*WASHINGTON'S*

# STATE WILDLIFE ACTION PLAN

## 2015 Update

Prepared by the
Washington Department of Fish and Wildlife
September, 2015

Washington Department of
FISH and WILDLIFE

**Recommended Citation:** Washington Department of Fish and Wildlife. 2015. Washington's State Wildlife Action Plan: 2015 Update. Washington Department of Fish and Wildlife, Olympia, Washington, USA.

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September 21, 2015

Kathy Hollar, Acting WSFR Chief
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Wildlife & Sport Fish Restoration
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Dear Ms. Hollar:

I am pleased to present Washington's State Wildlife Action Plan (SWAP) 2015 update. This plan serves as our formal comprehensive review and revision of the 2005 Comprehensive Wildlife Conservation Strategy (CWCS), and is required to ensure our continued eligibility for the State Wildlife Grants Program. We believe this plan provides the tools, information, and resources to significantly advance our conservation efforts and we are excited to share it with the U.S Fish and Wildlife Service (Service) and our conservation partners. As we noted in our letter to the Service in June 2013, we determined that a substantial revision of our 2005 CWCS was warranted. A table comparing key differences between the 2005 CWCS and the 2015 SWAP is enclosed with this letter and can also be found in Chapter 1 of the SWAP. We have also enclosed a Roadmap to guide the reviewer in finding information which responds to each of the eight essential elements mandated by Congress.

In the years since our CWCS was approved in 2005, we have directed State Wildlife Grant funds, matched with existing state funds, to implement a multitude of strategic conservation projects and initiatives on the ground, some of which are highlighted in the introduction of the new SWAP. State Wildlife Grant funds continue to play a central role in the success of our conservation efforts, allowing us to focus on a diversity of species and to address important conservation needs before animals become endangered and recovery opportunities much more limited and expensive.

The 2015 SWAP articulates the conservation threats and actions needed for 268 species of greatest conservation need and the habitats on which they depend. We intend to use this framework to guide our own work, and also to promote collaborative projects with partners to leverage resources around shared goals. We believe that the SWAP will help us to integrate wildlife conservation with sustainable working landscapes and environments, as we recognize the economic, community and ecological values of agriculture, rangeland, forestry, and fisheries.

We appreciate the many partners and members of the public who contributed to the development of our SWAP, through suggestions, comments, or technical review. All of us, no matter where we live or work, have an important role to play in conserving our natural heritage. I look forward to working with you to implement this plan as we collectively invest in the vital work to sustain Washington's extraordinary fish and wildlife resources for generations to come.

Sincerely,

James Unsworth, Ph.D.
Director

Enclosures

# GUIDE TO MEETING THE EIGHT ESSENTIAL ELEMENTS and MAJOR CHANGES FROM 2005 CWCS

This document provides information on key areas in which the 2015 SWAP Update differs from the 2005 CWCS, as well as a guide to evaluating Washington's State Wildlife Action Plan (SWAP) Update in addressing the eight required elements.

## Summary of changes in approach and content from the 2005 CWCS

The number of foundational changes in our approach to fulfilling the eight essential elements has resulted in a completely new document from the 2005 CWCS. It is not productive to attempt to cross reference new content to old, given the differences in organization and content. Rather, we have provided a description of these changes below, the rationale for the change and the implications for the 2015 SWAP. These changes profoundly affect the structure and content of the SWAP and include new SGCN criteria and resulting changes in the list, new terminology for defining threats and actions for both species and habitats, a new system for describing and classifying key habitats for SGCN and the integration of climate change throughout the document. We hope that the Road Map provided in this document will be sufficient to guide the reader in assessing how WDFW met each of the eight required elements.

This table is also included in Chapter 1 of the 2015 SWAP Update, Introduction and Overview.

| Major Change | Rationale | Implications for the 2015 SWAP |
|---|---|---|
| **SGCN criteria**<br>The criteria for inclusion as a Species of Greatest Conservation Need was modified from 2005. The criteria from 2005 included both biological and socioeconomic considerations. Modifications included focusing on biological conservation need and using NatureServe ranks as a criterion, based in part on the guidance document, "Best Practices for State Wildlife Action Plans" produced by AFWA[1]. | **Increased transparency and use-ability**<br>The criteria used in 2005 was complicated and proved difficult to explain to a non-technical audience. We simplified the criteria to focus on biological conservation need, with the understanding that socioeconomic needs would be addressed in prioritization processes. We also included NatureServe ranks as recommended in the AFWA Association of Fish and Wildlife Agencies Best Practices guide. | **Robust and updated SGCN list**<br>The SGCN list is almost 30 percent larger than in 2005 (from 186 to 268). This number reflects changes in our criteria and the inclusion of updated information and data for all species. The updated criteria resulted in an increased number of invertebrates on the SGCN list – from 42 in 2005 to 95 in 2015. A comparison between 2005 and 2015 is provided in Chapter 3, as well as a list of the species which have been dropped since 2005. |
| **Habitat classification**<br>Habitats were classified and described differently than the 2005 CWCS, which relied on a Washington-specific classification system. The SWAP Update uses the | **Standardized and mappable habitat classification**<br>Ecological systems (part of the NVC) are mapped across the west. Using ecological systems to describe and classify SGCN habitat provides an important spatial component to the SWAP, allowing us to spatially translate | **Habitats of Greatest Conservation Need**<br>This new term encompasses both ecological systems considered imperiled and those ecological systems particularly important to SGCN. Chapter 4 describes the methodology |

[1] Association of Fish & Wildlife Agencies. November, 2012. Best Practices for State Wildlife Action Plans, Voluntary Guidance for States for Revision and Implementation.

| Major Change | Rationale | Implications for the 2015 SWAP |
|---|---|---|
| National Vegetation Classification System (NVC) to represent habitat needs for SGCN. This change resulted in significant changes to the 2005 CWCS. | conservation priorities to specific landscapes. | for identification, the condition of these habitats, important features for the SGCN dependent on them and key stressors and conservation actions needed. |
| **Defining stressors and actions**<br>The terminology for describing and defining stressors and actions has changed from 2005. Based in part on the Best Practices for State Wildlife Plans document, the 2015 SWAP update adopts a nationally accepted lexicon for defining threats and actions. | **Consistency and relevance**<br>We selected the Wildlife TRACS[2] system of classification which was not available in 2005. TRACS is the tracking and reporting system for conservation and related actions funded by the USFWS. A nationally recognized classification scheme will help facilitate our ability to identify and characterize projects for State Wildlife Grants Funding. | **New categories for stressors and actions**<br>When stressors and actions are discussed in the SWAP, they are described by TRACS categories. In addition to helping to identify and track projects for State Wildlife Grants, this change will help provide consistency and to synthesize data. |
| **Inclusion of range maps**<br>Potential range and habitat distribution maps are included for a subset of the SGCN for which we had sufficient data. | **Conservation Planning Tool**<br>The CWCS did not include spatial representation of range and distribution for SGCN. These potential range and habitat distribution are intended to aid in conservation planning activities for SGCN. | **Potential range maps for over 80 SGCN**<br>Appendix B includes potential range and habitat distribution maps for selected SGCN. These maps are considered working drafts as we continue to refine the methodology used to generate them. |
| **Agency-wide participation**<br>Increased engagement by the WDFW Fish and Habitat programs resulted in a more robust SGCN fish and invertebrate list and also ensured relevancy to the entire agency. | **Greater transparency and improved process**<br>The WDFW Conservation Initiative, adopted in 2012, emphasizes the importance of cross-program engagement in key initiatives. | **More engagement in SWAP across WDFW**<br>There is greater awareness of the SWAP across the agency, and increased opportunities for implementation. |
| **Climate change**<br>Climate change has been integrated throughout the 2015 SWAP Update. Other than being identified as a threat, climate change was not discussed in the 2005 CWCS. | **Emerging Issue – Increased availability of data**<br>The last ten years have brought a growing recognition of the emerging threat that climate change poses to our fish and wildlife. We used the 2015 SWAP Update as an opportunity to build our understanding regarding specific risks and vulnerabilities. | **Climate vulnerability incorporated into SWAP**<br>Chapter 5 discusses projected impacts and introduces a list of species and habitats most at risk from climate change. Appendix C includes the full assessment of climate vulnerability for all SGCN. Climate change impacts have also been integrated into Appendix A – Species Fact Sheets, and Chapter 4 – Habitats. |

[2] U.S. Fish & Wildlife Service. (2015). Wildlife Tracking and Reporting on Actions for the Conservation of Species (Version 1.0) [Web application software]. Retrieved from https://tracs.fws.gov

## Road Map to the Eight Essential Elements

This table describes how the SWAP meets each of the eight essential elements and indicates the general location of where the supporting information/material can be found.

**Element 1: The distribution and abundance of species of wildlife, including low and declining populations, indicative of the diversity and health of wildlife of the State. These species are referred to as Species of Greatest Conservation Need or SGCN.**

The methodology and criteria for identifying SGCN is described in Chapter 3, Species of Greatest Conservation Need. This chapter also compares the number of species between 2005 and 2015, includes a list of species dropped since 2005 and provides a brief explanation of the rationale. Chapter 3 also includes a short, two-page narrative summary of the SGCN included for each taxa group; mammals, birds, reptiles and amphibians, fishes and invertebrates. Each SGCN is also listed and a summary of the conservation status and concern presented in tabular format (pages 3-5 to 3-47).

More detailed information about each SGCN is provided in Appendix A – Species Fact Sheets. Each fact sheet includes information on conservation status and concern, a summary of biology and life history, a narrative description of distribution and abundance and a summary of habitat needs. Key references used are identified in the fact sheet and also included in the Master Bibliography in Appendix F.

| SUB ELEMENT | LOCATION WITHIN 2015 SWAP |
|---|---|
| Sources of information are identified | Each fact sheet includes a list of key references (Appendix A). References are also included in the Master Bibliography (Appendix F). |
| Information about both abundance <u>and</u> distribution for species. | Narrative descriptions of distribution and abundance are in Appendix A – Species Fact sheets. Potential range and habitat distribution maps are also provided for selected SGCN – these are available in Appendix B. The SGCN fact sheets include an indication of the availability of a range map for that species. |
| Low and declining populations are identified. | Population size/trend (for example low/declining) is indicated in a table on page 1 of each SGCN fact sheet in Appendix A. |
| All major groups of wildlife have been considered | Chapter 3 includes a list of all SGCN list: 44 mammals, 52 birds, 12 reptiles, 14 amphibians, 51 fish and 95 invertebrates. |
| Process used to select SGCN. | The methodology and criteria for selecting SGCN is described in Chapter 3, pages 3-1 to 3-5. |

**Element 2. The location and relative condition of key habitats and community types essential to the conservation of each State's SGCN.**

Habitats important for SGCN are identified and described in three locations within the SWAP.

1. Species Fact Sheets (Appendix A) includes a narrative description of habitats important to the SGCN in different stages of life history.
2. Chapter 4 – Habitats of Greatest Conservation Need describes the methodology used to identify habitats needing conservation attention (pages 4 to 4-). The SWAP uses the National Vegetation Classification to represent SGCN habitats. Two levels within the NVC are used – the formation level (15 formations cover the state) and the ecological systems level (116 included in Washington). Fact sheets are provided for each formation and describe the distribution of the formation, the numbers of SGCN associated with them, habitat features and qualities important to SGCN, major stressors, actions needed and research and data needs. Fact sheets are also provided for selected ecological systems – those which are considered imperiled, and/or which are especially important to SGCN. These fact sheets list the SGCN associated with them and provide more detail on

stressors and the specific action needed. References are provided at the end of each fact sheet.

3. Appendix B – Potential Range and Habitat Distribution Maps provide a spatial distribution of potential habitat (as defined by close association with ecological systems) for selected SGCN (55). Range maps were prepared for those SGCN for which we had sufficient information.

| SUB ELEMENT | LOCATION WITHIN 2015 SWAP |
|---|---|
| Explanation for the level of detail provided. | Chapter 4 includes fact sheets for each formation type, which includes a discussion of research and data needs. At a finer scale, fact sheets for each ecological system of concern includes a list of stressors and actions needed. In instances were additional data is needed, this is described as an action. |
| Key habitats and their relative conditions are described in enough detail such that the State can determine where and what conservation actions need to take place. | Chapter 4 describes habitats for SGCN, as defined through association with ecological systems and formations, two levels of classification within the National Vegetation Classification. Relative conditions is described in the fact sheets for both formations and ecological systems. Additionally, we have used the NatureServe ranking methodology to ecological systems to determine which systems are most imperiled in Washington. These systems are included in our list of Ecological Systems of Concern. |

**Element 3. The problems which may adversely affect SGCN or their habitats, and priority research and surveys needed to identify factors which may assist in restoration and improved conservation of SGCN and their habitats.**

Chapter 3 – SGCN, provides a narrative summary of conservation threats and actions needed across each taxa group, as well as a general summary of conservation concern.

Appendix A – SGCN Fact Sheets provides a table for each SGCN listing key stressors, a description of the stressor and a corresponding action and a description of the action needed. "Resource collection needs" is a category used in the stressor column of this table. Where research and surveys are needed, these are identified in this category and a description provided in the table.

Chapter 4 - Habitats, includes fact sheets for each formation, and each ecological system of concern. These fact sheets include a list of key stressors and actions needed to the address them. Where research and survey information are needed, these are indicated here.

| SUB ELEMENT | LOCATION WITHIN 2015 SWAP |
|---|---|
| Sources of information used to determine the threats are identified. | Key references are provided at the end of each fact sheet for SGCN (Appendix A) and each fact sheet for habitat formations and ecological systems (Chapter 4). In addition, all references used in the document are provided in the Master Bibliography, Appendix F, separated by Chapter. |
| Threats/problems are described in sufficient detail to develop focused conservation actions. | Each threat is described in a summary fashion, with enough detail to identify a corresponding action to address the threat. Threats are described as noted above. |
| Research and survey efforts are identified to obtain needed information. | Research and survey efforts needed for SGCN and their habitats are described in Appendix A – Species Fact Sheets, Chapter 4- Habitats, in the formation and ecological systems fact sheets. |

| **Element 4. The actions necessary to conserve SGCN and their habitats and priorities for implementing such conservation actions** | |
|---|---|
| Chapter 3 – SGCN, provides a narrative summary of conservation threats and actions needed across each taxa group, as well as a general summary of conservation concern.<br>Appendix A – SGCN Fact Sheets provides a table for each SGCN listing key stressors, a description of the stressor and a corresponding action and a description of the action needed. "Resource collection needs" is a category used in the stressor column of this table. Where research and surveys are needed, these are identified and described here.<br>Chapter 4 - Habitats, includes fact sheets for each formation, and each ecological system of concern. These fact sheets include a list of key stressors and actions needed to the address them. Where research and survey information are needed, these are indicated here. | |
| SUB ELEMENT | LOCATION WITHIN 2015 SWAP |
| Identifies how actions address identified threats to SGCN and their habitats. | Appendix A – Species Fact Sheets include a conservation action for each identified threat.<br>Chapter 4 – Habitats, also includes a corresponding conservation action for each identified threat in fact sheets for habitat formations, and ecological systems of concern. |
| Describes conservation actions sufficiently to guide implementation of those actions | Actions are very briefly described, but in context with the additional information provided in species and habitat fact sheets there should be adequate information to guide implementation. |
| Links conservation actions to objectives and indicators that will facilitate monitoring | We identified conservation actions needed for each of 268 SGCN, 15 habitat formations and 30 ecological systems of concern – with a total number of actions close to one thousand. The sheer number addressed in the SWAP made it infeasible to provide fully fleshed out actions. The SWAP acknowledges that only a small number of actions will be able to be implemented with additional actions included as funding and other opportunities become available. Those actions selected for implementation will be fully described and will include objectives and indicators to facilitate monitoring. |
| Describes actions that could be addressed by Federal agencies or others partners | A lead role for each conservation action was identified as either WDFW, external partners, or both (external partners were not described in any further detail). With 268 SGCN it wasn't feasible to describe a lot of detail under each action needed. Once an action is selected for implementation, the need to include conservation partners will be fully fleshed out and described. |
| Identifies research or survey needs. | Research and survey efforts needed for SGCN and their habitats are described in Appendix A – Species Fact Sheets, Chapter 4, Habitats , in the formation and ecological systems fact sheets. |
| The Plan identifies the relative priority of conservation actions. | The conservation actions in the SWAP are not prioritized; rather the Plan clearly indicates that prioritization will be conducted as funding, partnership or other opportunities arise for implementation. The criteria for prioritization is described in Chapter 7, Implementation, and detail about the matrix developed to prioritize is presented in Appendix E, Prioritization Matrix. |

| 5. The provisions for periodic monitoring of SGCN and their habitats, for monitoring the effectiveness of conservation actions, and for adapting conservation actions as appropriate to respond to new information or changing conditions. | |
|---|---|
| Chapter 6 describes WDFW's approach to monitoring and adaptive management for SGCN and their habitats.<br>This chapter clarifies that monitoring objectives have not been identified for each of our 268 SGCN, the 15 habitat formations, the 30 ecological systems of concern or the roughly 1,000 needed conservation actions identified. As discussed elsewhere in the roadmap, the SWAP Update outlines a flexible process for prioritization with different critieria depending on the specific opportunity (funding source or partnership opportunity). Actions have been described very generally in the SWAP. However, once they are teed up for implementation, monitoring objectives and adaptive management considerations will be fully developed, as described in the remainder of Chapter 6.<br>Page 6-2 describes Population assessment (status and trends monitoring), identifies priorities and outlines opportunities for addressing gaps.<br>Page 6-4 describes Effectiveness and compliance monitoring and provides examples. | |
| SUB ELEMENT | LOCATION WITHIN 2015 SWAP |
| Describes plans for monitoring SGCN and their habitats. | Chapter 6 outlines WDFW's approach to population assessment (status and trends monitoring) and effectiveness and compliance monitoring. These approaches will be applied to conservation actions for SGCN and their habitats selected for implementation. |
| Describes how the outcomes of the conservation actions will be monitored. | Chapter 6, page 6-4 describes WDFW's approach to compliance and effectiveness monitoring and provides examples of how these have been used to implement adaptive management. |
| Allows for evaluating conservation actions and implementing new actions accordingly. | Chapter 6, page 6-4 describes WDFW's approach to compliance and effectiveness monitoring and provides examples of how these have been used to implement adaptive management. |
| **6. Each State's provisions to review its Strategy (Plan) at intervals not to exceed ten years.** | |
| Chapter 6 (page 6-5) includes a description of the process to review and revise the SWAP. | |
| **7. Each State's provisions for coordination during the development, implementation, review, and revision of its Plan with Federal, State, and local agencies and Indian Tribes that manage significant areas of land or water within the State, or administer programs that significantly affect the conservation of species or their habitats.** | |
| Appendix D – Stakeholder Engagement and Outreach, includes a full description of the process WDFW used to engage conservation partners, local, state and federal agencies, Indian tribes, stakeholders and the public in the development and review of the 2015 SWAP Update. | |
| SUB ELEMENT | LOCATION WITHIN 2015 SWAP UPDATE |
| The State describes its continued coordination with these agencies and tribes in the implementation, review and revision of its Plan. | Chapter 7 – Outreach, includes a discussion of opportunities for other organizations to work with WDFW in implementing the SWAP Update and to use the tools and resources developed as part of the Plan. |

| 8. Each State's provisions to provide the necessary public participation in the development, revision, and implementation of its Plan | |
|---|---|
| Appendix D – Stakeholder Engagement and Outreach, includes a full description of the process WDFW used to engage conservation partners, local, state and federal agencies, Indian tribes, stakeholders and the public in the development and review of the 2015 SWAP Update. | |
| SUB ELEMENT | LOCATION WITHIN 2015 SWAP UPDATE |
| Describes its continued public involvement in the implementation and revision of its Plan. | Chapter 7 – Implementation, describes opportunities for engaging in implementing the SWAP Update. |

# ACKNOWLEDGMENTS

Development of the Washington State Wildlife Action Plan (SWAP) Update was a multi-year collaborative effort involving many advisors and technical experts from the Department of Fish and Wildlife, as well as other organizations. We want to acknowledge and thank the following individuals in particular for contributing their time and expertise to this important work, and for helping us to ensure that it is of high quality and value.

