and abundance for these species. A monitoring effort for these species would implement surveys based on topographical strata, applicable survey type (e.g. nocturnal), and would employ single species surveys as needed.

There is also a need for supplemental monitoring efforts to overcome geographic monitoring gaps. There are several areas of Oregon and Washington that have little information relative to other areas. These areas include the: 1) Great Basin, 2) Northern Rockies, 3) Okanogan, and 4) Willamette Valley.

Short-term Actions

- In coordination with state BBS coordinators, solicit skilled long-term volunteers, promote agency and organization support (e.g. federal employee involvement by promoting letter of permission to complete BBS during work hours), assess BBS coverage annually, and target gaps for volunteer recruitment
- Evaluate past monitoring efforts for priority species and guilds for which trends cannot be assessed based on BBS results (Altman and Bart 2001, Panjabi et al. 2005) and complete analyses as possible with available data
- Implement monitoring for individual species that are most at risk and for which adequate status and trend information is not available (Altman and Bart 2001)
- Implement an alternate survey methodology for groups of species for which adequate information is not available, including nocturnal species and species that are high elevation and riparian specialists
- Contribute to the ongoing monitoring program in BCR10 (Skorkowsky et al. 2011) and implement additional monitoring projects to fill geographic gaps

Long-term Actions

- Implement monitoring needed to create a spatially dense map of bird distribution and abundance across the state of Oregon and Washington in a way that can be replicated in the future

Identify habitat relationships of priority species in priority habitats

While species-habitat relationships have been well studied for select species, there remain information gaps in our understanding of many species and habitats, particularly in the contexts of population dynamics and demographics. Such information is fundamental to informing conservation needs for these species and habitats. Priority habitats in need of further monitoring include:

BCR 5 Northern Pacific Rainforest

- Late-succession conifer
- Early-succession conifer
- Riparian
- Ponderosa pine
- Broadleaf/Oak
- Aspen

BCR 9 Great Basin

- Grassland
- Sagebrush
- Riparian

BCR 10 Northern Rockies

- Riparian
- Deciduous

Short-term Actions

- Compile a list of species-habitat relationships for which adequate data are available, and a list of species-habitat relationships for which additional data are needed, for each ecoregion
- Complete analyses to determine species-habitat relationships
- Continue monitoring where appropriate and begin monitoring where needed to fill data gaps

Long-term Actions

- Integrate current species-habitat relationships into distribution and abundance models to inform both population status and trends and land management questions

Coordinated monitoring

Prioritization

The monitoring objectives and associated goals and actions described above have been identified as priorities of OR/WA PIF and the network of partners who collaborated on this strategy. Their inclusion in this strategy indicates that they are among the top monitoring needs within the bi-state area. OR/WA PIF has further prioritized these monitoring objectives for the purposes of 1) identifying opportunities for collaboration, 2) guiding resource allocation, and 3) identifying the most pressing regional needs for furthering bird conservation in the bi-state area.

Highest Priority

- Archive existing and current bird monitoring data and make them easily accessible
- Improve understanding of current and future species distribution and abundance
- Determine limiting factors for priority species with declining trends

Medium Priority

- Evaluate full life cycle stewardship responsibility
- Improve understanding of bird response to natural and anthropogenic stressors

Lower Priority

- Improve population status and trend information for priority and focal landbird species
- Identify habitat relationships of priority species in priority habitats

Sampling design considerations for future monitoring

Design studies to scale-up to range-wide monitoring

The sampling design of new monitoring projects (i.e. effectiveness, long-term, special species) should consider how local results can be scaled to inform region or range-wide questions (NABCI 2009; PIF National Strategic Plan, Pers. Comm. J.D. Alexander). Through this approach to study design, limited monitoring funds can be used in a cost effective manner to answer pressing program level questions and contribute to regional landbird monitoring objectives.

A random sampling design is needed to facilitate scaling results up or down. One such approach is “grid-based sampling,” which when implemented on a defined sampling frame, allows for broad-scale inference to bird populations. Within a sampling frame, strata and substrata may be defined for smaller-scale areas to which inference can also be made. For example, a broad-scale monitoring program in BCR 10 would include samples from within that geographic area, and a stratum limited to alpine sites could be

defined for increased sampling density to answer questions specific to birds associated with alpine habitat (Skorkowsky et al. 2011). With this method, it is important that strata and substrata be defined by geographic or topographic features and not vegetation, which may change over time (White et al. 2010). The Avian Knowledge Alliance is currently working to generate a national monitoring grid which will be attributed to allow for landscape level analysis (e.g. vegetation type) and should be available for use in Oregon and Washington in the near future.

Within each strata, a generalized random tessellation stratification (GRTS) should be used to generate a spatially balanced sample design. GRTS is a good approach for long-term landbird monitoring because it is generally more efficient than pure random sampling, and because sample units can be weighted according to factors that influence sampling logistics and feasibility (e.g. to reduce the likelihood of locating points on private land). The GRTS design also allows for varying levels of annual monitoring in instances where programs may need to be scaled back. The smallest size of a sampling unit can be defined, but much work currently occurring in the West is based on 1 km² cells (White et al. 2010). GRTS is often implemented with grid-based sampling, but can also be used independently to strengthen project level study designs.