## WASHINGTON DEPARTMENT OF FISH AND WILDLIFE (WDFW)

***Project Coordinator and content editor:*** Lynn Helbrecht.

***Content development – Leads:*** Special appreciation goes to the staff who took on a lead role in writing, editing and organizing information for species or habitats: Gary Wiles (SGCN Mammals), Joe Buchanan (SGCN Birds), Lisa Hallock (SGCN Amphibians and Reptiles), Anne Marshall and Dayv Lowry (SGCN Fishes), Ann Potter and Derek Stinson (SGCN Invertebrates), Dave Hays (Habitats of Greatest Conservation Need) and Jeff Azerrad (Habitats of Greatest Conservation Need and Chapter 7- Implementation).

***Content development – Supporting Role**:* Preparing drafts and providing review for SGCN material was provided by Wildlife program staff: Chris Anderson, Wendy Connally, Steve Desimone, Erin Duvuvei, Joe Evenson, Gerry Hayes, Don Kraege, Jeff Lewis, Anita McMillian, Ruth Milner, Chris Sato, Mark Teske, Joanne Wisniewski, and participants in the Wildlife Program Workshops in 2013 and 2014. Fish program staff included Jennifer Blain, Bruce Baker, Bruce Bolding, Chris Donley, John Easterbrooks, Taylor Frierson, Andrea Hennings, Brad James, Dayv Lowry, Robert Pacunski, Kurt Stick, Mike Ulrich and Patrick Verhey. Habitat program staff included Keith Folkerts and Julie Henning.

***Map product development:*** *Leads* - Andy Duff, Janet Gorrell, Kevin Kalasz, John Pierce and Shelly Snyder. GIS Support provided by Gretchen Blatz, Brian Cosentino, Jane Jenkerson, Lori Salzer, Christopher Treg and John Talmadge.

***Leadership from Wildlife Program Managers:*** Eric Gardner, Penny Becker, Cynthia Wilkerson, Kevin Kalasz, John Pierce and Nate Pamplin provided leadership and guidance throughout the SWAP development process as well as content development and review of draft materials.

***Editing assistance and overall project support:*** Provided by Chris Sato, Colleen Stinson and Matthew Trenda.

***Advisors**:* Members of the SWAP Cross Program Advisory Team provided guidance and feedback throughout the project: Margen Carlson, Keith Folkerts, Janet Gorrell, Julie Henning, Anne Marshall, Erik Neatherlin, John Pierce, Timothy Quinn, Dave Ware (retired), Eric Gardner, Penny Becker, Bruce Thompson (retired), Chris Sato, and Cynthia Wilkerson.

**NATURAL HERITAGE PROGRAM, WASHINGTON DEPARTMENT OF NATURAL RESOURCES:** Technical advice and hands-on assistance provided by managers and staff of the Washington Natural Heritage Program staff was invaluable for several components of the SWAP Update. Rex Crawford, John Fleckenstein and Joe Rocchio provided expertise and data in developing Chapter 4 - Habitats of Greatest Conservation Need.

**WILDLIFE DIVERSITY ADVISORY COUNCIL:** The Wildlife Diversity Advisory Council, convened by WDFW to provide guidance to the agency on wildlife diversity issues, provided important perspective and advice at various points throughout the project. Special thanks go to the SWAP committee members: Cal Anderson, Fred Koontz, Joe Miles, and Ingrid Rasch.

**ECOADAPT:** Jessi Kershner led the team at EcoAdapt to assist WDFW with integrating climate sensitivity information and projected climate impacts into the SWAP. Jessi prepared draft material for Chapter 5 and Appendix C and provided input regarding the approach and content for these components of the SWAP.

**NORTH PACIFIC LANDSCAPE CONSERVATION COOPERATIVE**: Provided funding support for the Climate Change integration work conducted as part of the SWAP Update.

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# Chapter 1

# Introduction and Overview

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# Chapter 1
# Introduction and Overview

## 1.0 Chapter Overview
This chapter provides an overview of the State Wildlife Action Plan Update (SWAP or Plan). It includes discussion on the background and purpose of the plan, how this update differs from the first version completed in 2005, and reviews the key components.

## 1.1 Background and Purpose
Washington's State Wildlife Action Plan is a comprehensive plan for conserving the state's fish and wildlife and the natural habitats on which they depend. It is part of a nationwide effort by all 50 states and five U.S. territories to develop conservation action plans and participate in the State and Tribal Wildlife Grants (SWG) Program. The purpose of the SWG Program is to support state actions that broadly benefit wildlife and habitats, but particularly "Species of Greatest Conservation Need (SGCN)" as identified by each individual state.

Washington's first plan was completed in 2005 and was called the Comprehensive Wildlife Conservation Strategy or CWCS. The CWCS has since become known as the State Wildlife Action Plan. The United States Fish and Wildlife Service (USFWS) requires that these plans be updated every 10 years in order to remain eligible for State Wildlife Grants funding. This document represents Washington's 2015 update. It assesses the status of the state's wildlife and habitats, identifies key problems they face, and outlines the actions needed to conserve them over the long term. A guiding principle of the SWAP planning process is to identify actions needed to conserve wildlife and their habitats before species become too rare and restoration efforts too costly. Our intent is that the SWAP serves to inform conservation priorities and actions statewide, and provide tools and informational resources to support collaborative conservation initiatives across a range of organizations and entities.

## 1.2 The Importance of State Wildlife Grants
Over the past decade the support provided by the State and Tribal Wildlife Grant Program (SWG), along with matching funds generally provided by Washington's Personalized License Plate program, has resulted in significant conservation success. The work funded by this program has resulted in improved conservation status for species at risk, increased our knowledge of lesser known species, and improved the availability of data and our overall capacity for effective conservation. A few highlights are provided below.

**Greater Sage-grouse**
The state threatened Greater Sage-grouse was historically distributed throughout the Columbia Plateau and Okanogan Valley. Populations in Washington declined more than 50 percent from 1970 to 2012, down to a current range representing about eight percent of the historical. With the support of SWGs, WDFW staff conduct population monitoring at breeding grounds each year and conducts ongoing searches for new breeding areas to inform conservation work. In addition, WDFW and USFWS initiated a project to reintroduce Greater Sage-grouse to the Swanson Lakes Wildlife area and adjacent lands in Lincoln County in 2008, and recent monitoring efforts indicate that this population has been successfully established.

**Fisher**
State Wildlife Grant funding has also contributed to recovery efforts of another SGCN and state listed species - the Fisher. Historical over-trapping caused the extirpation of Fishers in Washington by the mid-1900s. To restore the species, WDFW and several partners initiated a reintroduction effort to capture and translocate Fishers from British Columbia to Washington. A total of 90 Fishers were released at 21 locations in the Olympic Recovery Zone from 2008 to 2010. Follow up monitoring indicates that reintroductions have been successful with widespread distribution and reproduction detected, although is it not yet known whether or not the population is self-sustaining. Using SWG funds, reintroduction efforts are expanding to include the Cascade Mountain Range in 2015 so that we might reach our ultimate goal of recovery and de-listing of the species in our state.

**Bald Eagle**
WDFW has a long history of involvement in Bald Eagle research, surveys, conservation and management. During the early period of SWG funding WDFW developed and approved hundreds of site-specific management plans throughout the state, primarily in western Washington. Following the recovery of the Bald Eagle population in Washington WDFW began to streamline its involvement in eagle management to facilitate a necessary shift to higher priority species conservation issues. Both prior to and during streamlining, WDFW conducted surveys, participated in monitoring of nest sites, and verified reports of new nests from the public and other entities. WDFW maintains the statewide Bald Eagle database and as a consequence our data management effort has been substantial: pre-survey reviews; coordination with other agencies, municipalities and organizations; interacting with the public; responding to data requests; and updating and maintaining a database for all known territories in Washington.

**Western Pond Turtle**
The Western Pond Turtle is a SGCN species that was listed as state endangered in 1993. In the late 1990s, less than 200 Western Pond Turtles remained at two locations in Washington. Over the past two decades, WDFW and its conservation partners have been working toward recovery of this species including adding four new recovery sites and increasing the number of turtles to approximately 800. Towards these efforts, WDFW has used SWG funding to help maintain nesting habitat, to monitor population size and health at all six recovery sites, and to monitor nesting females to protect nests from predators and collect eggs for head-starting programs at Woodland Park Zoo and Oregon Zoo. Recovery of the species in Washington has recently been impacted by disease. Diseased turtles have been found at all six recovery sites. Of the turtles examined at each site, 23-49% showed some evidence of shell disease (*e.g.,* ulcerative shell disease). SWG funding has supported disease investigation including pathology, demography and ecology, as well as how to proceed in effectively treating diseased turtles.

**Taylor's Checkerspot**
The decline of the state and federally endangered Taylor's Checkerspot butterfly in Washington has been largely a result of the loss of prairie and grassland habitats. State Wildlife Grants helped to fund WDFW's recovery program, which involves propagation and reintroduction to establish new populations on remaining and restored Puget Sound prairies. Two sites have received multiple releases of Taylor's Checkerspot caterpillars and/or adult butterflies and these releases combined with intensive and continued habitat management have met with early success. WDFW is also involved in a cooperative genetics research project, research into reproductive habitat and characterization of conditions, and habitat protection.

**Marbled Murrelet**
The Marbled Murrelet is a SGCN listed as state and federally threatened since the early 1990's, primarily due to declining populations and loss of habitat from commercial timber harvest. Using mapping tools and field data, WDFW evaluates and confirms "occupied" habitat, and delineates the spatial boundaries of occupied

habitat and potential habitat for the purpose of surveys. A comparatively higher level of protection is afforded occupied habitat than other categories of forest under the Washington State Forest Practices Rules. WDFW also provides technical assistance to other agencies and organizations regarding proposed actions that may affect Marbled Murrelet habitat. Technical assistance has included survey training and habitat identification workshops, survey consultation, field surveys and investigations, evaluation of information relating to forest practices applications, and landscape planning initiatives. For example, WDFW participated in discussions related to placement of the proposed Radar Ridge wind energy facility, and in 2015 WDFW assessed and designated baseline habitat for a joint State Cooperative Habitat Enhancement Agreement/USFWS Safe Harbor Agreement that will enhance conservation of habitat in a municipal watershed. In addition, WDFW participated in a working group that developed a long-term strategy that has helped to inform conservation of the Marbled Murrelet on lands managed by the Washington Department of Natural Resources.

**Golden Eagle**
Although less attention was directed to this species than to the Bald Eagle in the last decade, WDFW has done surveys and conducted field research. Staff time was also devoted to design, coordination and implementation of aerial surveys at known breeding territories. WDFW maintains a comprehensive Golden Eagle database; data management effort have included coordination with field biologists and staff with other agencies, responding to data requests, and updating and maintaining the database. In addition, substantial progress was made on development of a status report.

**Oregon Spotted Frog**
The Oregon Spotted Frog is a SGCN species that was listed as state endangered in 1997 and federally threatened in 2014. The primary threat to this aquatic species is the loss, alteration and degradation of wetland habitats. Currently, the species persists in only six Washington watersheds. With the support of SWG funding, WDFW has conducted inventories successful in finding new populations, monitored known populations to understand trends, conducted research projects, formed the Washington Oregon Spotted Frog Working Group to collaborate on inventory, monitoring and recovery efforts with conservation partners, drafted the state recovery plan, led a reintroduction effort and worked on habitat protection and enhancement. Habitat enhancement is particularly important for this species because the frogs require oviposition sites with short vegetation in seasonally flooded wetland shallows where eggs get full sun exposure. Without management such as mowing, haying or cattle grazing, most sites are quickly overgrown by invasive reed canary grass or tall native vegetation such as willow or hardhack.

**Pygmy Rabbit**
The state endangered Pygmy Rabbit is the smallest rabbit in North America. The Washington population has been isolated from the remainder of the species' western U.S. range for at least 10,000 years and therefore was federally listed as an endangered distinct population segment. Between 1997 and 2001, five of the six known populations disappeared in central Washington. Large-scale conversion and fragmentation of native shrub-state habitats likely played a primary role in the long-term decline of the species, along with other factors such as predation, disease and loss of genetic diversity. State Wildlife Grants funding has helped to support a captive breeding program in the past and since 2011 it helps support the management of an on-site breeding and reintroduction program within the historic range of the species.. Thus far, young rabbits have been released to two reintroduction sites and each year more rabbits are produced for recovery efforts.

**Habitat Protection, Acquisition and Management**
Protecting and managing habitats is key to SGCN conservation efforts and it provides a way to benefit a number of SGCN species at once. With the support of SWG, WDFW provides technical assistance to a variety of entities to promote more effective habitat management practices. One example of this work is the

assistance provided to the Arid Lands Initiative (ALI) to finalize spatial priorities for conservation targets in the Columbia Plateau. WDFW used these results to develop priority areas for a Candidate Conservation Agreement with Assurances for Greater Sage-grouse, and to focus priorities for the Agricultural Conservation Easement Incentives Program of the Farm Bill.

Land acquisition is a key tool for habitat conservation as well. For instance, in 2013 and 2014 WDFW coordinated the development of critical components of proposals for acquisition and conservation easements in shrub-steppe in the Columbia Plateau which benefits species such as Greater Sage-grouse, Columbian Sharp-tailed Grouse, Pygmy Rabbit, black- and white-tailed Jackrabbits, American Badger, Sage Thrasher, Ferruginous Hawk, Northern Leopold Frog, and Pygmy Short-horned Lizard . Proposals for acquisitions of South Puget Sound prairies and oak woodlands focused on land that assist recovery for Mazama Pocket Gophers, Streaked Horned Larks, Taylor's Checkerspot, Pacific Blue Butterfly, Valley Silverspot, Oregon Vesper Sparrow, and Western Gray Squirrels (see Chapter 2 for more information on land acquisition work).

**Data Management Capacity**

State Wildlife Grants have also been critical to improving our data management capacity. High quality data is critical to making good conservation decisions. In support of SWAP implementation, a GIS prototype tool was developed to generate species range maps for 28 priority SGCN. This tool provides an automated process and data management framework for developing species range maps, based on the most current and reliable location data available. Data sources include eBird, WDFW's Wildlife Survey Data Management System, Priority Habitats and Species (PHS), GeoBob, and the Natural Resource Information System. Species were then cross-walked to the ecological systems (National Vegetation Community Classification) to generate a modeled distribution map for each SGCN species within its predicted range.

This tool was improved to map additional SGCN for the 2015 State Wildlife Action Plan revision (see Appendix B for more information on the methodology and to view maps). Associating species with ecological systems is foundational work that is intended to be used in a variety of ways for species conservation. This dataset will allow staff and conservation partners to better monitor species and their habitats as well to identify, coordinate, and prioritize conservation actions and will allow us to better track the success of our actions.

## 1.3 Guiding Principles

WDFW established an interagency team early in the action plan revision process to ensure that the revised plan would be useful and relevant across the agency and to our conservation partners. The interagency team reviewed the strengths and weaknesses of the 2005 CWCS as a first order of business, identifying what worked well, what aspects could be improved, and areas that needed significant updating. The team determined that it would be helpful at the start of the revision process to outline the intended use of the product, in the interests of developing a SWAP that would deliver maximum benefit.

The team established a set of guiding principles as a way to be explicit about our goals for the State Wildlife Action Plan (see Figure 1). After internal review, these principles were then introduced to and approved by the Wildlife Diversity Advisory Council, a committee convened by WDFW to advise the agency on a number of issues related to managing at risk species in the state. More information about the engagement of the Wildlife Diversity Advisory Council can be found in Appendix D – Outreach.

**Figure 1-1**

**Guiding Principles**
***2015 State Wildlife Action Plan***

1. Design the State Wildlife Action Plan to guide WDFW conservation planning. It should also serve to inform and benefit conservation partners to advance conservation priorities.

2. Focus Species of Greatest Conservation Need on *biological* conservation needs; address *socioeconomic* factors in prioritization.

3. Recognize the importance of ecosystem based management in accomplishing conservation.

4. Include Cross Program expertise and perspective. The SWAP will aim for a final product that is consistent and relevant to agency values.

5. Engage conservation partners. A goal is to use the SWAP to facilitate collaborative conservation, including cross-state and regional approaches.

6. Create a document that is concise, readable, informative and available to a wide range of publics and stakeholders.

7. Be Efficient. Conduct the SWAP revision in a manner that matches available resources for planning and implementation.

## 1.4 Audience

One of the most important outcomes of the interagency team's review of the CWCS, which is codified in the guiding principles, was to clarify that the primary audience for the State Wildlife Action Plan is WDFW. The previous CWCS was developed and written to address a broadly defined conservation community across Washington. While we fully recognize that conservation is a collaborative endeavor, and that engaging conservation partners is critical, we learned that implementation becomes more difficult if the primary audience or owner of the plan is not clearly identified. For these reasons, and because we wanted to advance implementation and use of the products developed through the SWAP, we were explicit that WDFW is the primary audience, with the recognition that the document will also be useful to the full breadth of our conservation partners. Chapter 7 - Implementation, discusses opportunities for others outside the agency to benefit from a number of the products created through the SWAP. It is our hope that these products will advance our collective understanding of conservation needs across the state, and contribute to our effectiveness at addressing them.

## 1.5 A Word about Prioritization

Actions to conserve the 268 Species of Greatest Conservation Need and 37 Ecological Systems of Concern outlined in this document include population assessments and inventory, habitat protection, acquisition, and restoration. It is clear that WDFW does not have the financial capacity to adequately address all of these needs, and that we must prioritize where to invest; in which species, landscapes, or conservation tools. We also recognize that the criteria by which we prioritize investment will change depending on funding source, the specific conservation partners involved, or other factors. Consequently, WDFW has adopted a flexible approach to prioritization in the SWAP, one that allows the agency to prioritize conservation activity in response to changes in internal priorities, organizational capacity, targeted funding opportunities, or the availability of other resources. In 2014, we developed a prioritization matrix (see Chapter 7 and also Appendix E), which includes a range of factors and criteria for determining priority for implementation. Our SGCN list is larger than in 2005, in part because of an explicit recognition that, while the agency doesn't currently have capacity to adequately fund the conservation actions for all SGCN identified, other resources may become available or conservation partners may be able to address those needs. Thus, inclusion of a species as an SGCN or inclusion of an ecological system as an ESOC doesn't necessarily imply WDFW will initiate action; rather it shows there is a need for conservation action. We will work collaboratively with our partners to address unmet needs as capacity allows.

## 1.6 Eight Essential Elements

Congress established eight required elements to be addressed for approval of the original CWCS. The USFWS subsequently developed policy regarding what constitutes a major or a minor revision to the plan. During the Washington Department of Fish and Wildlife's (WDFW) required review of the 2005 CWCS, it was determined that sufficient changes to the plan (including changes to Washington's Species of Greatest Conservation Need list) would be proposed, thus meeting the definition for a major revision. This required WDFW to ensure that all eight elements were addressed during the review and revision process.

| | |
|---|---|
| **Element 1** | Identify distribution, abundance and status of species of greatest conservation need |
| **Element 2** | Identify condition of key habitat types essential to the conservation of SGCN |
| **Element 3** | Identify problems and threats that affect SGCN and their habitats |
| **Element 4** | Determine and prioritize actions to conserve SGCN and their habitats |
| **Element 5** | Provide for periodic monitoring and adaptive management of SGCN and their habitats |
| **Element 6** | Provide for review and revision of the State Wildlife Action Plan |
| **Element 7** | Coordinate development and revision with appropriate federal, state, local agencies and tribes |
| **Element 8** | Provide for necessary public involvement in the development, revision, and implementation of the SWAP |

## 1.7 Engaging Conservation Partners

We solicited input and feedback from our conservation partners early in the SWAP update process, through email announcements, surveys, workshops, and webinars. Our interest was to determine how the SWAP could be developed so it can contribute to the shared goals of conservation partners and others. Appendix D includes a full discussion of our outreach plan, specific activities, and results.

## 1.8 How the 2015 SWAP Differs from the 2005 CWCS

While we drew extensively from the CWCS, we recognized that the last ten years have brought significant changes in data availability and methodologies, as well as shifts in the landscape of conservation partners and priorities. These new developments, combined with our interests in developing a document more clearly focused on implementation, made it clear we needed a significantly updated document, rather than an amended 2005 CWCS. However, in doing so we also committed to using as much information as possible from the CWCS.

Another notable shift in the last ten years has been a rapidly growing body of research focused on understanding the impacts that a changing climate may have on fish and wildlife distribution and health. Chapter 5 includes a full discussion of how climate change is expected to affect SGCN and the habitats on which they depend. Appendix C includes additional material to support the climate change information presented in Chapter 5. The table below highlights key differences between the two documents.

**Table 1-1: Summary of Changes from 2005**

| Major Change | Rationale | Implications for the 2015 SWAP |
|---|---|---|
| **SGCN criteria**<br>The criteria for inclusion as a Species of Greatest Conservation Need was modified from 2005. The criteria from 2005 included both biological and socioeconomic considerations. Modifications included focusing on biological conservation need and using NatureServe ranks as a criterion, based in part on the guidance document, "Best Practices for State Wildlife Action Plans" produced by AFWA[1]. | **Increased transparency and use-ability**<br>The criteria used in 2005 was complicated and proved difficult to explain to a non-technical audience. We simplified the criteria to focus on biological conservation need, with the understanding that socioeconomic needs would be addressed in prioritization processes. We also included NatureServe ranks as recommended in the AFWA Association of Fish and Wildlife Agencies Best Practices guide. | **Robust and updated SGCN list**<br>The SGCN list is almost 30 percent larger than in 2005 (from 186 to 268). This number reflects changes in our criteria and the inclusion of updated information and data for all species. The updated criteria resulted in an increased number of invertebrates on the SGCN list – from 42 in 2005 to 95 in 2015. A comparison between 2005 and 2015 is provided in Chapter 3, as well as a list of the species which have been dropped since 2005. |
| **Habitat classification**<br>Habitats were classified and described differently than the 2005 CWCS, which relied on a Washington-specific classification system. The SWAP Update uses the National Vegetation Classification System (NVC) to represent habitat needs for SGCN. This change resulted in significant changes to the 2005 CWCS. | **Standardized and mappable habitat classification**<br>Ecological systems (part of the NVC) are mapped across the west. Using ecological systems to describe and classify SGCN habitat provides an important spatial component to the SWAP, allowing us to spatially translate conservation priorities to specific landscapes. | **Habitats of Greatest Conservation Need**<br>This new term encompasses both ecological systems considered imperiled and those ecological systems particularly important to SGCN. Chapter 4 describes the methodology for identification, the condition of these habitats, important features for the SGCN dependent on them and key stressors and conservation actions needed. |
| **Defining stressors and actions**<br>The terminology for describing and defining stressors and actions has changed from 2005. Based in part on the Best Practices for State Wildlife Plans document, the 2015 SWAP update adopts a nationally accepted lexicon for defining threats and actions. | **Consistency and relevance**<br>We selected the Wildlife TRACS[2] system of classification which was not available in 2005. TRACS is the tracking and reporting system for conservation and related actions funded by the USFWS. A nationally recognized classification scheme will help facilitate our ability to identify and characterize projects for State Wildlife Grants Funding. | **New categories for stressors and actions**<br>When stressors and actions are discussed in the SWAP, they are described by TRACS categories. In addition to helping to identify and track projects for State Wildlife Grants, this change will help provide consistency and to synthesize data. |

[1] Association of Fish & Wildlife Agencies. November, 2012. Best Practices for State Wildlife Action Plans, Voluntary Guidance for States for Revision and Implementation.
[2] U.S. Fish & Wildlife Service. (2015). Wildlife Tracking and Reporting on Actions for the Conservation of Species (Version 1.0) [Web application software]. Retrieved from https://tracs.fws.gov

| Major Change | Rationale | Implications for the 2015 SWAP |
|---|---|---|
| **Inclusion of range maps** Potential range and habitat distribution maps are included for a subset of the SGCN for which we had sufficient data. | **Conservation Planning Tool** The CWCS did not include spatial representation of range and distribution for SGCN. These potential range and habitat distribution are intended to aid in conservation planning activities for SGCN. | **Potential range maps for over 80 SGCN** Appendix B includes potential range and habitat distribution maps for selected SGCN. These maps are considered working drafts as we continue to refine the methodology used to generate them. |
| **Agency-wide participation** Increased engagement by the WDFW Fish and Habitat programs resulted in a more robust SGCN fish and invertebrate list and also ensured relevancy to the entire agency. | **Greater transparency and improved process** The WDFW Conservation Initiative, adopted in 2012, emphasizes the importance of cross-program engagement in key initiatives. | **More engagement in SWAP across WDFW** There is greater awareness of the SWAP across the agency, and increased opportunities for implementation. |
| **Climate change** Climate change has been integrated throughout the 2015 SWAP Update. Other than being identified as a threat, climate change was not discussed in the 2005 CWCS. | **Emerging Issue – Increased availability of data** The last ten years have brought a growing recognition of the emerging threat that climate change poses to our fish and wildlife. We used the 2015 SWAP Update as an opportunity to build our understanding regarding specific risks and vulnerabilities. | **Climate vulnerability incorporated into SWAP** Chapter 5 discusses projected impacts and introduces a list of species and habitats most at risk from climate change. Appendix C includes the full assessment of climate vulnerability for all SGCN. Climate change impacts have also been integrated into Appendix A – Species Fact Sheets, and Chapter 4 – Habitats. |

## 1.9 Document Overview

**Chapter 2 – State Overview**

Chapter 2 provides context for how the SWAP fits into Washington's conservation landscape. It describes the biological and physiographical characteristics of Washington and discusses the distribution of fish and wildlife resources across the state. It also provides an overview of the primary stressors and challenges for fish and wildlife, outlines the state framework for addressing them and indicates specific areas in which the SWAP provides supporting information or resources.

**Chapter 3 – Species of Greatest Conservation Need**

Chapter 3 reviews the Species of Greatest Conservation Need. It describes the criteria and process used to identify the revised list and describes differences from 2005, including a list of species that dropped off the list and why. Summaries of the conservation status and concerns for all of the SGCN are presented in taxa groups; mammals, birds, reptiles and amphibians, fish, and invertebrates. Each of the SGCN also has an associated fact sheet which provides more detail on habitat needs, distribution, and conservation threats and actions. These fact sheets can be found in Appendix A.

**Chapter 4 – Habitats of Greatest Conservation Need**
Chapter 4 discusses Habitats of Greatest Conservation Need, which are defined for the purposes of the SWAP as ecological systems of concern (those most imperiled from a conservation perspective), as well as those ecological systems particularly important for SGCN. We have used the National Vegetation Classification as a way to describe SGCN habitats, using two levels of the NVC hierarchy; vegetation formations and ecological systems. We describes threats generally for each of the 16 vegetation formations in the state and then focus on those ecological systems considered most imperiled (Ecological Systems of Concern) and/or most important for fish and wildlife. Fact sheets for each of the ecological systems of concern include a description, lists of SGCN for which this is a crucial habitat, key stressors, and actions needed.

**Chapter 5 – Climate Change: Which species and habitats are most at risk?**
In Chapter 5 we provide a summary of how climate change may affect the SGCN and the habitats on which they depend. We also highlight the summary findings from an analysis assessing the relative vulnerability to climate change of all of our SGCN, and our ecological systems of concern. From this analysis we identified a Climate Watch List – those species most at risk because of climate change effects. These species and the reasons why they are more sensitive to climatic change are outlined in Chapter 5. Additional detail from this analysis is provided in Appendix C.

**Chapter 6 – Monitoring and Adaptive Management**
In this chapter we discuss the agency's commitment to monitoring and adaptive management and profile a couple of examples. We focus on population assessment monitoring, and compliance or effectiveness monitoring.

**Chapter 7 – Implementation**
Chapter 7 considers specific products, either prepared in support of the SWAP or part of the SWAP itself, and discusses how they can inform activities and initiatives, both internal and external to the agency. We also outline future needs to fully implement the SWAP.

**Appendix A – SGCN Fact Sheets**
Appendix A includes fact sheets for each SGCN. These fact sheets describe conservation status and concern, abundance and distribution, habitat needs and key stressors and actions needed.
A1 – Fact sheets for SGCN Mammals
A2 – Fact sheets for SGCN Birds
A3 – Fact sheets for SGCN Reptiles and Amphibians
A4 – Fact sheets for SGCN Fishes
A5 – Fact sheets for SGCN Invertebrates

**Appendix B – Range and Potential Habitat Distribution Maps**
Range and potential habitat distribution maps for selected SGCN are presented in Appendix B, as well as a description of methodology and considerations for use.

**Appendix C – Climate Change Background Information**
This appendix includes supporting information regarding the climate change findings presented in Chapter 5.

**Appendix D – Outreach**
Appendix D contains a description of public and stakeholder outreach in the development of the SWAP.

**Appendix E – Prioritization Matrix**
This appendix is a matrix that allows for the prioritization of conservation actions.

# Chapter 2

# An Overview of the Challenges and Strategies for Conserving Biodiversity in Washington

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# Chapter 2

# An Overview of Challenges and Strategies for Conserving Biodiversity in Washington

## 2.0 Introduction and Overview

This chapter provides the context for understanding both the distribution of fish and wildlife in Washington and the framework that exists to conserve and protect these species and the habitats on which they depend. Bearing in mind that the primary audience for the State Wildlife Action Plan (SWAP) is the Washington Department of Fish and Wildlife (WDFW), this is written from an agency perspective, and intended to lay the groundwork for the conservation actions that are outlined later in the document, in Chapters 4, 5, 6 and 7. These actions will collectively inform WDFW strategic plans and agendas throughout the life of the plan.

Washington is one of the most ecologically diverse states in the United States, due in part to its varied topography, exposure to Pacific Ocean currents and weather patterns, and location on the migratory path of many wildlife species, including birds, whales and Pacific Northwest salmon. Our geographic diversity includes seacoast, shrub-steppe, native grasslands and prairies, river canyons, mountain ranges, and the huge inland estuary known as Puget Sound. Washington contains many of the major ecosystem types found in the western United States, including two that are found nowhere else in the world—the channeled scablands of eastern Washington and the Olympic rainforest.

Biodiversity is partially defined or characterized by species richness—the number of plants and animals that spend all or part of their lifecycle in a particular area. Washington is a permanent or temporary home to thousands of plant and animal species, including 140 mammals, 451 freshwater and saltwater fish species, and 341 species of birds that either breed here or stop here on their annual migrations. Washington also hosts 3,100 vascular plant species and more than 20,000 classified invertebrates; more than 2,000 of the invertebrate species are butterflies and moths[1]. While Washington's SWAP only focuses on animal species and their associated habitats, it is important to frame this discussion in the larger context of the state's full biological diversity. Most of the state's native animal species fall within the legal definition of "wildlife" and are under the purview of the WDFW. Responsibility for native plant conservation, including designated rare plant species, rests with Washington Department of Natural Resources (WDNR) Natural Heritage Program.

Biodiversity is not constant, even in a natural ecosystem with minimal human influence. Changes are accelerated, however, by human population growth, human disturbance, and shifts in economic activity, and Washington's biodiversity is impacted every day by human disturbance to natural ecosystems. Loss of habitats may lead to loss of species diversity. For example, much of the state is forested and most

[1] Washington Biodiversity Council, 2007, Washington's Biodiversity Status and Threats, Washington Recreation and Conservation Office, Olympia, WA

forests have been harvested, with an estimate of only about 18 percent of old-growth forest habitat remaining. Estuarine (coastal) wetlands are extremely productive biologically, yet more than 90 percent of these wetlands in the Puget Sound region have been lost since European settlement. As Washington continues to grow and develop, fish and wildlife habitat is being altered and sometimes lost, resulting in a net loss of biodiversity.

The remainder of this chapter presents, at a fairly high level, some of the most challenging problems facing our fish and wildlife populations and the range of specific programs and institutional framework that has been developed to address them. To be effective at stemming the loss of biodiversity, including important fish and wildlife resources, the WDFW and its conservation partners must work together and improve efforts to identify and prioritize the most important places for conservation action. The SWAP recognizes this need and identifies opportunities for collaboration in efforts such as the priority landscapes initiatives, described in Chapter 4, climate change research and monitoring, described in Chapter 5, and several others outlined in Chapter 7, Implementation.

## 2.1 Wildlife Species Distribution, Status and WDFW Management Priorities

The distribution and richness of Washington's species are dependent on the quality and quantity of habitats available to them. As Washington's habitat base has changed over the last hundred years, so has the distribution and status of the state's wildlife. Wild populations of Pacific salmon and steelhead have diminished in both numbers and diversity with the construction of dams, water development projects, overharvest, climate and land use changes. Species such as the greater sage-grouse that are dependent on native shrub-steppe habitat have declined in numbers and distribution as shrub and grassland habitat has been converted to farms and orchards, or have been developed for other economic uses. On the other hand, water development in the Columbia Basin has created new wetland habitat for migrating and wintering waterfowl, and the clearing of forests for agriculture in northeast Washington has facilitated the expansion of white-tailed deer into many areas where they did not occur prior to statehood.

The WDFW and its predecessors, the Department of Fisheries and the Department of Game, have always classified fish and wildlife species for purposes of management and harvest regulation. Historically, management emphasis was almost exclusively on commercially harvested fish species (salmon, shellfish and other food fish) and game. This began to change in 1972 when a citizen initiative established a Nongame Program funded from the sale of personalized license plates. The mission of the program was to identify and conserve species not identified as game species. In 1980, the Department of Game developed a state list of Endangered Species (which included all federally listed species). In 1990, the Fish and Wildlife Commission adopted WAC 232-12-297, which defines procedures for state listing and delisting of species as Endangered, Threatened or Sensitive. Species on the state list are called Species of Concern.

In 1989, the Department created a statewide list of Priority Habitats and Species (PHS), which has been used to provide important fish, wildlife and habitat information to local governments, state and federal agencies, private landowners and consultants, and tribal biologists for land use planning and wildlife conservation purposes. For more information, go to http://wdfw.wa.gov/conservation/phs/list/. PHS is currently the agency's primary means of transferring fish and wildlife information from resource experts to those who protect and manage habitat on both public and private land.

### 2.1.1 Species of Greatest Conservation Need (SGCN)

The SWAP requires a list of SGCN, updated at least every 10 years. The SGCN list differs from WDFW's Species of Concern list and Priority Habitats and Species list in that it is more comprehensive. It includes not only species known to be imperiled and in immediate need of conservation attention, but also other more common species that are in rapid decline or have other identified conservation concerns. One of the guiding principles of the State Wildlife Action Planning process is to encourage conservation actions for species before they become imperiled and opportunities for recovery before they become more limited. For this reason, the SGCN list also differs from the PHS list of species in that it includes game species only when those populations are low due to declines in habitat or the species has other conservation concerns that can be addressed through the implementation of the SWAP. Alternatively, PHS includes a more comprehensive list of vulnerable game species, since a primary purpose of PHS is to conserve species for recreational and cultural use. Chapter 3 includes a list of all SGCN and more discussion on the criteria and process for determining the 2015 SGCN list. Appendix A includes a fact sheet for every SGCN, describing habitat, distribution and key stressors and conservation actions needed.

### 2.1.2 Other Managed Species

In addition to adopting strategies to manage species on the statewide SGCN list, the SWAP and SGCN list do not diminish or replace WDFW's responsibility and mission to assess, conserve and manage *all* wildlife and the habitats on which they depend for the benefit of Washington's public. WDFW will continue to conserve and manage other fish and wildlife species and associated habitats for recreational use and/or commercial harvest. The term "other managed species" includes game species not on the SGCN list, including non-natives such as ring-necked pheasant, chukar partridge, and largemouth bass, as well as commercially harvested marine fish, anadromous fish, and shellfish. Many conservation actions undertaken for SGCN, especially actions that protect or restore habitat, will also benefit many game and commercially harvested species. In 2014, the WDFW published the *2015-2021 Game Management Plan*, which articulates management and research objectives, priorities and policies for all terrestrial game species managed by the WDFW. Go to: http://wdfw.wa.gov/conservation/game/ for additional details. Similar plans for sportfish, commercial fish and shellfish have also been adopted by the WDFW. More complete lists of WDFW management plans are available on the WDFW website (wdfw.wa.gov).

### 2.1.3 SWAP Habitats of Greatest Conservation Need

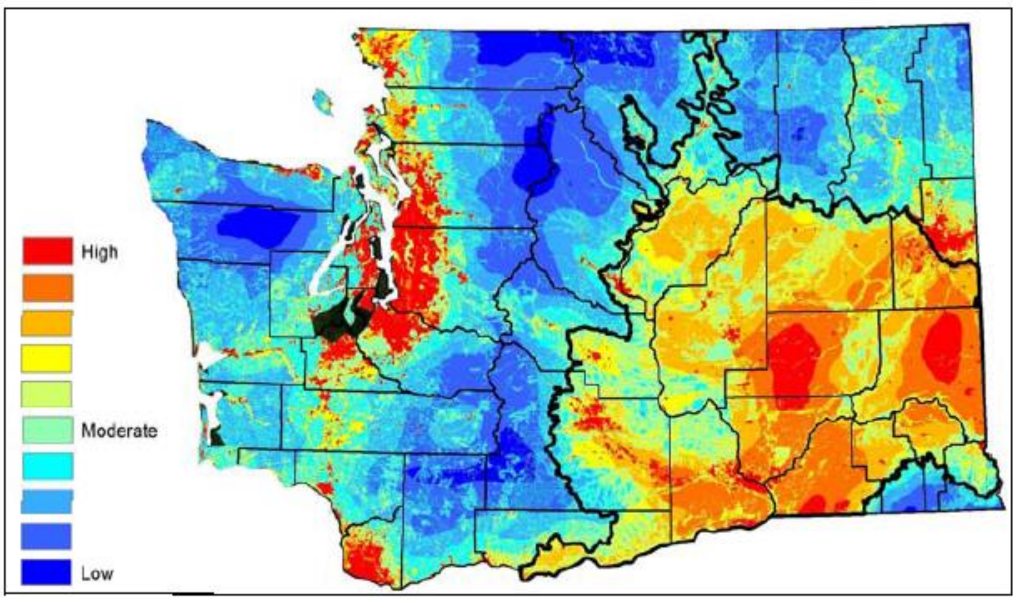
The SWAP also requires the identification of habitats important for the conservation of SGCN. The WDFW has updated its 2015 list of important habitats using ecological systems, a classification unit used in the National Vegetation Classification. Each of the SGCN are associated with the specific ecological systems important for their continued persistence. In addition to the relative importance of the ecological systems system to SGCN, the WDNR's Natural Heritage Program provided an assessment of the conservation status for all of the ecological systems found in Washington. For the purposes of the SWAP, we refer to the habitats of greatest conservation need as those ecological systems most at risk (imperiled or critically imperiled) as well as those particularly critical for SGCN (defined by the greatest number of associated SGCN). Chapter 4 provides a full discussion regarding the relationship of ecological systems to habitat, and includes a description of each of the imperiled systems in Washington, the SGCN which depend on them, key stressors and conservation actions needed.