Design monitoring to cross species and seasons

In addition to designing projects that can be scaled up and down, considerations should be given to implementing multiple methodologies across multiple seasons to effectively and efficiently meet monitoring objectives. Opportunities to expand existing monitoring programs should consider the ability to make inference to additional species as well as to populations across multiple seasons. Existing monitoring programs should evaluate opportunities, where feasible, to add components that will meet additional monitoring priorities. For example, an established banding station operated during the breeding season could operate year-round to increase seasonal understanding of migrant and resident species and could implement point counts during the breeding season to increase the number of species monitored.

Integrating existing long-term monitoring programs

Summary of Existing Monitoring Programs

There are a number of established long-term monitoring programs that are contributing to meeting the monitoring needs identified in this strategy. The existing monitoring programs described below are meeting two or more monitoring objectives, including one or more highest priority objectives. The monitoring objectives identified in this strategy include the continuation of and/or the strengthening of a number of these programs. The objectives marked in the table below are currently being addressed by the existing programs; however, many of these programs could also address additional monitoring objectives through the contribution of data to the avian data center, making them easily available for use in future analyses. Also, some sites of the larger scale monitoring programs may already be addressing additional priorities (e.g. select MAPS sites are also intended to serve as effectiveness monitoring stations).

	OR/WA PIF Monitoring Priorities							
	High			Medium		Low		
	Bird Monitoring Data: Archived and Accessible	Occurrence & Future Distribution	Limiting Factors	Full Life Cycle Stewardship Responsibility	Bird Response to Stressors	Improve Status & Trends	Habitat Relationships	
Existing Long-term Monitoring Program								
Breeding Bird Survey		X				X	X	
Christmas Bird Count				X		X		
Klamath Bird Monitoring Network	X	X	X	X	X	X	X	
Monitoring Avian Productivity and Survivorship (MAPS)		X	X			X	X	
NPS Inventory & Monitoring		X				X	X	
Oregon 2020 ¹		X				X	X	
Special Species Monitoring		X				X		
USFWS Inventory & Monitoring ²		X			X	X	X	

1. This monitoring program has been proposed but not implemented.

2. This monitoring program is in early stages of development, the monitoring objectives noted in the table above are preliminary.

A summary of established programs follows and should be referenced when considering the establishment of new programs to assure they build upon, rather than replicate, existing efforts.

Breeding Bird Survey

BBS was initiated in 1966 to track the status and trends of breeding birds in North America. The program is coordinated by U.S. Geological Survey Patuxent Wildlife Research Center and the Canadian Wildlife Service National Wildlife Research Center (<http://www.pwrc.usgs.gov/BBS/>). BBS provides a wealth of occurrence and abundance data across a broad geography for many landbird species. It is the primary data source for numerous publications documenting population trends, as well as the PIF Species Assessment Database used to prioritize species for conservation. Currently, 39 (of 136) Oregon routes and 23 (of 83) Washington routes are vacant.

Christmas Bird Count

The Christmas Bird Count (CBC), initiated in 1900, was designed to increase information about resident bird populations in the early winter across North America. At its onset this effort included 25 locations, but has grown to over 2000. This citizen science effort is coordinated by Audubon (<http://birds.audubon.org/christmas-bird-count>). The CBC has the largest geographic scope of any established monitoring program outside of the breeding season, and the data have the potential to be very useful in the context of understanding wintering bird populations.

Klamath Bird Monitoring Network

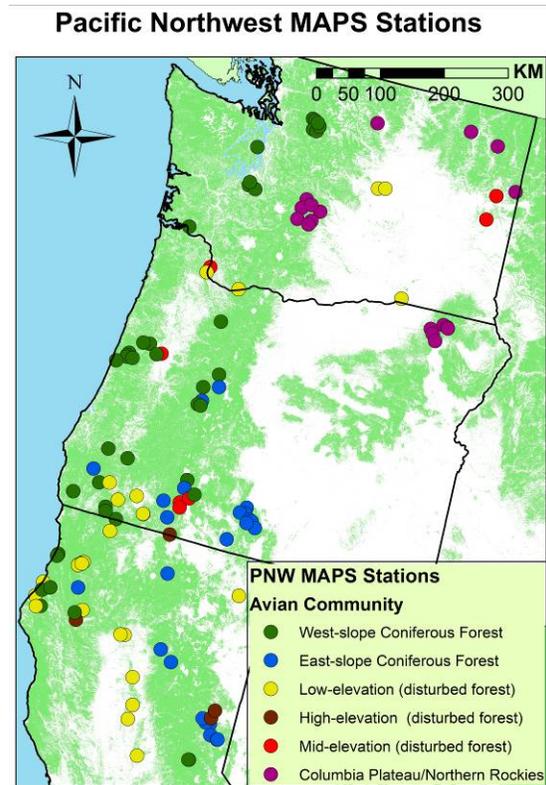
The Klamath Bird Monitoring Network is a comprehensive bird-monitoring partnership in southern Oregon and northern California (Alexander et al. 2004). The Network promotes a science-based approach to integrating bird conservation objectives into the ecosystem management process. Network cooperators study bird populations and provide information about bird distribution, population trends at various scales, and demographic factors that drive population change. The use of standardized bird monitoring methods is encouraged, and data are contributed to the KBO/RSL Avian Data Center. The applied ecological studies and long-term monitoring projects of Klamath Bird Observatory (KBO) are within the efforts of this network. KBO's applied ecological studies align with the effectiveness monitoring needs identified in this strategy. An example of KBO's recent work includes a number of studies assessing the effects of fuel reduction in oak woodlands (Seavy et al. 2008) and mixed-conifer forests (Alexander et al. 2007, Stephens and Alexander 2011). KBO has published a number of manuscripts on this topic, which have been presented in the context of additional literature to create decision support tools which address land management decisions related to fuel reduction, fire suppression, and fire prevention (e.g. KBO and BLM 2009).