## 2.2 Major Statewide Conservation Problems and Issues

Most of the major statewide problems affecting Washington's wildlife and biodiversity are the direct or indirect result of human influence on the state's habitat base. Rapid, sustained population growth since the end of World War II has resulted in substantial losses of fish and wildlife habitat in urbanizing areas of the state, as well as a constant invasion of non-native plant and animal species across the landscape. These habitat losses and changes are most profound in the Puget Sound region, which is home to most of the state's human population and where development pressure and urban runoff affect a host of terrestrial and aquatic habitats. Dramatic effects are also apparent for the Columbia Plateau, where much of the native shrub-steppe and grassland habitat has been converted to agriculture. Washington's population is projected to continue to rise, and with this population growth will come more cars and roads, more demand for water, energy and developable land, and increased need for the treatment and disposal of solid waste, sewage and stormwater runoff—all of which will impact the state's wildlife and habitat resources. In the face of this projected growth, the WDFW and its conservation partners find themselves in the difficult position of applying limited funds and staff resources to identifying, conserving and managing the remaining native species and the habitats on which they depend.

**Figure 2-1: The Human Footprint of Washington**

The human footprint of Washington, ranging from low (dark blue) to high (dark red). The human footprint is the combined effect of land uses such as agriculture, roads and development. (Figure is from Washington Department of Fish and Wildlife 2011, Management Recommendations for Priority Habitats, Shrub Steppe).




In addition to the threats described above, we are now also faced with the unprecedented threat of a changing climate, which has the potential to significantly and irreversibly alter our forests, coasts, wetlands, grasslands, freshwater aquatic systems and the species that depend on these habitats.
The following are the key conservation challenges facing Washington's fish, wildlife and habitat base:

- Habitat loss through conversion, fragmentation and degradation
- Invasive non-native plant and animal species
- Water quantity—allocation and diversion of surface water
- Water quality issues
- Forest management issues

- Unsustainable agricultural and improper livestock grazing practices
- Diseases and pathogens
- Inadequate data on wildlife species, populations, and
- Climate  change
- Changes in patterns of natural distrubance

### 2.2.1 Habitat loss through conversion, fragmentation and degradation

Habitat conversion, fragmentation, and degradation together pose the most serious state-wide threat to Washington's native fish and wildlife resources. Since statehood in 1889, these combined problems have cost the state more than half of its highest priority functioning habitats, including an estimated 70 percent of estuarine wetlands, 50 to 90 percent of riparian habitat, well over 80 percent of old growth forest, 70 percent of arid grasslands, and more than 50 percent of shrub-steppe[2]. These five native habitat types alone are among the most diverse and productive for the state's native fish and wildlife. About 75 percent of Puget Sound's estuaries and their adjacent habitats, such as grasslands, mixed woodlands and floodplain forests, have been modified so significantly that they no longer provide their original functions.

Once native habitat is converted to other uses, the remaining habitat is often left as isolated fragments in a matrix of multiple land uses. Wildlife populations associated with these fragmented habitats are often blocked from their normal movement patterns and migration routes, and thus subjected to isolation from other breeding populations. Habitat loss and fragmentation also causes increased competition with other species, predation, and increased conflicts with other land uses. In a fragmented landscape, animals have to move from one patch of habitat to another and when this happens, migrating wildlife populations become broken into smaller, isolated units that are more susceptible to population decline, disease impacts, localized natural disasters, and possible extirpation.

Transportation systems such as major highways and roads are also a primary cause of habitat loss and fragmentation, as they can constitute direct barriers to fish and wildlife movement and are a source of direct wildlife mortality through collisions with vehicles. When wildlife populations are low, roadkill mortality is significant, especially for slow-moving animals such as turtles and salamanders and wide-ranging carnivores that have to cross many roads.

Washington will continue to experience significant human population growth into the foreseeable future. This growth and development will result in continued loss, conversion and fragmentation of fish and wildlife habitat. Steps are being taken by WDFW, other state and federal agencies, local governments and many private conservation organizations to identify and conserve the most important and productive habitats, as well as to identify habitat connectivity corridors across the state with efforts such as the Washington Habitat Connectivity Working Group (http://waconnected.org).

### 2.2.2 Invasive non-native plant and animal species

Invasive species constitute a severe and growing threat to Washington's native wildlife, habitat and biodiversity—second only, many believe, to habitat fragmentation. Across the state, aggressive non-native plants and animals are displacing native species, profoundly altering natural systems and

[2] Washington Biodiversity Council, 2007, Washington's Biodiversity Status and Threats, Washington Recreation and Conservation Office, Olympia, WA.

affecting the state's economy and human health. These plants and animals have been introduced through both intentional and unintentional mechanisms, including: "hitchhiking" on birds, dogs, horses and other livestock, trucks and boats; transport on ocean currents and in ballast water and importation in aquaculture and horticulture products and the pet/aquarium trade. Unfortunately, many aquatic invasive species have been purposely introduced by state or federal fish and wildlife agencies and private individuals for sport fishing or as forage or bait, and many major invasive wildlife species arrives from other parts of America or the world for agricultural, commercial or sport purposes long before any problems with this practice had been identified or regulated. Although many non-native species are unable to form self-sustaining populations and soon disappear, some become established and thrive, often outcompeting native species and adversely changing ecosystems in the process. In some cases, these plants and animals also spread non-native diseases and parasites. They evolved in other parts of the world and arrive in Washington without natural predators and diseases that would normally keep their population growth in check in their native environment. The number and abundance of introduced species is both a cause and an indicator of declining ecosystem health.

The effect of invasive species is especially severe in the shared inland marine waters of Puget Sound and Georgia Basin to the north (collectively, the Salish Sea). Examples include cordgrasses (*Spartina*), Japanese eelgrass, wireweed (*Sargassum muticum*), oyster drill, varnish or dark mahogany clam, European green crab, and the American bullfrog. Cordgrass and wireweed outcompete and eliminate native salt marsh vegetation and raise the level of the marsh substrate. Additionally, wireweed clogs intake pipes of industrial facilities and hinders shellfish harvest on oyster beds. Oyster drills prey upon young oysters. The green crab, first reported in Willapa Bay in 1998, is a voracious predator that feeds on many types of organisms, particularly bivalve mollusks (clams, oysters and mussels), polychaetes, small crustaceans and juvenile Dungeness crab, and outcompetes Dungeness crab for habitat and food supply. In freshwater habitats, the proliferation of non-native bullfrogs has had a severe impact on declining species such as western pond turtles, northern leopard frogs, and other native species.

Some of the most destructive invasive plants are found in the shrub-steppe, grassland and forested communities of eastern Washington, where they thrive through the effects of agriculture, grazing, mining and certain natural disturbances such as catastrophic wildfire and floods. These invaders not only out-compete native plants, but also present a severe and growing problem for farmers, ranchers and forest managers. Perhaps the most widespread and problematic of the dryland invasive species is cheatgrass, originally from Eurasia, which has replaced native grassland communities all over the Intermountain West. Cheatgrass has limited or no food value for wildlife and livestock, and it presents a significant fire hazard in both shrub-steppe deserts and ponderosa pine forests, where it can add to the fire fuel load, resulting in hotter wildfires and more damage to native vegetation. Other examples of invasive, nuisance plant species include yellow star thistle, Japanese knotweed, knapweed species, Dalmatian toadflax, and sulfur cinquefoil.

Many freshwater aquatic invasive plants found in Washington were originally brought here as ornamental plants for aquariums or water gardens. These ornamentals are usually hardy species and, when introduced to Washington's waters, often thrive and outcompete native plants. Eurasian water milfoil is one aquatic noxious weed that is a particular problem state wide. It reproduces by fragmentation and proliferates to form dense mats of vegetation in the littoral zone of lakes and reservoirs, where it crowds out native aquatic vegetation, reduces dissolved oxygen and can severely degrade the ecological integrity of a water body in just a few growing seasons.

The invasion of non-native and invasive plant and animal species is recognized as a critical problem in Washington, not just for native fish, wildlife and biodiversity, but for the state's vital agricultural industry. The problem is currently being addressed at many different levels in Washington, within the constraints of budgets and staffing resources. Examples include Washington's Noxious Weed Control Board, which serves as the state's noxious weed coordination center for the activities of 48 county noxious weed control boards and districts, and the Washington Invasive Species Council, which was established by the legislature in 2006 and tasked with providing policy level direction, planning, and coordination for combating harmful invasive species throughout the state. Additional efforts include WDFW's Intra-Agency Invasive Species Management project, the agency's adoption of internal policies to provide direction for Department practices with regard to preventing the spread of nonnative invasive species and implementation of invasive species statutes under chapter 77.135 RCW.

### 2.2.3 Water quantity—allocation and diversion of surface water

The survival, distribution and diversity of Washington's fish and wildlife is largely determined by the availability of water, including water to support aquatic and marine species, water to drink, water to grow wildlife food plants, and water to support the annual upstream and downstream migration of anadromous fish. Water is as important in the Olympic rainforests, which can receive more than 200 inches of moisture a year, as it is in the Juniper Dunes wilderness of eastern Washington, which averages only 8 to 14 inches of annual precipitation. Without adequate water to support fish and wildlife, other conservation issues become secondary.

The relative abundance of water has been a major factor in the growth and development of Washington's landscape and economy since the late 1800s. The seemingly unlimited supply of surface and groundwater encouraged the growth of cities and development of irrigated agriculture, not to mention the generation of hydroelectric power and production of aluminum, both of which require massive amounts of water. Until recent years, water was considered so plentiful in the Northwest that plans were evaluated to divert water from the Columbia River and ship it south to California and other states.

**Dams**

There are currently over 1,000 dams on Washington's rivers and tributary streams. Because they obstruct the natural flow of rivers, these dams can have many detrimental effects on the aquatic environment, including altering the natural flow cycles of rivers, interrupting the transport of nutrients and sediments normally deposited in deltas and estuaries, fragmenting resident aquatic wildlife populations, and hindering anadromous fish migration between the ocean and upstream spawning areas. Older dams without fish ladders, including Chief Joseph and Grand Coulee Dam on the Columbia River, completely block the upstream migration of fish. Even on newer dams, spinning turbines that generate electricity often disorient, injure or kill juvenile fish on their downstream migration to the sea.

**Water diversions**

Salmon and other aquatic wildlife depend on reliable water flows during critical periods in their lifecycles. Unless adequate minimum flows are established for fish and wildlife and enforced by Washington state agencies, water withdrawals may result in dewatering important mainstem habitats as well as pools and quiet backwater areas that provide essential habitat for the growth and development of juvenile fish, amphibians and aquatic invertebrates. Inadequate flows and water depth in these backwater areas deprive developing fish eggs of oxygen, make it easier for fish predators to find their prey, and generally interfere with the journey of migrating fish. Interrupting or delaying migration can cause adult fish to resort to spawning in unsuitable habitat.

There are many ongoing state and federal efforts to mitigate for the adverse impacts of past water diversions and dams, ranging from adding or improving fish ladders on hydroelectric dams, to screening fish out of irrigation culverts, to requiring adequate year-round instream flows for fish and wildlife. These efforts have become more common and better-funded since the listing of numerous Northwest salmonid under the federal Endangered Species Act.

### 2.2.4 Water quality issues

Major water quality discussions in Washington usually revolve around preserving the quality of public drinking water supplies and the effects of non-point source contamination on ground and surface waters. However, the effect of surface water quality on the health of aquatic ecosystems and wildlife is also becoming increasingly important. The most common water quality problems affecting fish and wildlife in Washington's waters are: 1) fecal coliform bacteria contamination; 2) contaminated sediments, which are a particular problem in Puget Sound; 3) elevated water temperature, which can quickly alter or degrade an aquatic ecosystem; 4) increased sediment in streams, which can blanket important food sources and fish spawning areas; 5) excess nutrients and pesticides washed into lakes and streams from lawns, golf courses and agricultural fields, which can directly poison aquatic organisms or contaminate waterways;and 7) issues related to stormwater runoff. Water quality issues related to potential contamination of the Columbia River from the Hanford Nuclear Reservation are also of concern, particularly if long-buried radioactive waste reaches the river or its tributaries.

Recently, a shift in ocean chemistry has been observed in the state's marine waters that is related to increased concentrations of atmospheric carbon dioxide ($CO_2$). Changing ocean chemistry has profound implications for marine ecosystems. As an example, between 2005 and 2009, disastrous production failures at commercial oyster hatcheries were caused by the arrival of low-pH seawater along the West Coast, which created conditions corrosive to shell-forming organisms like young oysters. Ocean acidification is a reduction in the pH of seawater for an extended period of time due primarily to the absorption of $CO_2$ from the atmosphere. When $CO_2$ is absorbed by seawater, chemical reactions occur that lead to increased concentrations of hydrogen ions, causing seawater to become more acidic and causing carbonate ions to be relatively less abundant. Other, local sources of acidification such as nitrogen oxides and sulfur oxide gases, nutrients and organic carbon from wastewater discharges and runoff from land-based activities, can also contribute to ocean acidification. More than 30 percent of Puget Sound's marine species are vulnerable to ocean acidification by virtue of their dependency on availability of carbonate ions to form their calcium carbonate shells, skeletons, and other calcified body parts.

Although water quality is not a direct responsibility of WDFW, it is critical for the long-term health and survival of the state's fish and wildlife, including marine species in Puget Sound and the coastal ocean. The WDFW supports many other agencies to reduce water pollution from various sources listed above and maintain water quality standards that support healthy fish and wildlife populations. The federal Environmental Protection Agency and the Washington Departments of Ecology, Health, and Natural Resources all have important responsibilities for water quality, as does the Puget Sound Partnership.

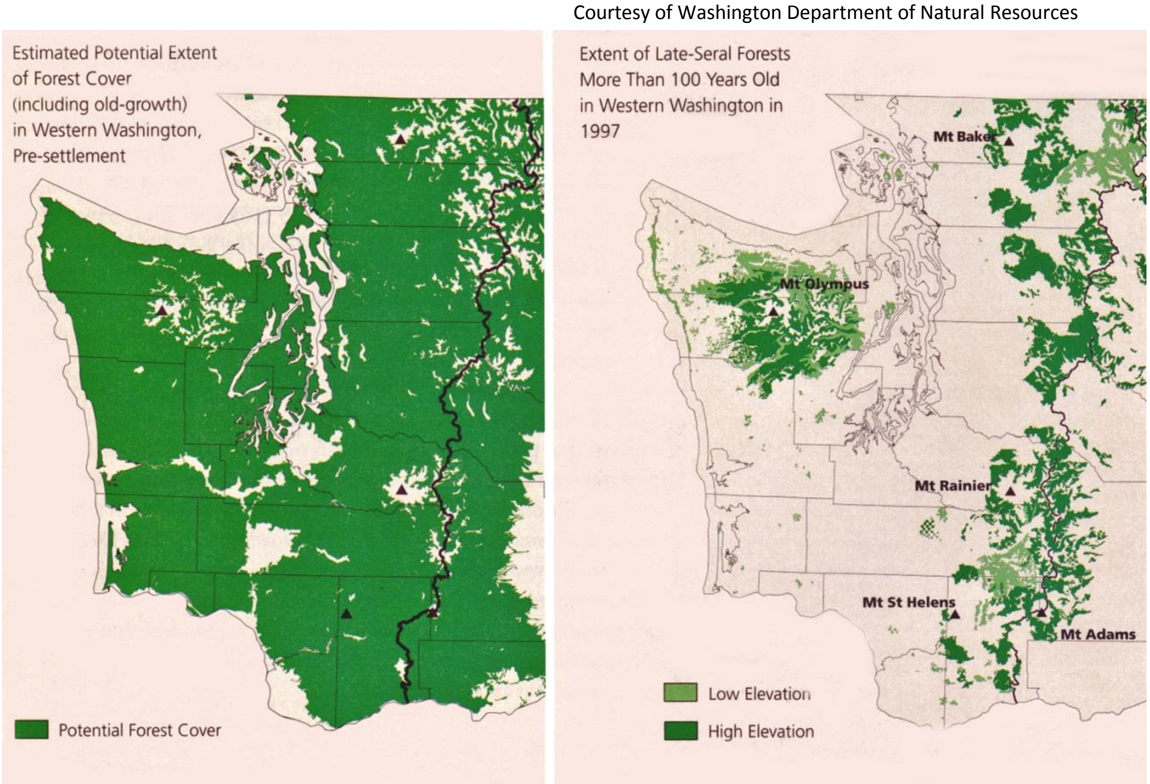
## 2.2.5 Forest conservation and management practices

Over half the land area of Washington is covered in forests, ranging from the temperate rain forest of the Olympic Peninsula to the Douglas-fir dominated lowland forests of the Puget Trough, and from the stunted, slow growing trees of alpine forests to the dry, ponderosa pine dominated forests of eastern Washington. The management and commercial harvest of timber on both public and private lands has been and remains an important part of Washington's history, economy and culture.

In western Washington, forests have been fragmented by urbanization, transportation corridors, and other land development. In remaining forested areas, commercial harvest and replanting has changed the natural forest structure, resulting in simplified forest habitats and a reduction in overall biological diversity. Some commercial timberlands are also being sold to non-industrial owners and in many instances, the new owners choose to convert the land to non-forest uses. The overall loss and fragmentation of forest land in western Washington has resulted in a parallel loss of fish and wildlife habitat and wildlife movement corridors as well as diminished water quality in streams and rivers (Figure 2-2).

**Figure 2-1: Forest land cover in Washington**

Courtesy of Washington Department of Natural Resources




Eastern Washington forests have also been harvested for timber and timber products for many years. Although timber harvest activities have affected the long-term structure and diversity of eastern Washington forests, these forests are nearly as extensive today as they were in 1900. The pressures of urbanization and deforestation are not as great in eastern Washington as they are west of the Cascade Mountains. One of the most severe long-term problems for wildlife and habitat in eastern Washington forests is the suppression of natural fires on both public and private forestland. Frequent, low intensity ground fires were historically part of the forest ecosystem, including forest-associated wildlife, and the recent emphasis on fire suppression has eliminated an important natural means for removing fuels and thinning stands. The lack of fires often results in denser tree cover, particularly at low elevations, and changes in both species composition and structure of natural timber stands, leading to overcrowding and increased susceptibility of these stands to damage by bark beetles, defoliating insects and catastrophic fires which are outside the historical range of variability and impart devastating ecological consequences.

Historically, the construction of logging roads near streams or across wetlands was often destructive to fish and wildlife habitat. Although modern forest practices under state and federal rules provide much more protection for wetlands and riparian zones, there are still potential adverse impacts from construction and operation of logging roads that do not meet modern forest practice standards. Improperly constructed or maintained logging roads may trigger or accelerate slope failure, erode stream channels, block fish migration and deposit sediment into streams and wetlands.

The WDFW is collaborating with WDNR and other agencies, organizations, and private forest landowners to promote, develop and implement forest practices that best protect the Washington's fish and wildlife resources.

### 2.2.6 Agriculture and livestock grazing impacts to habitat

Agriculture, like forestry, is an important part of Washington's landscape and economy. About one-third of the state's land area (15 million acres) is in agricultural production, including cropland, pastures and orchards. This current condition is a result of conversion of native grassland, shrub-steppe and wetlands to agricultural purposes since the turn of the 20$^{th}$ century and has resulted in extensive losses and fragmentation of habitat and associated wildlife.

Historic agricultural practices didn't consider impacts to wildlife habitat, and consequently had detrimental effects. Modern agricultural practices have developed an awareness for the need for and techniques to maintain and enhance habitat quality. Agricultural development has tended to be concentrated in low elevation valleys all over the state, which has significantly reduced and fragmented valley bottom grasslands, shrublands and forested riparian habitats. Agricultural operations in valley bottoms and riparian zones have also increased sediment loads of rivers and tributary streams and past practices unintentionally introduced herbicides and pesticides into aquatic ecosystems. As a result of increased environmental regulation, publicly funded incentive programs and public values, modern agriculture has adapted to reduce impacts to fish and wildlife habitat.