The Klamath Bird Monitoring Network operates a number of ecological monitoring stations in the Klamath-Siskiyou bioregion of southern Oregon and northern California. Ecological monitoring stations improve our understanding of population trends, breeding success, bird health, and longevity. At these sites biologists use mist nets to capture, band, and release birds while surveying the areas using area search and checklist methodologies. These ecological monitoring stations are operated across multiple seasons, including spring migration, breeding, fall migration, and some are operated year-round. Data collected at these stations contribute to a number of priorities identified in this strategy, including informing full life-cycle stewardship. Banding stations operated

under the umbrella of this partnership include stations operated by KBO and USFS Redwood Sciences Laboratory, as well as stations operated by partners, in southern Oregon and northern California. These stations contribute data to the MAPS program and are represented in the map below.

Monitoring Avian Productivity and Survivorship (MAPS)

The Monitoring Avian Productivity and Survivorship (MAPS) program is a continent-wide network of constant-effort mist netting stations. The program is supported by the Institute for Bird Populations (IBP) which coordinates the operation of MAPS stations on federal lands and also collates, verifies, and archives data from hundreds of other MAPS contributors (<http://www.birdpop.org/maps.htm>). Banding sites that are operated under the umbrella of MAPS may be funded and implemented by IBP or other partners. An example is KBO and USFS Redwood Sciences Laboratory, who have coordinated the operation of over half of the 100 Oregon and Washington MAPS stations.



Since 1992, the MAPS program has collected mark-recapture data and in-the-hand information from a network of >120 stations throughout the Pacific Northwest, totaling ~250,000 individual birds of over 180 species from six avian communities. Most stations operate on forested lands of Washington, Oregon, and northern California under the stewardship of USDA Forest Service Region 6 or the Bureau of Land Management. Of the 100 stations that have ever operated in Washington and Oregon, 63 operated in 2010. Data collected at these stations through 2006 are available through the Avian Knowledge Network and have been analyzed to provide state- and BCR-specific estimates of demographic parameters (e.g., survival, recruitment, lambda, productivity).

These data have facilitated important research into the identification of limiting factors on populations, including climate phenomena (Nott et al. 2002) and landscape structure and pattern (Nott et al. 2005, Nott and Kaschube 2007, Nott and Michel 2011). Region 6 MAPS data were specifically used to advance mark-recapture analysis techniques (Nott and DeSante 2002). More recently MAPS and multiple spatial datasets were used to construct 1 km-resolution regional models to predict the distribution of breeding and post-breeding habitat for a suite of Pacific Northwest landbirds. The models are made available through the Conservation Biology Institute’s Data Basin GIS server.

The Institute for Bird Populations has put forth recommendations for the future direction of MAPS stations in the Pacific Northwest (DeSante et al. 2004, Pyle et al. 2005). The recommendations set priorities based on 1) habitats of special concern, 2) species of special concern, 3) geographic data gaps, 4) taxonomic gaps, and 5) opportunities on federal land. They identified shrub-steppe habitat as the highest priority for increased monitoring, followed by broadleaf, conifer, and riparian. Evaluation of existing MAPS stations and consideration of establishment of new stations (or re-establishment of previously operated stations) should reference these recommendations.

National Park Service Inventory and Monitoring Program

National parks in the Pacific Northwest play vital roles as both refuges for bird species dependent on late-successional forest conditions, and as reference sites for assessing the effects of land use and land cover changes on bird populations throughout the larger Pacific Northwest region. Changes in the larger Pacific Northwest landscape stem from local causes such as conversion to agriculture, forest management, and suburban development, as well as broader-scale processes such as global climate change. Monitoring population trends at ‘control’ sites in national parks is especially important, because parks are among the few sites in the United States where population trends due to large-scale regional or global change patterns are least likely to be confounded with local changes in land use.

The National Park Service operates three Inventory and Monitoring Networks within Oregon and Washington: North Coast and Cascades; Klamath; and Upper Columbia Basin. Two of these networks are implementing long-term monitoring for landbirds. In the North Coast and Cascades Network, the NPS, partnering with IBP, initiated the monitoring program in 2006 at five park units (<http://www.birdpop.net/nccn/>). In partnership with the Klamath Network, Klamath Bird Observatory initiated long-term landbird monitoring at six national park units in 2008 (Stephens et al. 2010a). Results from the landbird inventory and monitoring efforts in these parks will inform future decisions about important management issues in the parks, including visitor impacts, fire management, and the effects of introduced species. The work in the North Coast and Cascades Network has already yielded a peer-reviewed paper refining knowledge on the elevational distributions of common bird species in the Pacific Northwest (Siegel et al. in press), including subalpine birds, which are generally not well sampled by other monitoring programs. The Upper Columbia Basin did not identify landbirds as a priority for their monitoring efforts, but are implementing a monitoring program specifically for Sage Grouse.