Livestock grazing throughout Washington over the last century has had widespread impacts on the structure and composition of native vegetation and wildlife habitat. Although properly managed grazing can be neutral or even beneficial to wildlife, improper management of grazing (overgrazing) can destroy native vegetation, change the balance of plant species, compact soil, accelerate soil erosion, and reduce the abundance and diversity of native wildlife. The severity of these impacts depends on the number and type of livestock (e.g. cattle, sheep, and horses) and their grazing pattern. Improper grazing practices also promote the spread of invasive plants and eventually reduce the productivity of native grasslands for both wildlife and livestock.

WDFW works at many different levels, including with many individual farmers and ranchers, to influence grazing and other agricultural practices to protect and enhance fish and wildlife habitat and biodiversity on private land. In 1993, the Washington State Legislature enacted House Bill 1309, which directs

WDFW and WDNR to develop consistent grazing standards that preserve, protect and perpetuate fish, wildlife and habitat on state public lands.

### 2.2.7 Diseases and pathogens

The rapid spread of new wildlife diseases in the United States and around the world since the beginning of the 21st century has created new challenges for both wildlife managers and public health officials. The social and economic impacts of wildlife diseases can be large, not only affecting wildlife populations and habitat but also human health, agriculture and food safety, and many nature-based industries.

A number of serious diseases currently affect Washington's wildlife populations and species at risk in every region of the state. These diseases include notoedric mange, which has become a serious risk to western gray squirrel populations; West Nile virus, a mosquito-borne virus that can cause encephalitis and/or meningitis in birds, horses and humans; avian botulism, which occurs principally in waterfowl and other birds living in an aquatic environment; and hair loss syndrome, which causes hair loss, emaciation and often death in Columbian white-tailed deer. Other diseases of current concern include hoof disease in elk, pneumonia in Bighorn Sheep, avian influenza, and white nose syndrome in bats

Hoof disease was first reported in elk populations in Washington around 2008; it has spread across the southwestern part of the state, affecting the St. Helens and Willapa Hills elk herds. Bighorn Sheep face a major threat from an exotic strain of pneumonia carried by domestic sheep and goats. The disease is often fatal in wild Bighorn Sheep, and can also affect the survival rate of lambs later born to animals that survive the disease. In 2010, roughly a third of two wild Bighorn Sheep populations totaling 260 animals had to be euthanized in the Yakima River region of Washington.

Avian influenza ("bird flu") is a viral illness found in birds. Wild birds can carry a number of bird flu viruses, but most strains do not seriously affect them. In 2014 a Gyrfalcon on northwest Washington died after eating a wild duck; it was tested and found to have a highly pathogenic strain of bird flu. In addition, a Northern Pintail Duck tested positive for carrying another strain of the virus, and this year a third form was detected in a wild duck in Whatcom County. Since then, several forms of the virus have spread quickly in the Pacific Flyway and have been found in backyard poultry flocks, commercial poultry, and wild waterfowl.

White-nose Syndrome (WNS) of bats is a disease caused by a fungus. It is estimated to have killed over six million bats in the eastern United States since 2006, and can kill up to 100 percent of bats in a colony during hibernation. Of the seven bat species so far afflicted by WNS, Little Brown Bats and Big Brown Bats occur in Washington, in addition to another 11 cave or mine-roosting species that are potentially at risk in this state. Although it has not been found in Washington to date, the fungus and disease are spreading across North America towards the West and into Canada.

WDFW works closely with neighboring states and Canadian provinces, as well as federal wildlife and fisheries agencies and the veterinary medicine and academic communities, to identify and respond to outbreaks of the wildlife diseases highlighted here.

### 2.2.8 Inadequate data on wildlife species, populations and habitat requirements

Although range, distribution, life history, populations and habitat requirements of some wildlife species under the WDFW's purview are fairly well understood in terms of life history, populations and habitat requirements, the ecology of many others is poorly known. The WDFW and its conservation partners, including the Washington Natural Heritage Program, recognize the need to design and implement additional applied research and surveys for many of the identified SGCN and Ecological Systems of Concern to better craft and prioritize conservation actions. In Chapter 4, additional research needs are outlined for some of our most imperiled ecological systems, including eastern Washington wetlands and Puget Sound prairies.

Development of the SGCN list and their associated habitats will help direct and focus the efforts of the WDFW and its conservation partners to collect more and better information in the future on wildlife species, populations and habitats. SGCN Fact Sheets (Appendix A) describe specific additional research needs and in Chapter 4 outlines additional research and data needs for some of our most imperiled ecological systems. See also Chapter 6 – Monitoring and Adaptive Management, and Chapter 7 – Implementation for more discussion on data collection and management.

### 2.2.9 Climate change

Impacts from a changing climate are already being observed on fish and wildlife across the region, including a northern shift in species' ranges, shifts in the timing of ecological events, and increased incidence of disease and invasive species. Among the many consequences for Washington's natural systems, several stand out as key vulnerabilities: forests, coastal systems and freshwater habitat. Forests will be impacted both directly and indirectly through synergisms between multiple disturbances, including pest and disease outbreaks and susceptibility to wildfires, the extent and severity of which are expected to increase with climate change. Many of the state's coastal wetlands, tidal flats and beaches are likely to decline in quality and extent due to an accelerating rate of sea level rise, particularly where upland migration of habitats is hindered by bluffs or anthropogenic structures such as bulkheads and other shoreline armoring , dikes, or where natural sources of sediment are limited. And finally, climate change is already having an impact on the state's freshwater aquatic systems, including higher average water temperatures and altered hydrology. The region's salmonids stand out as especially vulnerable given that they are expected to face climate change impacts throughout their complex life cycle. The impacts of ocean acidification on marine systems also have significant implications for wildlife and is discussed above in section 2.3.4. A summary of impacts to species and habitats and an analysis of species specific sensitivities and projected exposure to climate change are presented in Chapter 5, with supporting information available in Appendix C.

## 2.3 Major Conservation Strategies

Many tools and strategies are available to the WDFW and its partners to address the conservation of fish and wildlife habitat and biodiversity in Washington, on both public and private lands. These range from direct conservation efforts such as law enforcement and habitat protection, to indirect but equally important programs such as environmental education, habitat assessment and research.

Many Washington residents and decision makers care deeply about their quality of life, including their fish and wildlife resources, and they have consistently been willing to pass laws and fund programs to help identify and protect important wildlife, habitat and biodiversity. It is important to effectively administer and enforce existing laws and to coordinate the various federal, state, tribal and private programs that are already in place—all of which require adequate funding, staffing and support from the public and decision makers at all levels.

Some of the most effective programs, strategies and tools used by the WDFW and its public and private conservation partners are briefly discussed below.

### 2.3.1 Species conservation strategies

The WDFW works closely with other conservation agencies and organizations to identify wildlife species in need of special conservation measures. The USFWS and National Marine Fisheries Service (NMFS) classify and protect fish and wildlife species under the federal Endangered Species Act, and WDNR uses the NatureServe methodology to rank the global and state status of plant and animal species. For the purposes of implementing the SWAP, the WDFW will focus attention on species included on the SGCN list (Chapter 3), which includes many classified by Washington as endangered, threatened, or sensitive. It also includes a number of species that are not included in one of those classifications but which have been identified as needing additional research or funding attention. A range of conservation actions are recommended for identified SGCN, from the development of recovery plans for endangered, threatened or sensitive species to baseline population surveys for other species. Appendix A includes fact sheets describing life history, population status, distribution, threats and conservation actions recommended for all SGCN.

### 2.3.2 Coordinated salmon recovery

In 1999, after Pacific salmon listings were made under the Endangered Species Act, Washington developed the *Statewide Strategy to Recover Salmon: Extinction is Not an Option* to outline the vision, goals and objectives necessary to keep salmon from becoming extinct in Washington. The Strategy identified four main areas of recovery emphasis, referred to as the “four Hs”—habitat, harvest, hatcheries and hydropower—and stressed that recovery efforts need to be appropriately integrated and coordinated at the federal, state, regional and watershed levels. Since then, large-scale, coordinated salmon recovery efforts have been underway in Washington, involving many federal, state, tribal and local agencies, as well as organized conservation groups and the public. For additional information go to: http://www.rco.wa.gov/salmon_recovery/gsro.shtml.

Salmon recovery is a complex and expensive proposition in the Pacific Northwest. The WDFW and many of its conservation partners are committed to assuring that these various efforts are successful in recovering salmonid populations. Salmon recovery is being coordinated in seven regions of the state (Figure 2-3).

Figure 2-3: Salmon Recovery Regions


In 1999, the Legislature also created the Salmon Recovery Funding Board (SRFB), composed of five citizens appointed by the Governor and five state agency directors, which provides grant funds to protect or restore salmon habitat and assist related activities. It works closely with local watershed groups known as lead entities. The SRFB has helped finance over 500 salmon recovery projects since its creation.

### 2.3.3 Habitat conservation on public lands and waterways

Approximately 40 percent of Washington's land base is in public ownership, and conservation of wildlife and habitat may be easier to accomplish on these public lands and waterways than on private property, depending on the legal mission of these public lands. Most of Washington's public lands and water resources are either managed under a multiple-use concept that addresses the conservation of important habitat in the context of other uses or specifically for fish and wildlife habitat. All public land and water management agencies have some responsibility for protecting fish, wildlife and habitat on their lands. The Department of Defense and Department of Energy operate or fund active fish and wildlife programs on their lands, including Joint Base Lewis-McChord, the Yakima Training Center, and the Hanford Nuclear Reservation.

The WDFW manages a statewide network of over 1,000,000 acres of land and water that provide important habitat for wildlife while offering a range of fishing, hunting and other wildlife-related recreational opportunities. Most of these lands are designated as state Wildlife Areas and are found in almost every county in Washington. Washington Department of Natural Resources (WDNR) manages almost 3 million acres of public lands and trust lands (not counting aquatic lands), which include lands managed for timber, agriculture, recreation and conservation.

Protecting wildlife habitat and biodiversity on other public lands, including state and federal lands, depends on each agency's mission, management priorities, funding, knowledge of natural resources, and their willingness to identify and conserve areas important for fish, wildlife and biodiversity. The WDFW has many cooperative conservation agreements with other agencies and provides fish and wildlife information and habitat management recommendations to other public land management agencies on request. WDFW's wildlife areas are managed to benefit biodiversity and SGCN conservation.

### 2.3.4 Habitat conservation on tribal lands

About 16% of the land area of Washington is within tribal reservations. Conservation of fish, wildlife and habitat within tribal reservations is the responsibility of the governing tribal councils. The WDFW, as well as other state, federal and private conservation partners, work closely with the various tribal councils to identify and conserve important fish and wildlife resources on tribal lands. The largest Indian reservations in Washington are the Yakama, Colville, and Quinault reservations.

### 2.3.5 Habitat conservation on private lands

Because about 60% of Washington's land base is in private ownership, the WDFW and its conservation partners have developed many different approaches or tools for identifying and protecting important wildlife species, habitats and biodiversity on private lands. Conservation tools include direct and indirect regulation, habitat acquisition and voluntary landowner incentives. All conservation tools are important, but no single approach can adequately identify, protect, restore and properly manage the state's wildlife resources and biodiversity, especially on private lands.

WDFW regularly utilizes conservation tools that include regulations for hunting and fishing seasons, our Priority Habitats and Species lists (integrated into local land-use planning), management actions for imperiled species associated with Forest Practice Rules for private forestlands, and our hydraulic project approval that is required for any work that is conducted that uses, obstructs, diverts, or changes the natural flow or bed of state waters.

One of the most cost effective ways to ensure the protection of important wildlife and habitat on private lands is through the application of financial and non-financial landowner incentive programs. These voluntary landowner incentives include direct local property tax reductions by counties; conservation easements by agencies and land trusts; Farm Bill tools such as the Conservation Reserve Program (CRP) and State Acres for Wildlife (SAFE) and programs such as WDFW's voluntary Upland Wildlife Restoration program, which provide direct incentives to willing agricultural landowners to protect and restore wetlands and other important habitat on their land. WDFW will continue to work with landowners, private conservation organizations, county extension agents, and conservation districts to provide technical assistance and encouragement to landowners to implement land and water management practices, including grazing practices that benefit fish and wildlife on private land.

### 2.3.6 Habitat acquisition

For the WDFW and conservation partners like WDNR, USFWS, Rocky Mountain Elk Foundation, The Nature Conservancy, the Trust for Public Land, and local land trusts, acquisition of land from willing landowners is an important non-regulatory tool for protecting areas with high habitat or biodiversity values. Although the cost of acquiring land can be significant compared to other alternatives, in some cases it is the best or only alternative for long-term protection and stewardship of critical habitats. The term "acquisition" is usually associated with the outright purchase of land, but may also include conservation easements, land donations, or land trades.

The WDFW has a long and successful history of identifying important habitat areas and protecting them through acquisition. The State's habitat acquisition program began in 1939, shortly after the Department of Game was established by the legislature. It tapered off in the 1970s after about 340,000 acres of habitat had been purchased, but continues today in a targeted and collaborative fashion. Currently, WDFW owns or manages over one million acres of land, all of which are open to public use most days of the year (some seasonal closures occur for a variety of reasons).

In 2005, the WDFW completed a policy plan to guide its future acquisition and management of habitat and wildlife recreation lands. This plan, entitled *Lands 20/20: A Clear Vision for the Future* is available at http://wdfw.wa.gov/publications/00726/. WDFW assesses species and landscape conservation needs using species recovery and management plans, habitat conservation plans, biodiversity conservation frameworks, habitat connectivity analyses, and other data. The Lands 20/20 process includes robust vetting and public outreach before a project is approved to pursue funding. The following principles are employed in this process:

- Optimize, pursue, and use partnerships
- Evaluate whether acquisition is the best conservation alternative
- Pursue lands that provide long-term opportunities
- Pursue lands that will provide long-term ecological value
- Place a higher value on acquisitions that create blocks of ownership
- Pursue easements or other non-fee title options on smaller tracts
- Prioritize lands that are ecologically or socially important

From 1990 - 2015, WDFW has focused its land acquisition and easement efforts on securing the future condition of large landscapes in priority habitats that protect SGCN and game species and provide habitat connectivity. During this time, WDFW acquired close to 300,000 acres of fish and wildlife habitat through state and federal grant programs (listed below). This work requires partnering directly with local governments, landowners, conservation organizations, recreation organizations and land trusts to identify, create and implement opportunities to secure the value of these lands for their combined habitat, recreation, working lands, economic, health and quality of life contributions in perpetuity. Key habitat and SGCN targets include: wetlands, shrub-steppe, east Cascade mixed-conifer forests, South Puget Sound prairies, oak woodlands, riparian, salmonids, elk, waterfowl, sage- and sharp-tailed grouse, pygmy rabbits, butterfly species, western pond turtles, peregrine falcons, gray wolf, Canada lynx, grizzly bear, wolverine, and great blue herons. A few areas of focus have been the Mountain View project in the Blue Mountains to secure 13,000 acres of ponderosa pine and riparian habitat along the 10 miles of the Grande Ronde River that benefits high quality low-elevation riparian curl-leaf mountain mohagany, interior grasslands, talus, cliff, ponderosa pine and meadows as well as 15 aquatic species, steelhead, bull trout, elk, bighorn sheep, deer, golden eagle, northern goshawk, sagebrush lizard and interior redband trout; the Heart of the Cascades project in Kittitas County to consolidate checkerboard ponderosa pine, Douglas-fir mixed-pine conifer and riparian habitats for spotted owl, bull trout, wolverine, large carnivores, deer and elk; and the Methow River and Okanogan River Watersheds projects which has preserved tens of thousands of acres of riparian and low elevation shrub-steppe habitats that support salmon, sharp-tail grouse, critical winter range for mule deer and connectivity for mule deer and large carnivores (gray wolf, grizzly bear, Canada lynx, and wolverine) through both outright purchase and conservation easements that allow for on-going continued ranching while ensuring the continued habitat value.

A number of state and federal funding programs have been established over the last twenty years to address habitat acquisition, and these programs are administered in Washington by a mix of federal, state and local agencies, partnerships and conservation organizations including the Pacific Coast and Intermountain West joint ventures and an expanding system of regional and local land trusts. These programs include:

- Washington Wildlife and Recreation Program (state)
- Salmon Recovery Funding Board (state)
- Trust Land Transfer Program (state)
- Aquatic Lands Enhancement Account (state)
- Land and Water Conservation Fund (federal)
- Cooperative Endangered Species Conservation Fund (federal)
- North American Wetlands Conservation Act (federal)
- National Fish and Wildlife Foundation (federal-private partnership)
- National Coastal Wetland Conservation Grant Program (federal)
- Bonneville Power Administration, Wildlife Mitigation Program (quasi-federal)
- Regional Conservation Partners Program (federal)

### 2.3.7 Research, monitoring and surveys of fish, wildlife and habitat

Scientific research has long provided the foundation for fish and wildlife management in Washington. WDFW and its conservation partners conduct ongoing research and field investigations into the ecological requirements, population status, migrations, distributions, and habitat relationships of many fish and wildlife species. The WDFW also conducts genetic research on terrestrial wildlife and fishes, performs DNA forensic analysis to support WDFW enforcement investigations, and provides technical support and expertise in wildlife veterinary medicine, including training on humane and safe handling and immobilization of wildlife species. The WDFW develops, analyzes and maintains wildlife and fish survey databases. To ensure that conservation priorities always reflect the current conservation needs of wildlife species and habitats, research and surveys will continue to be a high priority for the WDFW. Species, habitats and biodiversity survey and monitoring are addressed in Chapter 6, Monitoring and Adaptive Management.

### 2.3.8 Direct enforcement of state laws to protect fish, wildlife and habitat

The WDFW's direct authority for the protection of wildlife habitat is limited, although the agency does enforce state laws to protect fish habitat (Hydraulic Project Approval), fish passage and diversion standards and invasive species under chapter 77.135 RCW. Through the Washington Fish and Wildlife Commission, the WDFW establishes regulations for the legal harvest of game species and commercially harvested fish and wildlife, and WDFW officers enforce those harvest regulations statewide in cooperation with other state, federal and tribal enforcement personnel. Harvest regulations are generally conservative and designed to allow sustainable harvest that has no adverse impact on fish and wildlife populations. However, the illegal overharvest of fish and wildlife or the destruction of critical protected habitats can have a profound impact on populations that are rare, depressed or threatened with extinction. WDFW's Enforcement Program is primarily responsible for enforcing **Title 77**, the Fish and Wildlife Code. WDFW Enforcement Officers are fully commissioned, meaning they have authority to enforce all criminal laws and have jurisdiction over federal fish and wildlife violations. They ensure compliance with licensing and habitat requirements and enforce prohibitions against the illegal taking or poaching of fish and wildlife.

### 2.3.9 Indirect enforcement of local, state and federal laws to protect fish, wildlife and habitat

The WDFW works closely with other agencies including local and tribal police agencies, WDNR, USFWS, and NMFS to enforce laws and regulations that are both within and outside the WDFW's jurisdiction. For example, migratory birds and marine mammals are protected and regulated under both state and federal law and jointly enforced by the WDFW, USFWS and NMFS. The WDFW also works closely with other agencies in publicizing, implementing and sometimes enforcing laws, regulations and permit conditions that prevent the destruction or degradation of important habitat, including the federal Endangered Species Act, Northwest Power Planning Act, Clean Water Act, the Washington Forest Practices Act, Shoreline Management Act and the locally administered Washington Growth Management Act. WDFW also works with the Washington Departments of Transportation and Ecology in developing and implementing mitigation measures for projects with potential adverse impacts on fish and wildlife.

Because much of Washington's authority to protect fish and wildlife habitat is shared with cities and counties, the WDFW puts a high priority on providing comprehensive biological information to local planners and decision makers to improve their ability to administer the Growth Management Act and other locally administered land use laws. The PHS program has provided site-based information to local governments since 1989.