Oregon 2020

The proposed Oregon 2020 bird monitoring program will establish baseline data on the distribution and abundance of Oregon’s avifauna. The primary aim is to create a spatially dense map that illustrates the distribution and abundance of Oregon’s birds and their habitats. The project has two major components. One allows contributions by the birding public and students, who will be trained through outreach of the Oregon 2020 project to contribute data via eBird. The other component involves data contributed by professional ornithologists. Those data will be gathered in a manner that is repeatable in the future.

With these data, the project will allow for short and long-term assessment of how the distribution and abundance of Oregon's birds and their habitats are changing in association with changes in land-use and climate.

Special Species Monitoring

Ongoing single species monitoring projects are operated by a number of partner organizations. These efforts address species including Bald Eagle, Black Swift, Peregrine Falcon, Purple Martin, Northern Spotted Owl, and Streaked Horned Lark.

In addition, the Nightjar Survey Network was initiated in 1997, to improve our understanding of Nightjar trends and distribution in the United States. The effort is coordinated by the Center for Conservation Biology (<http://www.ccb-wm.org/nightjars.htm>). The network originally focused in the Southeast, and efforts began in the West in 2008. Most of the routes in Oregon and Washington are currently vacant.

U.S. Fish and Wildlife Service Inventory and Monitoring Program

The U.S. Fish and Wildlife Service Inventory and Monitoring Program, administered and funded by the National Wildlife Refuge System, was initiated in 2010 and is still in the early stages of development. This program is refuge centric, but not refuge exclusive. The program will coordinate data and management activities across refuges and with other agencies and partners. This monitoring strategy can help inform the development of the USFWS Inventory and Monitoring Program.

Conclusion

Our knowledge of bird populations in Oregon and Washington has been advanced by PIF's efforts over the last two decades. Results from numerous research and monitoring projects, in the context of regional, national, and international PIF conservation plans, provide a solid groundwork for implementing bird conservation priorities. Despite this increased knowledge, there are critical gaps limiting bird conservation. This bi-state monitoring strategy seeks to address these information gaps.

Objectives of the monitoring strategy for Oregon and Washington align with the four overarching goals put forth in *Opportunities for Improving Avian Monitoring* (NABCI 2007):

1. *Fully integrate monitoring into bird management and conservation practices and ensure that monitoring is aligned with management and conservation priorities.*

This strategy sets forth monitoring goals for Oregon and Washington to ensure that monitoring programs align with management and conservation priorities. The strategy is based on the guiding documents of regional, national and continental bird conservation initiatives and on partner strategies and priorities. Monitoring priorities that align with prominent management actions and the most pressing information needs in the bi-state area have been identified. The intent is that this framework will promote the integration of monitoring into management and conservation practices, through the delivery of needed information and the application of effectiveness monitoring through an adaptive management framework.

2. *Coordinate monitoring programs among organizations and integrate them across spatial scales to solve conservation or management problems effectively.*

A primary goal of OR/WA PIF is to facilitate interagency, private, public, and international partnerships towards landbird management, monitoring, and research. By identifying partner priorities within this bi-state monitoring strategy, current and future efforts can be coordinated to increase efficiencies. A driving factor behind the development of this strategy is to improve our ability to scale monitoring projects to contribute to inferences at various spatial scales. This is specifically addressed in the suggested sampling design considerations. Within a grid-based framework, it is the priority of OR/WA PIF to increase our understanding of demographics and the limiting factors of populations, as well as to implement a full life cycle stewardship approach. While these and other priorities may not be able to be implemented widely due to budget constraints, monitoring efforts should be tiered to various scales whenever feasible.

3. *Increase the value of monitoring information by improving statistical design.*

Statistical design of new monitoring projects should consider both statistical rigors to answer specific monitoring questions, as well as the ability of the data to be scaled up and/or down to address range-wide questions. Specific needs for improved statistical design are not unique to Oregon and Washington, and thus are not detailed in this strategy. However, the idea of improved statistical design underlies all priorities in this

strategy and national references should be consulted when designing new studies (Laurent and Pashley, 2009NABCI 2007).

4. Maintain bird population monitoring data in modern data management systems. Recognizing legal, institutional, proprietary, and other constraints, provide greater availability of raw data, associated metadata, and summary data for bird monitoring programs.

The majority of existing data from disparate research and monitoring projects in Oregon and Washington are not widely available to contribute to analyses. In many cases, such data have already been lost through turnover in both technology and personnel. The development and maintenance of a regional node to the Avian Knowledge Network (AKN) is an objective of this monitoring strategy. The priorities of a regional avian data center are to archive existing datasets, facilitate the accessibility and subsequent use of existing data in analyses, and generate web-based decision support tools that inform conservation efforts. This coordinated and cost-effective approach to data management will create readily accessible data and support land management decision-making. Compiling existing monitoring data and making it readily accessible is a critical step towards achieving the other monitoring objectives identified in this strategy.

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Appendix A. Partner strategies and priorities

This monitoring strategy aligns with the guiding documents and priority species lists developed by the following key partners. A summary of each partner's mission, guiding documents, current monitoring programs, and monitoring priorities are provided here for reference.

Joint Ventures (JVs)

Joint Ventures are cooperative partnerships that work to preserve avian habitat and to carry out the directives of the four major bird conservation initiatives. Oregon and Washington are covered by the Intermountain West Joint Venture (IWJV) east of the Cascades and by the Pacific Coast Joint Venture (PCJV) west of the Cascades. In addition, the Oregon Habitat Joint Venture works throughout the state, aligning with both regional joint ventures. The IWJV has a *Strategic Implementation Plan for Landbird Conservation* (Casey 2011) and the PCJV has implementation plans for geographic focus areas (Altman 2010, PCJV 2011). These implementation plans are designed to enable the JVs to meet bird population objectives.

The IWJV Landbird Science Team is establishing population objectives for seventeen priority species that occur in Oregon and/or Washington as a basis for identifying habitats needed to sustain healthy bird populations. The information is presented at ecoregional scales [Bird Conservation Region (BCR) by state polygons]. A database has been developed to generate population estimates that parallel the trend-based information in the *PIF North American Landbird Conservation Plan* (Appendix B, Casey 2011). The PCJV has identified priority species for each geographic focus area (Appendix B, Altman 2010, PCJV 2011).

Neither JV identifies plans for long-term bird monitoring, but future monitoring suggested within this strategy aligns closely with IWJV goals to validate existing population estimates. The modeling process used to develop the population objectives would be improved by additional data, both to fill geographic gaps and to increase the models' abilities to make inference to finer scales. Monitoring projects that contribute to a BCR-wide approach would be most useful to roll-up to the JV planning area. Further monitoring will be needed to measure the effectiveness of the JV conservation actions as they relate to meeting population objectives.

Landscape Conservation Cooperatives

Landscape Conservation Cooperatives (LCCs) are partnerships that promote a networked approach to large landscape conservation. Oregon and Washington intersect with three LCCs: Great Basin, Great Northern, and North Pacific. Each of these LCCs is currently in various early stages of planning; therefore, this landbird monitoring strategy should inform the LCCs as they further develop and define their own monitoring priorities.

The Great Northern LCC (GNLCC) is developing a strategic plan that will capture the collective vision of a broad array of agencies, interest groups, and stakeholders in the

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Columbia Plateau and Northern Rocky Mountains. Plan development is guided by a Steering Committee which represents 27 federal and state agencies, Native American tribes, and non-governmental organizations. GNLCC's Strategic Framework will identify shared conservation priorities while respecting existing documents and strategies. The Framework will inform cooperative on-the-ground actions, followed by coordinated, thoughtful monitoring, evaluation, and adaptation when necessary. Though GNLCC will not conduct monitoring per se, they will lead the coordination of landscape-scale monitoring, as well as develop and deliver data management and analysis tools throughout the adaptive management process.

Portland Metro

Metro is a regional governmental organization in the Portland metropolitan area representing three counties in Oregon (Clackamas, Multnomah, Washington). Metro is currently developing a regional conservation strategy that will guide its land acquisition program. Effectiveness monitoring for species benefiting from the restoration of these acquired lands has been and will continue to be implemented. In addition to the regional conservation strategy, site based conservation plans are currently being written for all natural areas. These conservation plans will be referred to in assessments for twenty-seven target areas. These documents refer to any and all historic and planned avian monitoring. All avian monitoring has been developed primarily to provide baseline information for, and to measure the effectiveness of, restoration projects. Long-term monitoring is occurring at three sites, where approximately ten years of point count and area search surveys have already been completed. Metro's greatest information needs with regard to bird conservation are presence/absence, abundance, and habitat use. The goal of ongoing and future bird monitoring is to respond to specific restoration based and research related questions.

Oregon Department of Fish and Wildlife

The Oregon Department of Fish and Wildlife (ODFW) has a statutory obligation to protect and enhance Oregon's fish and wildlife and their habitats for use and enjoyment by present and future generations. ODFW, in collaboration with multiple partners, developed the *Oregon Conservation Strategy* to act as a long-term blueprint for conserving Oregon's natural resources (ODFW 2005). The goals of the *Oregon Conservation Strategy* are to maintain healthy fish and wildlife populations by maintaining and restoring functioning habitats, prevent declines of at-risk species, and reverse any declines in these resources where possible. Conservation issues that affect species can occur at multiple scales; therefore the *Oregon Conservation Strategy* steps down from statewide approaches (six key conservation issues), to the ecoregional level (eight ecoregions), and finally to individual species (286 Strategy Species, including 62 birds) and habitat types (11 Strategy Habitats).

The *Oregon Conservation Strategy* recognizes that monitoring needs are larger and more complex than any one agency or organization can sustain. A primary goal of the *Oregon Conservation Strategy* is to improve coordination of monitoring efforts throughout Oregon. The monitoring approach in the *Oregon Conservation Strategy* works to fill data gaps for certain species, follow short and long-term trends in Strategy Species

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populations and Strategy Habitat conditions, and track the effectiveness of conservation actions over time. In addition to the data gaps and research needs identified for individual Strategy Species, the following overarching monitoring needs are highlighted throughout the *Oregon Conservation Strategy*:

- Determine baseline conservation status, estimated population size and trends, and limiting factors for Strategy Species.
- Develop and implement survey and monitoring methodology for species lacking protocols. Monitoring techniques should be quantitative and scientifically sound.
- Identify monitoring priorities, including a list of Strategy Species and indicator species to monitor.
- Determine responses to land management actions or human activities.
- Determine habitat requirements, and relationships between population dynamics and habitat dynamics.
- Evaluate and address the impacts of climate change.
- Create and maintain a centralized database to track data on Strategy Species and Habitats, and conservation actions. Standardize database formats to ensure compatibility, and facilitate information sharing between organizations and researchers.
- Work with the multi-partner Fish and Wildlife Monitoring Team to provide guidance for needed monitoring and assessments. Build on the ongoing work to increase coordination between groups and to focus any new monitoring activities on gaps in current efforts.
- Support and develop tools for citizen-based monitoring programs.