### 2.3.10 Wildlife information and conservation education

Effective conservation of habitat and biodiversity is best accomplished if the public and policymakers understand fish and wildlife needs, the importance of biodiversity to our overall quality of life, and how citizens can be involved and contribute to conservation efforts. To support this understanding, it is critical that the public have opportunities to observe and enjoy fish and wildlife in their natural surroundings. As Washington's population grows, so does public demand for wildlife information and wildlife-related recreation opportunities on both public and private lands, including hunting, sportfishing, wildlife viewing and naturalists' pursuits.

The WDFW's Public Affairs Office and various teams in the Fish and Wildlife Programs communicate with the news media, the public and various government agencies and conservation groups about wildlife conservation and recreation. Interpreted wildlife viewing opportunities are offered online through the WildWatch cameras and seasonally at WDFW wildlife areas (e.g. Oak Creek elk viewing). WDFW access sites and wildlife areas provide resources online and on site to promote outdoor experiences afield by promoting access and site-specific information about wildlife viewing on our kiosks and online (http://wdfw.wa.gov/lands/wildlife_areas/). WDFW offers some watchable wildlife resources in print, but a great deal of information is provided online (**http://wdfw.wa.gov/viewing/** and **http://wdfw.wa.gov/living/**) including the *Living With Wildlife* series; marine wildlife, marine sanctuary, and SCUBA viewing guides; road trip and roadside viewing access areas' directions and interpretive materials; and information about the Great Washington State Birding Trail (developed collaboratively with our Audubon Society partners, **http://wa.audubon.org/great-washington-state-birding-trail**), among many other guides and resources.

For a more field-directed and interpreted experience, WDFW provides opportunities for volunteers to engage directly in survey, monitoring, management and conservation activities through our citizen science efforts, stewardship projects on wildlife Areas and Access Sites, and other coordinated special events. Importantly, many of these activities can be tailored and promoted to address information gaps in SGCN range, distribution and ecology. Participants volunteer with purpose, contributing directly to the work WDFW does in exchange for training, friendship-building, and an opportunity to view and understand wildlife in their native habitats.

### 2.3.11 Wildlife recreation programs

The demand for traditional hunting and fishing activities remains steady in Washington. The 2011 National Survey of Fishing, Hunting and Wildlife-Associated Recreation indicated that the state of Washington is eighth in the nation in spending by recreational fishers and hunters, generating an estimated $1.6 billion in annual revenues to the state. The fastest growing sector of wildlife recreation demand, however, is watching wildlife: an estimated 47 percent of Washington's residents participated in some form of wildlife watching in 2001. The WDFW has embraced the national Watchable Wildlife concepts and is working with the Washington Division of Tourism, Department of Transportation, Washington State Parks and Recreation Commission, Audubon Washington, and other partners to promote programs that connect with and serve traditional (hunting, fishing, resource collection) and non-traditional constituencies [e.g., birding, botanizing, butterfly and dragonfly watching, "herping" (reptile and amphibian enthusiasts)]. Wildlife viewing opportunities (passive, passive interpreted, or actively interpreted) have long been a part of WDFW's values and recreation delivery on our lands and some of our access easement programs.

More recently, WDFW and conservation partners have been growing citizen science opportunities which also provide a recreational aspect. Out in the field, projects and tools which are part of the WDFW Wildlife Areas Ecological Integrity Monitoring, eBird Northwest, and Incidental Wildlife Observation reporting (**http://wdfw.wa.gov/viewing/observations/**), tap into the enthusiasm and expertise of naturalists, avid learners, and other interested people to participate directly in the Department's survey, monitoring, and stewardship response data needs. A springtime walk through the shrub-steppe can provide opportunities to enjoy the day, connect with a wildlands experience, and provide information that can help WDFW manage our lands in an informed way. These recreational opportunities engage the public in a way to better understand fish and wildlife needs while recreating outside.

As the state's population grows, so does the demand for wildlife-related recreation opportunities and public access to wildlife on both public and private lands. The WDFW will continue to work with public and private conservation organizations and landowners to try to meet this growing public demand for wildlife recreation.

### 2.3.12 Forest practices management

Over half the land area of Washington is forested, and most of the state's forested landscapes continue to be managed for timber and timber products. Because of the influence of commercial forestry on the state's forest lands and wildlife habitat, it is imperative that the WDFW and its conservation partners continue to put an emphasis on influencing forest practices on these public and private timberlands. In the last 30 years, Washington's forest practices regulations have been dramatically improved and are now considered by some to be the best in the nation. It is critical that WDFW work as partners with forest landowners and other stakeholders to optimize conservation of fish and wildlife, as well as to assure that healthy forest lands remain on the landscape.

Federal forest lands within the range of the northern spotted owl are regulated by the Northwest Forest Plan (NWFP), adopted by the federal government in 1994 to provide for maintenance and restoration of functional, healthy and interconnected late-successional forest ecosystems, alongside sustainable and predictable supplies of timber and other forest products. State and private forest lands in Washington are regulated by the state Forest Practices Act. Since the federal listing of the northern spotted owl as a Threatened species in 1990 and the passage of the Northwest Forest Plan in 1994, there have been a number of proactive efforts and agreements among public agencies, Indian tribes, conservation groups and forest landowners. These agreements work to protect listed species and their habitat, and to avoid further listings of forest species under the Endangered Species Act, while protecting the economic viability of the timber industry in Washington.

One of the most recent and successful of these public-private efforts is the Washington Forests and Fish Agreement initiated in 1997 by state and federal agencies, local governments, Indian tribes, conservation groups and private forest landowners. The primary goals of this agreement were to: provide compliance with the Endangered Species Act for aquatic and riparian-dependent species; restore and maintain riparian habitat to support a harvestable supply of fish; meet the requirements of the Clean Water Act for water quality; and keep the timber industry economically viable in the State of Washington. In 2006, Washington State completed the Forest Practices HCP, based on this Forest and Fish agreement. This HCP is the largest programmatic HCP in the nation, and the associated forest practices rules and adaptive management program are believed to be some of the most progressive in the nation. The forest practices rules apply to over 9 million acres of state and private forest lands and protect habitat on over 60,000 miles of streams. The HCP and associated rules that resulted from this agreement were developed in concert by all parties and are a good example of how a high degree of habitat protection can be achieved through collaboration.

In addition to the Forests and Fish Agreement, the WDFW and many of its conservation partners are heavily involved in other efforts to promote conservation of forest ecosystems and fish and wildlife. State forest practices rules include protections for specific state and federally listed wildlife species and their habitats, and voluntary protection strategies are developed for other listed species. WDFW screens forest practices applications for potential conflicts with wildlife species of concern; and when potential conflicts are identified, WDFW works with landowners to develop management plans which will both protect the species and their habitats, while also meeting the goals of the landowners. Other landscape management plans have and are being developed to address wildlife species of concern. WDFW is also engaged with the NWFP planning and revision processes on the various national forests to ensure that forest health, and wildlife and aquatic resource objectives are met.

The development of HCPs with private forest landowners, and most recently, public land management agencies, is a good alternative to additional federal regulation to protect ESA-listed wildlife species and habitats. In 1997, WDNR and federal fish and wildlife agencies signed a multi-species Habitat Conservation Plan that covers 1.6 million acres of state-owned trust forestlands. The WDFW is also currently at work on a similar federally-funded HCP that would apply to the management of lands owned and managed by the WDFW.

### 2.3.13 Landscape Conservation Efforts

Ultimately, conservation of Washington’s biodiversity relies on collaboration across ownership boundaries. Federal, state, and local land-use planning needs to be coordinated and mutually supportive to meet not only the ecological goals, but other social, cultural and economic goals associated with natural resource use. Much conservation success in Washington also relies on management practices on private lands. WDFW and our partners are working to create and deliver incentives to support the ability of private landowners to uphold fish and wildlife values through their land management. Current conservation efforts require landscape-level efforts and collaboration across broad groups. WDFW and our partners have been engaged in a multitude of such efforts, several of which are highlighted in this section. The tenets of multiple societal values, defining shared goals, and working together to preserve the future of our cherished Washington natural heritage will continue to be essential as we move forward in our efforts to conserve our state's fish and wildlife.\

**1. Douglas County State Acres for Wildlife Enhancement (SAFE) Program**

The Douglas County's Sage and Sharp-tailed Grouse SAFE program has benefitted declining species by putting tens of thousands of acres of less productive farm lands back into shrub-steppe habitat. The Washington Department of Fish and Wildlife along with its partners have been very successful at encouraging farmers and ranchers in Douglas County to enroll in this voluntary incentive program, where Landowners enter into a 10 to 15 year agreement to plant eligible lands with native flora. The mix of seed enrollees are required to plant provides both food and cover to shrub-steppe wildlife once plants have established. Douglas County is of particular significance to shrub-steppe wildlife given it holds the last remaining population of Pygmy Rabbits in Washington. The county also is habitat to the largest populations of Greater Sage and Columbian Sharp-tailed Grouse in the state.

Since the inception of the Douglas County SAFE program, its success has surpassed expectations both in the numbers of landowners interested in enrolling, as well as the amount of land that now successfully supports a suite of shrub-steppe species. Strong enrollment was also attributed to the solid relationships and trust that our biologists have formed with Douglas County property owners. Strong teamwork with other stakeholders, including the Foster Creek Conservation District and Natural Resources Conservation Service, was also vital to how much the program has achieved so far.

**2. The South Puget Sound Prairie Partnership**

The South Puget Sound Prairie Partnership is an effort by federal, state, local jurisdictions, land trusts and other NGO's to either provide private landowner incentives or acquire lands to restore, and conserve grassland and adjacent oak woodland in primarily Pierce and Thurston counties, Washington. The partners use funds from a variety of sources to achieve conservation efforts. These include the Army Compatible Use Buffer Program, the Sentinel Landscape Program, funds from Washington Recreation and Conservation Office projects, Fish and Wildlife Service Recovery funds, and NRCS easement funds. The DOD programs (Army Compatible Use Buffer Program and Sentinel Landscape Program) have provided over 16 million dollars since 2006 for acquisition and enhancement of grasslands outside of DOD lands. Partners have contributed at least 7 million in funds during this period for acquisition, restoration, and easements. Joint Base Lewis McChord has provided significant funds (in the millions) during this timeframe for active management of prairies on DOD lands.

Partnership for South Puget Sound Prairies began in the 1990's with The Nature Conservancy, WDFW, WDNR, and U.S. Fish and Wildlife Service initiating planning and conservation efforts at several publicly-owned grasslands. The partnership grew during the 2000's with the addition of Joint Base Lewis-McChord (then Fort Lewis), land trusts, and expanded work by the NRCS. One of the significant achievements has been the development of genetically appropriate native seed resources for habitat restoration and species translocation and reintroduction projects for two federally listed endangered species, the Mazama Pocket Gopher and Taylor's checkerspot. Research has been conducted on habitat needs of Washington's SGCN, as well as the federally listed pocket gophers, Taylor's checkerspot, and streaked horned lark.

Major challenges for the program have been battling invasive species like Scot's broom and invasive grasses, developing and implementing a prescribed fire program, and nursery development. The Center for Natural Land Management recently took over projects formerly implemented by The Nature Conservancy, and is the primary contractor for the DOD ACUB program. They have played a leadership role in many efforts, including prescribed fire and the development of plant resources for restoration.

**3. Skagit Watershed Council**

The WDFW, Skagit Watershed Council, non-governmental conservation organizations, as well as other partners have been active in protecting and restoring key segments of this important watershed. The Skagit Watershed Council's strategic approach is committed to restoring and protecting landscape processes to produce long-term, sustainable recovery of habitat conditions to benefit multiple species. Their landscape scale approach is demonstrated in an analysis they carried out for a 43 river mile reach of the Skagit River. The purpose was to take a landscape scale approach to targeting priority areas so they could focus their activities to restore and protect key segments of the watershed. They also target much of their work to the delta and floodplain habitat in the lower Skagit River, given its significance for Chinook Salmon as well as a multitude of other species like shorebirds.

Non-profits such as Skagit Land Trust and TNC have also formed strong ties with the community. The Nature Conservancy in particular has taken a role in finding ways to keep working lands working, while balancing the needs of fish and wildlife. One way they have done this is by building relationships with the farmers that manage much of the land along the Skagit River. For instance, TNC has partnered with agricultural producers in their Farming for Wildlife program. This program aims to replace lost freshwater wetlands in the Skagit Delta by paying farmers to incorporate wetland habitat into their crop-rotations. A strong partnership between WDFW, TNC and others in the community has also led protection of thousands of acres in the Skagit Watershed. The Skagit Land Trust has built a broad list of partners that have helped them secure the conservation and protection of nearly 7,000 acres in the watershed. Some of the Trust's greatest successes have come in the form of projects where they have protected habitat areas across private ownership boundaries.

**4. Blue Mountain Elk Initiative**

The Blue Mountain Elk Initiative (BMEI) is the cooperative effort of many dedicated partners to improve habitat for elk and other wildlife across the Blue Mountains of Oregon and Washington. The BMEI partners, which include WDFW staff engagement, are consistently leveraging funds to improve wildlife habitat across the 30,000 square miles that make up the Blue Mountains Ecoregion. With this money they have funded numerous projects to improve elk habitat.

This year marks the initiative's $25^{th}$ anniversary, during which BMEI partners can boast that they have leveraged nearly $10 million. BMEI has directed much of this money to projects that have resulted in over 300,000 acres of habitat enhancements spanning political and ownership boundaries. Such work has ranged from removing weeds in mid- to higher elevation grasslands to benefit all native species to prescribed fire for restoring forest health. In recent years, BMEI has supported weed control on thousands of acres of WDFW lands. The initiative has also funded important research to guide elk habitat management.

One of the biggest challenges for the BMEI has been finding consistent sources of funds to keep up the group's momentum for funding elk conservation projects, as well as reaching out to new partners to work with. Another challenge is locating money to conduct post project monitoring for each and every BMEI funded project. To increase the chances that BMEI funded projects will be successful, their strategy is to fund projects that not only benefit elk, but that also address other needs of land managers implementing these important projects. This strategy has increased the odds that managers overseeing BMEI funded projects achieve a successful outcome.

**5. Restoring Fish Passage**

Fish passage has been a priority for WDFW for decades. Since 1991, WDFW's fish passage unit has been dedicated to finding and removing fish barriers in streams and rivers across Washington. The unit's biologists, engineers, and field technicians provide all the services needed for passage restoration projects. WDFW staff is on the ground walking streams to assess potential barriers and upstream habitat gain. Over 14,000 barriers have been identified and included in WDFW's statewide database. Our biologists prioritize barriers for removal and collaborate with environmental engineers to design fish passage solutions.

WDFW also works with outside organizations, such as the Washington State Department of Transportation, to find and remove barriers on their lands. WDFW identifies and prioritizes WSDOT-owned barrier culverts and collaborates on design and construction of barrier removal projects. WDFW also evaluates and monitors the post construction effectiveness of all WSDOT fish passage projects.
As a leader in fish passage, WDFW developed the Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual to teach other restoration groups on proper procedures for collecting and managing barrier information. These science-based protocols are nationally recognized and the standard for collecting data on a fish barrier.

In 2014, the Washington State Legislature created the Fish Passage Barrier Removal Board to identify and expedite and a coordinated statewide approach to fish barriers removal. Chaired by WDFW, the board is represented by other state agencies, tribes, city and county governments, as well as the Governor's Salmon Recovery Office. The goal of this board is to coordinate the removal of barriers within a watershed to help ensure fish passage throughout the entire stream. WDFW is developing a grant program to fund projects that remove several barriers along a stream and projects that open more habitat upstream of recent barrier removal sites. This statewide initiative builds on the momentum of existing restoration programs and partnerships, but funding is needed to implement coordinated work that maximizes investments.

**6. Yakima Basin Integrated Plan**

For decades stakeholders have disputed over control of the Yakima Basin's over-allocated water supply. These disputes involved irrigators; federal, state, local, and tribal governments; as well as conservationists and community leaders. After five drought years in a 15 year period the problem only became worse. So after decades of inaction, water users throughout the region put aside their differences to craft a consensus-based plan for meeting everyone's needs. Spearheaded by the U.S. Bureau of Reclamation and the Washington Department of Ecology, this effort became the Yakima Basin Integrated Plan (YBIP), whose goal it is to restore the ecological integrity of the Basin while shoring up existing agricultural water rights.

To restore ecological integrity, YBIP partners have set out to acquire nearly 100,000 acres of forest and shrub-steppe, protect 200 miles of river, and increased fish passage on six existing dams. Since the plans inception in 2009, partners have quickly come a long way to meeting these objectives. The most notable accomplishment is the 50,000 acre Teanaway Community Forest acquisition in 2013, the single largest land transaction in Washington in 45 years. This transaction was made possible because this diverse set of stakeholders worked together for a common set of goals. Washington Department of Fish and Wildlife and DNR jointly manage this property as a working, recreational forest managed as a healthy watershed with input from the local community. Another success was the completion of the Manastash Creek Project in 2014. Water conserved from removing a diversion in Manastash Creek has increased instream flow and opened up 25 miles of habitat for steelhead, coho, bull trout, and spring Chinook.

Key to these extraordinary achievements is the strong relationships that have been built amongst the diverse range of private, local, state, and federal entities. This includes the mutual trust that has been built with the Yakama Nation, irrigators, local governments, and conservation organization through years of working together. This relationship along with others helped WDFW and our partners work out an agreement that ultimately became the YBIP. Upon its completion, the YBIP is estimated to cost nearly $3.8 billion. Many consider the YBIP a model because for every dollar spent, nearly double the investment will be gained from tangible benefits to stakeholders, including increased water for farming and more productive fisheries.

**7. Puget Sound Nearshore Ecosystem Restoration Project**

The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP) began in 2001 as a partnership between the Washington Department of Fish and Wildlife and the U.S. Army Corps of Engineers. Since then the partnership has greatly expanded to include multiple local, state, and federal government agencies; tribes; industries; and environmental groups. Their goals are to evaluate nearshore ecosystem degradation, formulate potential solutions, and recommend actions to restore ecosystem function. To accomplish these goals PSNERP has formed many partnerships with wide a range of groups involved in restoration throughout Puget Sound.

To understand the problems that the Puget Sound nearshore environment faces today, PSNERP completed a study to identify how the ecosystem has changed over time. This tool has provided insight into which ecosystem functions have changed the most while also helping to identify where these changes have occurred. Stakeholders have used this powerful tool to identify the places where they can get the most ecological benefit from their restoration work. Puget Sound counties and municipalities have also used PSNERP data to inform updates to their Shoreline Master Programs.

The PSNERP partnership also has published a comprehensive suite of technical guidance and informational publications to address key nearshore Puget Sound natural resources. These publications have given conservation partners in Puget Sound valuables tools and information to guide restoration. Restoration work proposed by PSNERP has also been an integral component in the Puget Sound Action Agenda, which will serve as the federal and state road map for restoring the health of Puget Sound by 2020.

PSNERP is one of the largest habitat restoration and preservation studies ever undertaken in the United States. Their work has great potential to provide far reaching benefits by beneficially influencing physical nearshore ecosystem processes. Many Species of Greatest Conservation Need benefit from the PSNERP effort, including Boccacio, Orca, Bull Trout, Canary Rockfish, Chinook Salmon, Chum Salmon, Green Sturgeon, Marbled Murrelet, and Yelloweye Rockfish.

**8. Mountain to Sound Greenway**

A coalition of diverse stakeholders makes up the Mountain to Sound Greenway partnership, including environmentalists and timber companies; developers and farmers; federal and state agencies; cities and counties; nonprofits and businesses. This partnership focuses on the conservation, restoration, and protection of lands that make up this greenway that parallels Interstate-90 from the shores of Puget Sound, over the Cascades, to the arid landscapes of Central Washington. The Greenway was first envisioned in 1990 by a group of citizens when the region experiencing a significant economic and development boom. They saw that unchecked urban sprawl had the potential to fragment much of this corridor and they wanted to keep this landscape intact and connected.

WDFW supports the shared vision of the partnership in a many ways. This includes WDFW's purchase of thousands of acres of lands to form contiguous blocks of public lands where otherwise there lands would be in a checker board of public-private ownership. The Trust also had a role in acquiring the 50,000 acre Teanaway Community Forest, which lies at the eastern flank of the greenway. They also have brought on board many supporters in Washington D.C. to push for a proposal to designate the greenway as a National Heritage Area. Overall, the trust has been involved in purchases or exchanges of 170,000 acres of new public lands.

**9. Merrill Lake Conservation**

WDFW and the Rocky Mountain Elk Foundation are pursuing almost 1,500 forested acres adjacent to Merrill Lake. For a number of reasons WDFW considers this site, which lies just southwest of Mount Saint Helens, a priority for protection. Merrill Lake is an ecologically unique and diverse place that is home to old-growth forest, miles of riparian corridor, seeps and springs, wetlands, and lava tubes. As for fish and wildlife, biologists have documented high numbers of SGCN, primarily amphibians. Western Toad, Larch Mountain Salamander, Van Dyke's Salamander, and Cascade Torrent Salamander occur on site. Other SGCN include Steelhead, Northern Spotted Owl, and Bald Eagle. As for Merrill Lake's place in the big picture, it lies at a strategic landscape position and would provide important connectivity. Just north and east is Mount Saint Helens National Monument, while Washington Department of Natural Resource holds large land blocks just south of Merrill Lake. Although these blocks are separated by a small area of private lands, a Merrill Lake acquisition would nearly link the two large blocks of public land together.

From almost the start, the Merrill Lake project has garnered support from everyone involved, including partnering conservation organizations in the region. Strong support has also come from the community, including the Cowlitz County Commission and local sportsman groups. The latter have a personal connection to this land because for years the landowner has opened it to recreation. This project success has a lot to do with these relationships and with the trust we have built with the landowner and with this community. The Merrill Lake project has seen challenges in acquiring the needed funds to purchase the property, though all are confident that it will happen thanks to everyone patiently staying engaged. This is testament to the fact that all involved have felt they have something to gain by protecting Merrill Lake.

**10. Washington Wildlife Habitat Connectivity Working Group**

The Washington Wildlife Habitat Connectivity Working Group is a science-based partnership that is composed of participants representing land and natural resource management agencies, organizations, tribes, and universities. The working group is co-led by Washington Department of Fish and Wildlife and the Washington Department of Transportation. Organizations and/or individuals engage in the development of analyses within the Washington Connected Landscapes Project.

The Full Working Group encompasses all participants and includes talents in science, communications, and implementation. This group has produced several research papers regarding habitat connectivity needs and modeling results statewide as well as in the Columbia Plateau and Transboundary regions of Washington. Current efforts include looking at connectivity needs in the Southwest coastal region. The work of the WWHCWG has been utilized in several landscape conservation efforts. The vision for the Working Group is for connectivity to be consistently included in decisions and conservation actions related to: land use, restoration, private landowner incentive programs, species recovery, and wildlife area plans. WDFW is working to integrate the results into multiple on-going implementation efforts and to integrate more on-the-ground land managers into the development of future products.

**11. The I-90 Snoqualmie Pass Project – Enhancing Wildlife Connectivity**

Just east of Snoqualmie Pass in the Cascade Mountains of Washington State, the state Department of Transportation (DOT) designed and is currently implementing a highway expansion that is improving aquatic and terrestrial wildlife connectivity. This stretch of freeway cuts across a vital north-south wildlife corridor connecting wildlife in Washington's Cascade mountain range. Tremendous private and public investment has protected habitat throughout this landscape in recent decades, and similar public and private partnerships led to an innovative design for improvements to Interstate 90 that will make the roadway safer for motorists and wildlife. The I-90 Snoqualmie Pass East Project stretches 15-miles from Hyak to Easton and will expand the capacity of the highway from four lanes to six, while constructing 24 wildlife crossing structures. A majority of the crossing structures are wildlife underpasses that will facilitate movement of aquatic and terrestrial species under the freeway along creeks and rivers, while two 150-foot wide wildlife bridges will be constructed to provide safe passage for wildlife over the freeway. Species of Greatest Conservation Needs, their habitats, and the ecological processes upon which they depend, from the smallest mollusk through salamanders and bull trout, up to elk and wolverine, benefit from this project.

Partnerships have been instrumental in all aspects of this project since its inception. WSDOT led a Mitigation Development Team for project design with federal and state agency partners including US Forest Service, US Fish and Wildlife, and Washington Department of Fish and Wildlife. Over forty local and national non-profit organizations joined to form the I-90 Wildlife Bridges Coalition to advocate for high wildlife standards in this project and educate the public about the issues surrounding transportation and wildlife. Central Washington University, Western Transportation Institute, citizen scientists, and motorists have contributed monitoring information to complement agency efforts.

Construction of the project is underway and will continue for the next 15 years. Fish and wildlife are already benefitting from crossing structures completed in the project, while partners focus in restoring the habitat that was conserved north and south of these structures.

**12. Northcentral Washington Prescribed Fire Council**

Established in 2005 by WDFW fire experts and partners, the Northcentral Washington Prescribed Fire Council's (NCWPFC) mission is to protect, conserve, and expand the safe use of prescribed fire. More specifically, the group works to promote an understanding of benefits of fire, distribute guidance for prescribed fire safety, endorse fire management and safety policies, and provide a platform for communication. Support for the council has come from state, federal, and county government; conservation districts; industry trade organizations and professional societies; landowner groups; university extension; as well as conservation organizations.

Overcoming the public's negative perception of fire has been a significant challenge for the NCWPFC. Prescribed fire is still not a widely accepted tool, although council members say the health of many ecosystems in Washington depend on its widespread use. The Council is actively working to dispel negative attitudes and teach about the ecosystem health benefits of fire. They have done this by holding media events and by producing and distributing flyers and fact sheets on various topics concerning fire management. The NCWFPC also has periodically pushed for legislation. One such effort was their push for a law to indemnify fire managers, on condition they adhered to strict safety protocol prior to an accident. The ultimate vision of many Council members is to see the day when fire becomes a go-to tool to manage for healthy fire-depended ecosystems in Washington.

**13. Arid Lands Initiative**

Formed in 2009, Washington's Arid Lands Initiative (ALI) is a collaboration of public, private, and tribal interests working to conserve and restore viable and connected terrestrial and freshwater systems in Washington's shrub-steppe and Palouse prairie landscapes that support plants, fish, wildlife, and the communities who depend on these resources. WDFW has been a core partner of the ALI since its inception.

Experts and stakeholders working through ALI have developed guidance to assess ecosystem health and the species that characterize eastern Washington's arid lands. This included identifying focal systems and species requiring management to achieve successful conservation. The species and systems ALI identified include many that WDFW classify as Ecological Systems of Concern and Species of Greatest Conservation Need. They also identified key locations across the arid landscape requiring immediate actions, and are currently working to map the necessary actions to specific places across the landscape. In this way, the ALI partners have laid out a road map for investing resources and for engaging partners to help efficiently manage and conserve key locations.

Partners are putting the ALI's shared priorities into practice by using Initiative tools to guide their own conservation work. Federal and state partners in particular have begun using these products in a range of ways. The USFWS and WDFW are using priority area maps developed by ALI to identify where to invest Candidate Conservation Agreement with Assurances resources to safeguard sage grouse. WDFW is using these same tools to guide many of their eastern Washington private landowner conservation efforts and land acquisitions. Products developed by ALI are also guiding decisions to mitigate the impacts that the Vantage to Pomona transmission line will have on valuable shrub-steppe and sage grouse habitat.

ALI is gradually identifying more projects to move from planning to implementation. In light of a changing climate, habitat fragmentation, and the complex ownership patterns that currently characterize these arid landscapes, a forum for partners to coordinate conservation action continues to be essential for the long-term preservation of fish and wildlife across the Columbia Plateau.

**14. Simcoe Mountains Acquisition**
WDFW is partnering with the Eastern and Central Klickitat Conservation Districts to conserve fish and wildlife habitat, as well as promote non-motorized recreation and working lands on a large tract of privately owned timber lands in Klickitat County. The Simcoe site sits in the Simcoe Mountains of central Klickitat County, just south of the Yakama Reservation. WDFW recognizes the value that the Simcoe's hold for their high ecological integrity. Of particular interest for fish and wildlife conservation are two relatively large blocks of land that feature intact Oregon white oak woodlands, riparian corridors, and shrub-steppe. The combined land area of the two tracts is nearly 20,000 acres, much of which is important habitat for many SGCN, including Steelhead, the State Threatened Western Gray Squirrel, as well as Western Toad, Golden Eagle, Black-tailed Jackrabbit, and White-headed Woodpecker. These lands would constitute a near contiguous corridor of protected lands running the length of the east slope Cascades from the boarder with British Columbia to the Columbia River.

## 2.4 Conclusion

This chapter has presented an overview of Washington's biodiversity and a high level view of major conservation issues and current approaches and strategies for addressing them. This grounding is intended to set the context for how the State Wildlife Action Plan fits in to the conservation landscape, and specifically for understanding the needs for SGCN and their habitats, as described in Chapter 3, Chapter 4, and Appendix A. Overall, the work of fish and wildlife conservation in Washington State will continue to require both the in-depth scientific understanding of management needs, reflected in other sections of this document, and the commitment and capacity to build and sustain partnerships across societal interests.

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# Chapter 3

# Species of Greatest Conservation Need

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# Chapter 3
# Species of Greatest Conservation Need

## 3.0 Overview

In this chapter, we review the methodology used in the 2005 Comprehensive Wildlife Conservation Strategy (CWCS) and describe how it was revised for this revision to provide clarity. The revised methodology was used to develop the list of Species of Greatest Conservation Need (SGCN). We also discuss changes in the list since 2005. Section 3.2 includes an overview of all the current SGCN by taxonomic group, with separate discussions for mammals, birds, reptiles and amphibians, fish and invertebrates. For each taxonomic group, there is a narrative summary of conservation trends and a table summarizing conservation status. Section 3.3 identifies the most prevalent stressors across taxa. Finally, Section 3.4 includes an explanation of terms used throughout the chapter. Appendix A contains fact sheets for each species that describe in detail distribution, habitat needs, stressors and priority actions needed. Additional information and discussion on the habitats important to SGCN and the actions needed to conserve them can be found in Chapter 4.

**Multiple Species Lists**

Prior to development of the 2005 CWCS, the agency had two lists of species at risk: 1) the Species of Concern list, maintained by the Wildlife Program, that included all State or Federal Endangered, Threatened, Sensitive or Candidate species; and 2) the Priority Habitats and Species List (PHS) list, maintained by the Habitat Program, to guide local governments and others in land use planning activities as part of the PHS Program. The requirement of the State Wildlife Action Planning Process to identify SGCN introduced a third species "list". While the PHS list is specifically used to inform land use planning, the SGCN list is intended to inform voluntary conservation of species and habitats for a wide variety of government agencies and conservation organizations. The SGCN list is a distinct product, developed to address somewhat different questions and for a different purpose and audience compared to the other two lists. The state wildlife action planning process and the resulting SGCN list provides an opportunity for the agency to work internally across programs to clarify the distinct purposes of these three lists.

The SGCN list is designed to be comprehensive including the species already listed threatened, endangered or sensitive, as well as additional species thought to need conservation attention. The SGCN is the basis upon which all other aspects of the State Wildlife Action Plan (SWAP) is built upon. It serves in part as an "early warning system" for those species that are in need of additional conservation attention from filling information gaps to identifying and implementing conservation actions specific to those species. This is all in an attempt to protect rare species while keeping more common species common. We expect the data collected for SGCN and the habitats on which they depend will inform future updates of the Species of Concern and PHS lists, as well as other conservation planning processes throughout the agency.

## Methodology

Criteria used to develop the 2005 SGCN list were revised to simplify the methodology by using the 'conservation' scores, but not using the 'socio-economic' and 'conservation action' scores. The process provided clearer communication both internally and externally about the rationale for species inclusion on the 2015 SGCN list. NatureServe[1] rankings were emphasized in developing our revised list, as

[1] See Section 3.4 for an explanation of NatureServe rankings

recommended in the Best Practices for State Wildlife Action Plans Guidance document. The most recent research was consulted to make evaluations for all proposed SGCN, and broader agency input resulted in inclusion of more fish and invertebrate species.

WDFW staff focused significant effort on a re-evaluation of all taxa on the 2005 SGCN list. Selection of species for inclusion on the SGCN list began with a master list of more than 700 species taken from the 2005 CWCS evaluation process. Species on this list were given consideration for the 2015 SGCN list if they met at least one of the following criteria:

- Federally listed as Endangered, Threatened, Candidate, or Species of Concern
- State listed as Endangered, Threatened, or Candidate, or Sensitive species
- Rank of "high" on threat/vulnerability by WDFW biologists in the 2005 SGCN process
- Rank of S1, S2, G1, or G2 in NatureServe (see Section 3.4 - References of this chapter for a description of these ranks)

An SGCN technical team comprised of taxonomic group experts for mammals, birds, reptiles, amphibians, fish, and invertebrates then reviewed all of the draft SGCN meeting one of the above criteria and applied a secondary set of criteria to either remove or add species to the list. Secondary criteria included:

- Whether updated data or literature had become available about the status of a species, threats, or conservation actions since 2005
- Team or other expert knowledge of the species' status in Washington
- Whether recent taxonomic changes affected the population unit present in Washington
- Whether the species was considered peripheral to the range of an otherwise widespread species
- If occurrence in the state was a result of a recent range expansion or contraction

A small group of 25 game birds and mammals was also considered and added to the SGCN list if their populations were known to be small or experiencing significant declines. In some cases (mainly for fish), where species declines were known to be strongly associated with certain distinct population segments (DPSs), evolutionarily significant units (ESUs), or geographic areas of the state, these species were identified as SGCN for those populations or regions only.

The draft SGCN list was then reviewed by regional and field biologists across the state which resulted in additional modifications to the list. Experts and advisors outside the agency were also consulted for their input and guidance in developing the list, particularly for invertebrates (see Appendix D for a full description of outreach activities). This more rigorous process resulted in the identification and evaluation of hundreds of invertebrates, with 93 being designated as SGCN. As a result, the 2015 list is substantially different from and includes more species than the 2005 list.

### Notable Changes in the SGCN list from 2005

The number of taxa on the 2015 SGCN list is substantially bigger than in 2005 – increasing from 183 in 2005 to 265 in 2015 due to changes in the inclusion criteria (Table 3-1). Including NatureServe rankings as one of our criteria resulted in more species qualifying as SGCN. Other factors included the availability of updated information and research for many of the species, particularly several invertebrates that are now better understood in terms of distribution and threats. There were additions to all taxa groups except for birds of which there are now six fewer species listed as SGCN.

**Table 3-1: Number of SGCN in 2015 and 2005**

| | 2015 | 2005 |
|---|---|---|
| Mammals | 44 | 31 |
| Birds | 52 | 58 |
| Reptiles | 12 | 8 |
| Amphibians | 14 | 11 |
| Fish | 51 | 33 |
| Invertebrates | 95 | 42 |
| **TOTAL** | **268** | **186** |

Thirty-four species included on the 2005 SGCN list were removed from the 2015 SGCN list. The specific reasons each species was dropped are shown in Table 3-2. In a few cases, these reflect the improved conservation status of the species (for example, Steller Sea Lion and Pacific Harbor Porpoise) and are examples of conservation successes that should be celebrated. In other cases, the changes were due to a taxonomic reclassification (for example, Pallid Townsend's Big-eared Bat and Bog Idol Leaf Beetle), or determinations that the taxa is likely extirpated in Washington (Pacific Gopher Snake and Western Yellow Bellied Racer). Another group of species was removed from the list as a result of refining our SGCN Criteria – specifically clarifying that if a species' range in Washington is very limited and considered peripheral to its overall range, it should not be considered an SGCN (unless it is listed under federal or state endangered species laws). Finally, in other cases, species were removed from the list due to a lack of knowledge regarding their distribution or status (for example, Common Murre and Cassin's Auklet). For these species, if new data surface that indicate a species should be on the SGCN list, the WDFW will take the necessary steps to add them during the next revision or address conservation needs as emerging issues if SWG funds are needed.

**Table 3-2: SGCN from 2005 not included on 2015 list**

| 2005 SGCN not included on 2015 list | |
|---|---|
| **MAMMALS** | |
| Elk (Nooksack herd) | This is one of ten managed herds in the state of Washington and is no longer of conservation concern. |
| Pallid Townsend's Big-eared Bat | Based on recent taxonomic changes, this subspecies of Townsend's Big-eared bat is no longer recognized as occurring in Washington. |
| Pronghorn | This species is native to the Columbia Basin in Washington, but was rare in the 1800s prior to agricultural conversion, possibly because of marginal habitat. No records exist from the 1900s. Habitat in Washington is now fragmented and may remain marginal. Historical status of pronghorn in Washington is very poorly known, but suggests that the state was at the periphery of its geographic range. Washington appears to have been marginal habitat for the species for at least the past 10,000 years, with modern agriculture degrading conditions even further. |
| Steller Sea Lion | This species was state delisted from threatened in May 2015 due to its strong population growth in Washington since the late 1980s, and along the North American west coast from about 1980 to the present. Washington has a small breeding population that has continued to grow since 1992. |
| Pacific Harbor Porpoise | The Pacific Harbor Porpoise has increased in abundance in the Washington portion of the Salish Sea during the past 15 to 20 years. It is now considered common in this area and may be at historical high population levels. |
| **BIRDS** | |
| Acorn Woodpecker | This species is peripheral and has expanded its range into the state in the last three decades. |
| Ancient Murrelet | The Ancient Murrelet's breeding range is peripheral in Washington. There is only one nest record from 1924. |
| Arctic Tern | The Arctic Tern is peripheral in Washington. It breeds in the Arctic, and the local breeding population--represented by one colony at a single location (human-built)--is 1,000 miles south of the breeding range. |
| Black Oystercatcher | Much of the population is secure, and generally does not appear to be greatly vulnerable to human disturbance. Sea level rise could affect the species in the future, but this is not currently an issue. |
| Black-backed Woodpecker | We are unaware of any data indicating that the species is experiencing a long-term population decline. |

| 2005 SGCN not included on 2015 list | |
|---|---|
| Cassin's Auklet | We are unaware of data indicating a population decline. |
| Common Murre | We are unaware of data indicating a population decline. |
| Great Blue Heron | Washington populations are common and appear to be stable according to BBS surveys. We are unaware of data indicating a population decline. |
| Greater Scaup | This species is a fairly common migrant and winter visitor in Washington, with a stable population. |
| Lesser Scaup | The overall population of this species in Washington has increased. BBS surveys show that populations are stable. |
| Northern Goshawk | Scientific literature indicates that there is no population concern about this species at a range-wide scale. There are no specific data from Washington to support keeping the Northern Goshawk as a SGCN. |
| Northern Pintail | The Northern Pintail occurs at a limited number of sites in Washington, but it is abundant at those sites. |
| Pileated Woodpecker | General concerns relate only to industrial forest lands. The Pileated Woodpecker is numerically uncommon but regularly occurs in forests elsewhere in the state and even in some urban/suburban areas it appears to be faring well. |
| Prairie Falcon | Data from the BBS suggest stable or increasing populations in Washington, neighboring states, and the Great Basin as a whole. These trends are noted for the long-term analysis period of 1966 to 2013 as well as the more recent short-term period of 2003 to 2013. |
| Redhead | The overall population of Redheads in North America has increased. In Washington, BBS surveys for the last five years show that populations are stable. |
| Trumpeter Swan | Numbers and range for this species have been increasing for 30 years. Currently the population is at nearly 20,000 birds. |
| Tule Greater White-fronted Goose | This species spends only a few weeks in Washington each year during stopovers in September on its way to wintering areas in the southwestern U.S. Hunter harvest in Washington is limited and there is adequate habitat to accommodate them. |
| Vaux's Swift | We are aware of no monitoring data that rigorously demonstrate a population decline in this species on a regional scale in Washington. |
| Willet | This species is peripheral in Washington. The Washington population appears to consist of between 8 and 15 individuals that overwinter near Tokeland. |
| **REPTILES** | |
| Pacific Gopher Snake (Western WA) | This subspecies is extirpated in Washington. The only known evidence of occurrence is based on specimens from the 1800s. |
| Western Yellow-bellied Racer (Western WA only) | This subspecies is believed to be extirpated in western Washington. The last observations were reported in the 1970s. |
| **FISH** | |
| Black Rockfish (Puget Sound) | Black Rockfish are currently plentiful and may be on an abundance upswing. A harvest management plan is in place to help achieve conservation goals. |
| **INVERTEBRATES** | |
| Bog Idol Leaf Beetle | Taxonomic uncertainties make it difficult to justify keeping this species on the list, though it does appear on the list of species for the USFWS Cedar River HCP, updated in March 2015. |
| Boreal Whiteface | This species is peripheral in Washington. Knowledge of only a single site suggests that it is not present at very many additional sites. It has not been found in recent years, even at the historical site. Few surveys have been done. |
| Native Mussel | This mussel species is common and locally abundant in Washington’s marine waters. It has a large Northeast Pacific Ocean range and has a NatureServe National Conservation Status Rank of "Secure". Aquaculture of non-native mussels (e.g., *M. galloprovincialis* and *M. edulis*) raises concerns about hybridization and competition risks, but few data are available about these potential threats in Washington. |

| 2005 SGCN not included on 2015 list | |
|---|---|
| Oregon Floater (bivalve) | Taxonomic questions exist regarding the Oregon Floater and Western Floater, and anatomical and genetic studies must be conducted to resolve them before either can be considered for addition to the SGCN list. |
| Shepard's Parnassian | This species is a rare and threatened habitat specialist. However, taxonomic questions exist, and surveys need to be conducted to resolve them. |
| Subarctic Darner | The Subarctic Darner occurs at four locations in Washington but is common in appropriate habitat throughout its range across North America. The species faces few immediate threats, though global warming could become a problem sometime in the future. |
| Western Floater (bivalve) | Taxonomic questions exist regarding the Western Floater and Oregon Floater, and anatomical and genetic studies must be conducted to resolve them before either can be considered for addition to the SGCN list. |