USDA Forest Service

The USDA Forest Service (USFS) is recognized as a national and international conservation leader and plays a pivotal role in the conservation of migratory bird populations and their habitats. Many national forests and grasslands are nationally and internationally recognized Important Bird Areas or other migratory bird designations. Within the National Forest System, the conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for other land management activities. The National Forest Management Act (NFMA) (1976) requires that each national forest develop a land and resource management plan and provide for diversity of plant and animal communities in order to meet overall multiple-use objectives. National forest and grassland managers design or collaborate on projects that provide for bird conservation in accordance with numerous laws, agreements, and comprehensive planning documents. Additionally, Forest wildlife biologists frequently incorporate recommendations from comprehensive planning efforts when addressing the effects of proposed actions on migratory bird populations.

USFS has several overarching documents that influence monitoring and resource management in the context of bird conservation. In addition to falling under the Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds (Clinton 2001), USFS has a Memorandum of Understanding (MOU) with USFWS that provides further direction related to the conservation of neotropical migratory birds.

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Oregon and Washington are within the Pacific Northwest Region (Region 6) of the USFS, which includes 16 National Forests. Each of these National Forests has an individual Forest Plan with detailed land management planning. Those planning documents include monitoring and management requirements for species identified in the Interagency Special Status/Sensitive Species Program (ISSSSP) (2011) (Appendix B). Oregon/Washington PIF is currently working with regional BLM and USFS biologists to revise the ISSSSP list to better align with the PIF Species Assessment Database (Panjabi et al. 2005).

USDA Natural Resources Conservation Service

The Natural Resources Conservation Service (NRCS) works to help private landowners solve natural resource problems, primarily but not exclusively on farm and ranch lands. The resource concerns that they assist with are broad and include soil, water, air, plants, animals, and energy. NRCS provides direct technical assistance to landowners to conduct resource inventories, evaluate management alternatives, and develop conservation plans for the sustainable management of their lands. NRCS administers a variety of Farm Bill conservation programs that provide financial assistance to landowners to facilitate on-the-ground conservation. In 2010, over \$55 million was invested with landowners in Oregon and Washington for private lands conservation. Under broad direction from the national level, funding priorities are refined at county, multi-county, and state levels. Increasingly, NRCS is taking a strategic approach to Farm Bill program delivery in order to solve complex natural resource problems, maximize conservation outcomes with limited resources, increase accountability, and leverage partner resources. NRCS recognizes the importance of measuring the outcomes of conservation efforts, but they do not receive regular funding for monitoring. As such, NRCS often seeks to collaborate with partners to accomplish effectiveness monitoring for NRCS funded projects. As part of the NRCS National Easement Assessment Project (NEAP, <http://neap.tennessee.edu/>) a recent report recommends that the NRCS Easement Programs Division (EPD) establish a comprehensive biological monitoring program focused on monitoring biological condition on NRCS easements (Gray et al. 2011).

USDI Bureau of Land Management

The mission of the USDI Bureau of Land Management (BLM) is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations. The BLM is responsible for management of 253 million surface acres - more land than any other federal agency. These lands, mostly in 12 western states, including Alaska, are characterized predominately by grassland, forest, high mountains, arctic tundra, and desert landscapes. The BLM manages these lands for multiple uses, including energy and mineral extraction, timber, forage, recreation, wild horse and burro herds, fish and wildlife habitat, wilderness areas, and archaeological, paleontological, and historical sites.

The BLM is recognized as a leader in public land management nationally and internationally and plays a pivotal role in the conservation of migratory bird populations and their habitats. For example, the BLM manages many national and internationally significant Important Bird Areas. The BLM uses both broad-based Resource

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Management Plans and more focused activity planning, such as Habitat Conservation Management Plans and Watershed Management Plans, to further habitat improvement and bird conservation. Many BLM field office, state, and headquarters personnel are actively involved in partnerships to facilitate bird conservation on public lands throughout North America.

The BLM has several overarching documents that influence monitoring and resource management in the context of bird conservation. The BLM falls under the Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds (Clinton 2001), and has an MOU with USFWS that provides further guidance as to how the BLM will address neotropical migratory bird conservation. There are ten BLM Districts in Oregon and Washington. Each of these Districts has an individual management plan, which includes monitoring and management requirements for species identified in the Interagency Special Status/Sensitive Species Program (ISSSSP) (2011) (Appendix B). Oregon/Washington PIF is currently working with regional BLM and USFS biologists to revise the ISSSSP list to better align with the PIF Species Assessment Database (Panjabi et al. 2005).

USDI National Park Service

The USDI National Park Service's (NPS) mission is to preserve designated lands for the scenery, resources, and wildlife they contain, and to provide for the enjoyment of current and future generations. NPS falls under the Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds (Clinton 2001), and has an MOU in place with the USFWS addressing management for neotropical migratory birds. The NPS Inventory and Monitoring Program is organized into networks, three of which include Oregon and/or Washington: the Klamath Network, the North Coast and Cascades Network, and the Upper Columbia Basin Network. Landbirds are prioritized for long-term monitoring at both the Klamath Network and the North Coast and Cascades Network, while the Sage Grouse is a monitoring priority at the Columbia Basin Network. Outside the scope of the Inventory and Monitoring Program, each of the parks has a unique management plan, and some individual parks conduct species specific monitoring (e.g. Northern Spotted Owl at Crater Lake National Park). There remains a need for landbird monitoring at some parks within Oregon and Washington (e.g. John Day Fossil Beds); and a coordinated monitoring approach with adjacent landowners and agencies should be considered.

US Fish and Wildlife Service

The US Fish and Wildlife Service (USFWS) has three branches that relate to bird conservation: 1) the Migratory Bird Program, which works to protect, restore, and manage migratory bird populations for long-term sustainability; 2) the National Wildlife Refuge System, which is a strategically located and carefully managed network of public lands conserving fish, wildlife, and plants; and 3) the Partners for Fish and Wildlife Program, which works to achieve voluntary habitat restoration on private lands. The USFWS maintains a list of Threatened and Endangered birds (USFWS 2011) and Birds of Conservation Concern (USFWS 2008) included in Appendix B.

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The USFWS Migratory Bird Program is guided by the Fish and Wildlife Conservation Act (Nongame Act 1988) which calls for 1) trend and status monitoring of all migratory nongame birds, 2) identifying the effects of human activity and environmental change on those species, 3) identifying species that without conservation action are at risk of becoming listed as threatened or endangered (ESA 1973), 4) identifying conservation actions to assure that the federal listing of species identified above does not become necessary, and 5) identifying lands whose protection, management, or acquisition will benefit those species. In line with these priorities, the Migratory Bird Program maintains a list of Birds of Conservation Concern (USFWS 2008) (Appendix B).

The USFWS National Wildlife Refuge System is guided by the Refuge Improvement Act, which calls for refuge lands to be managed for wildlife conservation and management (NWRS Improvement Act 1997). Each refuge is managed to fulfill both the mission of the refuge system and the purpose for which it was established (NWRS Improvement Act 1997). Each refuge has a Comprehensive Conservation Plan that guides the management of an individual refuge, and it may highlight monitoring priorities. The recent development of the Inventory and Monitoring Program will provide additional guidance for monitoring on refuge lands. The program seeks to inform resource management decisions on wetlands as well as scale up to contribute to landscape-level monitoring goals. Monitoring will likely emphasize focal waterbird, shorebird, and landbird species.

The USFWS Partners for Fish and Wildlife Program, which promotes collaboration and conservation on private lands, does not include a formal monitoring component. The current strategic plan calls for assessment of effectiveness of the habitat conservation programs. Effectiveness monitoring is a priority for the program and may best be achieved through a collaborative approach.

US Geological Survey

The US Geological Survey (USGS) provides scientific understanding and technology needed to support sound management and conservation of the nation's natural resources. USGS has Science Strategies at the regional and national level, which are primarily designed to meet the research needs for Department of Interior agencies (e.g. BLM, NPS, USFWS). The Science Strategy outlined by the Forest & Rangeland Ecosystem Science Center (USGS-FRESC) emphasizes research on western ecosystems and on the Pacific Northwest in particular (FRESC 2005). This bi-state landbird monitoring strategy aligns with many of the goals and objectives outlined in the FRESC Science Strategy, including:

- Understand status and trends and sustainability of ecosystem properties, ecological communities, and focal species groups
- Assist partner agencies in developing monitoring systems and programs that enable the management and stewardship of biological resources, and promote public understanding and appreciation
- Coordinate and facilitate integration of inventory and monitoring across scales and jurisdictions
- Design monitoring strategies and improve the efficiency of techniques to determine the effectiveness of restoration and management techniques

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- Develop monitoring frameworks and sampling plans that facilitate integration of information from multiple spatial and temporal scales
- Evaluate monitoring information to assess the effects of disturbances and management actions at multiple scales
- Improve the scientific basis for evaluating the effects of multiple stressors at all levels of biological organization and at multiple temporal and spatial scales
- Use long-term data to assess the effects of anthropogenic and ecological processes on habitats and species, and develop a long-term monitoring strategy for key ecosystems

Washington Department of Fish and Wildlife

The Washington Department of Fish and Wildlife (WDFW) oversees state lands for multiple use, works as a steward of fish and wildlife and their habitats, and provides opportunities for fish and wildlife-related recreation. WDFW developed a Comprehensive Wildlife Conservation Strategy (CWCS) which identifies species and habitats most in need of conservation in Washington, and provides a management framework to protect these species and their habitats (WDFW 2005). WDFW is currently working on a new Conservation Initiative, which will provide a prioritization and accounting system for the CWCS and increase efficiencies by identifying strategies for ecosystem level management. The CWCS identifies the following monitoring priorities, all with an emphasis on Species of Greatest Conservation Need (WDFW 2005):

- Status and trends (extensive) monitoring
- Research (intensive) monitoring
- Effectiveness monitoring
- Implementation monitoring

The top priority for WDFW is to determine whether ecosystem level management can encompass individual species, thus avoiding the need for single species management. Current monitoring includes Monitoring Avian Productivity and Survivorship (MAPS) stations, Streaked Horned Lark, and Threatened and Endangered Species monitoring.

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Appendix B. Focal and priority species

Table 1. Focal (OR/WA PIF) and priority (all other lists) landbird species in Oregon and Washington.

Common Name	PIF						USFWS						ODFW				WDFW				ISSSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶							
	N.A. ¹	OR/WA					Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS						
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive	Strategic			
Acorn Woodpecker				X												X					X	X	X									X		
Allen's Hummingbird	X									X																						X		
American Kestrel				X																														
American Pipit					X																													
American Three-toed Woodpecker																X						X												
Ash-throated Flycatcher			X	X																		X		X										
Bald Eagle	X									X	X	X		X		X					X		X		X							X	X	
Band-tailed Pigeon	X				X											X															X	X		
Bewick's Wren				X																														
Black Rosy-Finch		X									X	X												X										
Black Swift	X	X			X						X	X	X			X						X		X								X		

Common Name	PIF						USFWS						ODFW				WDFW				ISSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶								
	N.A. ¹		OR/WA				Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS							
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive	Strategic				
Black-backed Woodpecker			X												X				X			X													
Black-capped Chickadee				X																														X	
Black-throated Gray Warbler	X				X																													X	
Black-throated Sparrow						X																	X												
Blue-gray Gnatcatcher				X											X										X										
Bobolink															X						X		X												
Boreal Chickadee																					X														
Boreal Owl																					X														
Brewer's Sparrow		X								X	X				X																	X			
Broad-tailed Hummingbird																								X		X									
Brown Creeper			X		X																														
Bullock's Oriole				X		X																													
Bushtit				X																															
California Towhee	X			X																															
Calliope Hummingbird		X								X	X																								

Common Name	PIF						USFWS						ODFW				WDFW				ISSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶										
	N.A. ¹		OR/WA				Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS									
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive	Strategic						
Cassin's Finch		X										X																									
Cedar Waxwing																																					
Chestnut-backed Chickadee	X																																			X	
Chipping Sparrow			X	X							X					X																				X	
Clark's Nutcracker		X	X																																		
Columbian Sharp-tailed Grouse						X									X		X						X	X													
Common Nighthawk				X											X	X																				X	
Cooper's Hawk				X																																	
Downy Woodpecker				X																																X	
Dusky Flycatcher		X																																			
Ferruginous Hawk						X					X	X			X	X		X				X	X										X			X	
Flammulated Owl	X	X	X			X					X	X				X		X				X	X										X				
Fox Sparrow	X																																				
Golden Eagle											X							X				X														X	
Golden-crowned Sparrow	X																																				

Common Name	PIF						USFWS						ODFW				WDFW				ISSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶			
	N.A. ¹		OR/WA				Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS		
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive
Grasshopper Sparrow				X		X										X					X					X	X			
Gray Flycatcher		X																			X					X				
Great Gray Owl															X						X	X				X	X			
Greater Sage-grouse		X						X			X				X		X					X				X		X		
Greater Sandhill Crane			X											X	X							X				X	X		X	
Green-tailed Towhee		X		X							X										X					X				
Gyrfalcon																					X					X				
Hammond's Flycatcher					X																							X		
Hermit Thrush			X																											
Hermit Warbler	X				X																							X		
House Wren				X																								X		
Hutton's Vireo					X																							X		
Lark Sparrow				X		X																								
Lazuli Bunting						X																								
Lesser Goldfinch				X																	X				X		X			

Common Name	PIF						USFWS						ODFW				WDFW				ISSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶			
	N.A. ¹		OR/WA				Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS		
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive
Lewis's Woodpecker	X	X	X	X		X	X				X	X			X	X			X			X		X		X	X		X	
Lincoln's Sparrow					X																									
Loggerhead Shrike						X				X	X				X			X				X								
Long-billed Curlew										X	X	X									X		X		X	X				
MacGillivray's Warbler						X																					X			
Marbled Murrelet							X			X			X		X		X					X				X				
Merlin																							X							
Mountain Bluebird		X																												
Mountain Quail	X														X							X		X		X				
Nashville Warbler			X	X																										
Northern Goshawk										X					X		X					X					X			
Northern Harrier				X																										
Northern Spotted Owl	X	X					X						X		X	X						X					X			
Northern Waterthrush																					X		X		X					
Oak Titmouse	X			X																										
Olive-sided Flycatcher	X	X	X		X	X				X		X			X											X	X			

Common Name	PIF						USFWS						ODFW				WDFW				ISSSP ¹³				IWJV ¹⁴	PCJV ¹⁵	LCC ¹⁶						
	N.A. ¹		OR/WA				Endangered ⁷	Threatened ⁷	Candidate ⁷	Delisted ⁷	BCR5 (North Pacific Forest) ⁸	BCR9 (Great Basin) ⁸	BCR10 (Northern Rockies) ⁸	Endangered ⁹	Threatened ⁹	Sensitive ⁹	Conservation Strategy ¹⁰	Endangered ¹¹	Threatened ¹¹	Candidate ¹¹	Sensitive ¹¹	Monitored ¹¹	Conservation Strategy ¹²	BLM				USFS					
	Pacific	Intermountain West	Cascade East-slopes ²	W. Lowlands and Valleys ³	W. Coniferous Forest ⁴	Columbia Plateau ⁵																		Rocky Mountains ⁶				Sensitive	Strategic	Sensitive	Strategic		
White-throated Swift	X	X																															
Williamson's Sapsucker		X	X							X	X																						
Willow Flycatcher	X	X		X		X	X			X	X	X				X															X	X	X
Wilson's Warbler					X																												
Wrentit	X			X																													
Yellow Warbler				X		X																										X	
Yellow-billed Cuckoo				X		X				X	X				X			X				X		X							X		
Yellow-breasted Chat				X		X									X	X															X		

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Appendix B.

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