**Climate Change**
Climate change poses potentially significant impacts for many of the SGCN on our list and we included it as a stressor where appropriate for both SGCN and their habitats. We assessed the relative vulnerability to climate change of all SGCN by evaluating the inherent sensitivity to climatic change, as well as the likelihood that such changes will occur. These two factors comprised a relative climate vulnerability rank for each species - low, moderate, high, or unknown. We also included the degree of confidence we had in assigning such ranks based on the extent and quality of available references. These rankings and the rationale and references for them are available in Appendix C.

For species that ranked low to moderate in vulnerability, we simply included the ranking in the SGCN fact sheets (see Appendix A). Species that ranked moderate-high or high, *and* for which we had a high degree of confidence in our assessment were placed on a Climate Watch list, indicating a high climate risk. Note that several species ranked as likely moderate-high or high in terms of overall vulnerability, but because our confidence was less than high based on initial literature availability, they were not included on the Climate Watch list. As additional reference information becomes available these rankings will be updated.

Future tasks for the Climate Watch species will include evaluating which of the existing stressors are likely exacerbated by climate change, and might consequently be considered as a higher priority to address. Please see Chapter 5 for a full discussion of Climate change in the context of the SWAP, including a summary of the projected impacts on fish, wildlife and their habitats, a detailed explanation of the methodology for ranking climate vulnerability, and a discussion of potential approaches for addressing climate risks and increasing the resilience of species and habitats.

## 3.1 The SGCN Species

The following sections of this chapter provide a high level summary of the SGCN species, by taxa, in the following order: mammals, birds, amphibians and reptiles, fish, and invertebrates. For each taxonomic group we provide a brief narrative summarizing the conservation trends of the species, a table listing the conservation status, and a table summarizing key threats and actions for each species. Please refer to Appendix A for a complete set of species fact sheets, with detail on distribution, status, habitats, threats and conservation actions needed.

### 3.1.1 MAMMALS

**Mammals Overview**
Forty-four species of mammals are included on the SGCN list for Washington. These represent a variety of taxa including rabbits (four species), shrews (three), bats (five), rodents (10), terrestrial carnivores (nine),

marine mammals (10), and ungulates (three). These species use various habitats across the state, have small to large geographic distributions in Washington, and are of concern for different reasons, as summarized below. Most of the species are year-round residents, but at least 10 are either fully or partially migratory, including seven species of whale and two bat species (Hoary Bat, Silver-haired Bat).

**Distribution**

SGCN mammals have varying distributions across the state and occupy many habitats. Of the 44 species, 20 are found only or largely in western Washington (e.g., Mazama Pocket Gopher, Columbian White-tailed Deer), 16 in eastern Washington (e.g., Spotted Bat, Lynx), and eight in both western and eastern Washington (e.g., Western Gray Squirrel, Western Spotted Skunk). Marine mammals comprise half of the species, occurring only or largely on the state's west side. Three species are found statewide: Hoary Bat, Silver-haired Bat, and Townsend's Big-eared Bat. In contrast, all other species have much smaller ranges that cover less than a third of the state. Several taxa currently have extremely limited ranges that are less than five percent of the land area of Washington (e.g., Pygmy Rabbit, Brush Prairie Pocket Gopher, Gray-tailed Vole, Columbian White-tailed Deer, Woodland Caribou). Two species (Destruction Island Shrew, Shaw Island Townsend's Vole) are restricted entirely to islands, with the shrew having a total range of just 30 acres.

Three-quarters of the taxa are commonly associated with three general habitat types: 16 species in conifer and/or deciduous forest ecosystems (e.g., Keen's Myotis, Western Gray Squirrel, Fisher, Woodland Caribou); 10 species in marine ecosystems (all marine mammals); and eight species in shrub-steppe ecosystems (e.g., Washington Ground Squirrel, American Badger). Other habitat types include grasslands, alpine, wetlands, and riparian corridors.

**Population Sizes and Trends**

Most of Washington's SGCN mammals are uncommon or rare, or are represented by small populations. Populations of seven taxa are considered to be in critical condition (Grizzly Bear, Pacific Marten, Wolverine, Blue Whale, North Pacific Right Whale, Sei Whale, Woodland Caribou) and probably have state populations of fewer than 25 individuals at any one time. Twenty-two species have "low" populations compared to their historical abundance (e.g., White-tailed Jackrabbit, Northern Bog Lemming, Gray Wolf, Killer Whale, Bighorn Sheep). Four species (Hoary Bat, Silver-haired Bat, Shaw Island Townsend's Vole, Gray Whale) are characterized by having moderately-sized populations that face specific conservation challenges. Information is lacking on the relative population sizes of 11 species, which are categorized as having "unknown" population sizes (e.g., American Pika, Preble's Shrew, Western Gray Squirrel, Cascade Red Fox, Western Spotted Skunk). Population trends of SGCN mammals are either unknown (23 species), declining (eight), stable (eight), or increasing (five). With population trends unknown for nearly half of the species, improved information of this topic represents a clear need in future research and monitoring efforts.

**Conservation Concern**

Threats to SGCN mammals are varied and most taxa are of concern due to habitat-related factors, the lingering impacts of historical unsustainable harvest (e.g., most marine mammals, Pacific Marten, Fisher), small population size, or a combination of these factors. For a few species, the cause(s) of concern are poorly understood (e.g., Spotted Bat, Kincaid Meadow Vole, Western Spotted Skunk). Other factors include human disturbance, disease, prey declines, unnatural levels of predation, mortality at wind energy facilities, vessel interactions, entanglement in marine debris, highway mortality, direct human-caused mortality, oil spills, and the threat of future climate change. For nearly all species, there exists a need to gather more information to clarify threats.

**Climate Change**
Species evaluated with moderate-high or high vulnerability (but varying levels of confidence) included: American Pika, Cascade Red Fox, Keen's Myotis, Lynx, southern resident Killer Whale, Northern Bog Lemming, Olympic Marmot, Pacific Marten, Pygmy Rabbit, Townsend's Big-eared Bat, Wolverine, and Woodland Caribou. In general, species occupying higher elevation habitats such as alpine and subalpine forests, meadows, and parklands have higher vulnerability, in particular, to warming temperatures and reduced snowpack.

**Conservation Success**
Many of the 13 SGCN mammals with increasing or stable population trends represent conservation success stories, but they remain SGCN species because their recovery has not yet progressed far enough or delisting has not occurred so their legal status under Washington law remains unchanged. Conservation programs have allowed a number of mammal species in the state to recover (i.e., Gray Whale), to show recent improving trends in population size (e.g., Pygmy Rabbit, Gray Wolf, Fin Whale, Humpback Whale, Sea Otter), or to stabilize their population size (e.g., Townsend's Big-eared Bat, Blue Whale, Sperm Whale, Columbian White-tailed Deer).

**Alphabetical List of SGCN Mammals**

1. American Badger
2. American Pika
3. Bighorn Sheep
4. Black-tailed Jackrabbit
5. Blue Whale
6. Brush Prairie Pocket Gopher
7. Cascade Red Fox
8. Columbian White-tailed Deer
9. Destruction Island Shrew
10. Fin Whale
11. Fisher
12. Gray Whale
13. Gray Wolf
14. Gray-tailed Vole
15. Grizzly Bear
16. Hoary Bat
17. Humpback Whale
18. Keen's Myotis
19. Killer Whale
20. Kincaid's Meadow Vole
21. Lynx
22. Mazama Pocket Gopher
23. Merriam's Shrew
24. Minke Whale
25. North Pacific Right Whale
26. Northern Bog Lemming
27. Olympic Marmot
28. Pacific Marten
29. Preble's Shrew
30. Pygmy Rabbit
31. Sea Otter
32. Sei Whale
33. Shaw Island Townsend's Vole
34. Silver Haired Bat
35. Sperm Whale
36. Spotted Bat
37. Townsend's Big-eared Bat
38. Townsend's Ground Squirrel
39. Washington Ground Squirrel
40. Western Gray Squirrel
41. Western Spotted Skunk
42. White-tailed Jackrabbit
43. Wolverine
44. Woodland Caribou

**Table 3-3: SGCN Mammals Summary of Conservation Status**

**Please see Appendix A for a complete discussion of key threats and conservation actions needed for these species**

Please see Section 3.3 at the end of this chapter for an explanation of the terms used in the headings

| MAMMAL SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **RABBITS** | | | | | | |
| American Pika | None | None | No | Unknown/ unknown | High | A montane talus habitat specialist that may face threats from climate change. |
| Black-tailed Jackrabbit | None | Candidate | Yes | Low/declining | Moderate | Once abundant and broadly distributed in eastern Washington, the species is now rare and sparsely distributed due to habitat loss from fragmentation and possibly disease. |
| Pygmy Rabbit | Endangered | Endangered | Yes | Low/increasing | Moderate-High | The Columbia Basin Pygmy Rabbit, a distinct population segment of this species, is a sagebrush obligate associated with shrub-steppe in eastern Washington. Large-scale loss and fragmentation of shrub-steppe habitat were likely the primary factors contributing to decline, but once the population dropped below a certain threshold, other factors such as environmental events (extreme weather and fire), predation, disease, and inbreeding likely became threats. A major recovery effort is currently underway for this species. |
| White-tailed Jackrabbit | None | Candidate | Yes | Low/declining | Moderate | Once abundant and broadly distributed across the bunchgrass communities of eastern Washington, the species is now rare and sparsely distributed due to the loss, degradation, and fragmentation of habitat and possibly disease and competition with Black-tailed Jackrabbits. |
| **SHREWS** | | | | | | |
| Destruction Island Shrew | None | None | No | Unknown/ unknown | Low-Moderate | This subspecies is endemic to Destruction Island. Its status and biology have not been assessed, but it may be threatened by herbivory from introduced European Rabbits. |
| Merriam's Shrew | None | Candidate | Yes | Unknown/ unknown | Low-Moderate | This relatively little known species appears rare but widespread in much of the Columbia Basin and several adjoining localities of eastern Washington. Additional sampling is needed to clarify its status. It may be threatened by habitat loss and fragmentation, and by the invasion of cheatgrass. |
| Preble's Shrew | None | Candidate | Yes | Unknown/ unknown | Low-Moderate | Preble's Shrew is a poorly known species that appears to be extremely rare in Washington; additional sampling is needed to understand distribution, habitat needs, and factors that affect populations. |
| **BATS** | | | | | | |
| Hoary Bat | None | None | No | Moderate/ unknown | Low-Moderate | This is a widely distributed migratory bat that is vulnerable to mortality from wind turbines during migration. It also faces threats from habitat alteration throughout its range. |
| Keen's Myotis | None | Candidate | Yes | Low/unknown | Moderate-High | In Washington, this bat is poorly known and probably rare. Loss of large decadent trees and snags is likely an important threat. |

| MAMMAL SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Silver-haired Bat | None | None | No | Moderate/ unknown | Low-Moderate | Although relatively common in much of Washington, silver-haired bats experience extensive mortality at wind turbines. Loss of large roost trees and snags locally and along migration routes is another important concern. |
| Spotted Bat | None | Monitor | No | Low/unknown | Low | Individual populations are apparently disjunct and may be vulnerable to human disturbance. Population trends, life history, and habitat requirements are unknown. |
| Townsend's Big-eared Bat | None | Candidate | Yes | Low/stable | Moderate-High | This species occurs in small to moderately-sized aggregations at sites throughout the state, where it may be vulnerable to human disturbance during the breeding and wintering periods. |
| **RODENTS** | | | | | | |
| Brush Prairie Pocket Gopher | None | None | No | Unknown/ unknown | Low-Moderate | Current status and distribution of the Brush Prairie Pocket Gopher in Washington is unknown. It is known only from southwestern Clark County, a developing urban/suburban area. |
| Gray-tailed Vole | None | Candidate | Yes | Unknown/ unknown | N/A | Gray-tailed Voles are probably still common in pastures and grassy roadsides in Clark County, but current status and distribution is uncertain; southwestern Clark County is a developing urban/suburban area. |
| Kincaid Meadow Vole | None | Monitor | No | Low/unknown | Low-Moderate | The Kincaid Meadow Vole is a unique subspecies only found in eastern Washington. Its distribution is poorly defined and there is little current information on the status of populations. |
| Mazama Pocket Gopher | Threatened | Threatened | Yes | Low/declining | Low-Moderate | Some subspecies are threatened by habitat loss from human development. Species existence is compatible with some levels of development, but high density development likely leads to extirpation. |
| Northern Bog Lemming | Petitioned | Monitor | No | Low/unknown | Moderate-High | The Northern Bog Lemming is known from about 12 locations in Washington, where it reaches the southwestern limit of its range. Its glacial relict habitats are isolated and patchy in nature, making the risk of extinction very high. |
| Olympic Marmot | None | Candidate | Yes | Low/possibly stable | Moderate-High | An endemic to mountainous meadows of the Olympic Peninsula, Olympic Marmot populations have possibly stabilized since 2007 after declining from 2002 to 2006. Threats include increased coyote predation, and habitat fragmentation due to rising tree line (caused by declining snow pack and climate change), resulting in greater population isolation and increasing the risk of inbreeding and extinction. |
| Shaw Island Townsend's Vole | None | Monitor | No | Moderate/ unknown | N/A | This subspecies occurs on at least 16 islands in the San Juan Archipelago. Overall population status is unclear, but populations appear secure on several larger islands. Apparent threats include habitat loss and mortality from agricultural practices. |
| Townsend's Ground Squirrel | None | Candidate | Yes | Unknown/ unknown | Moderate | Population status of this Washington-endemic ground squirrel requires clarification. Significant declines have occurred in many areas, yet this species is common at a number of human-modified locations. |

| MAMMAL SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Washington Ground Squirrel | Candidate | Candidate | Yes | Low/declining | Moderate | This species is associated with shrub-steppe and steppe in eastern Washington and is threatened by a number of factors, especially habitat loss, degradation, and fragmentation. |
| Western Gray Squirrel | None | Threatened | Yes | Low/unknown | Low-Moderate | The three remaining populations of this species in Washington are isolated and face a number of threats, including habitat loss and degradation, wildfires, highway mortality, and disease. |
| **TERRESTRIAL CARNIVORES** | | | | | | |
| American Badger | None | Monitor | No | Unknown/ unknown | Low-Moderate | The status of badgers in Washington is poorly understood because of a lack of survey effort and the small amount of occurrence data available to indicate its current distribution. |
| Pacific Marten | None | None | Yes | Critical or possibly extirpated/ unknown | Moderate-High | Based on the almost complete lack of recent verifiable detections, the population of coastal martens in Washington is very small. Trapping, loss, and fragmentation of late-successional forests at low elevations, and small population size are likely factors in the decline of the species in Washington. |
| Cascade Red Fox | None | Candidate | Yes | Unknown/ unknown | High | Little information is available on the distribution and status of this fox in Washington, although recent surveys suggest that populations are likely to be small and may be isolated. Climate change could reduce the availability of habitat for this species. |
| Fisher | Proposed Threatened | Endangered | Yes | Unknown/ unknown | Moderate-High | Historical over-trapping, incidental mortality, and habitat loss and fragmentation caused the extirpation of Fishers in Washington by the mid-1900s. A reintroduction project to recover the species on the Olympic Peninsula was completed in 2010. A Cascades Fisher reintroduction is scheduled to begin in 2015. |
| Gray Wolf | Endangered (Western two-thirds of WA only) | Endangered (State-wide) | Yes | Low/increasing | Low-Moderate | Gray wolves were once common throughout most of Washington, but human persecution led to their extirpation from the state by the 1930s. Wolves have started to recover in recent years, with pack numbers increasing from one in 2008 to 16 in 2014. Human-related mortality is the greatest threat to the population. |
| Grizzly Bear | Threatened | Endangered | Yes | Critical/ unknown | Moderate | This omnivore is extirpated from most of the state; however, two populations of uncertain viability have been identified and each plays an important role in the range-wide conservation and recovery of the species. Grizzly populations in Washington are very small and isolated due to habitat fragmentation caused by human settlement and highways, which makes the species more vulnerable to inbreeding, wildfire, illegal harvest, and other threats. |
| Lynx | Threatened | Threatened | Yes | Low/declining | High | Washington's Lynx population is small (likely less than 100 animals) and restricted to a small portion of its historical range. Small population size, habitat loss from large wildfires, and climate change are threats to Lynx in Washington. |

| MAMMAL SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Western Spotted Skunk | None | None | No | Unknown/ declining in Puget Trough | Low | There is inadequate information on the current status and distribution of this species in much of its range in western and southeastern Washington. The increased occurrence of opossums and loss and fragmentation of forest habitats due to urban and agricultural development may explain the apparent substantial decline of verified occurrences in the Puget Trough since the 1970s. |
| Wolverine | None | Candidate | Yes | Critical/stable | Moderate-High | Washington's Wolverine population is small, largely restricted to the North Cascades, and is an extension of a larger population in southern British Columbia. Climate change may be a significant threat to the species in Washington if denning and food cache sites are impacted. |
| **MARINE MAMMALS** | | | | | | |
| Blue Whale | Endangered | Endangered | Yes | Critical/stable | Low-Moderate | The stock along the U.S. west coast, which includes Washington, is estimated at 1,647 whales and has a stable trend. Ship strikes and fisheries entanglements may negatively affect recovery. |
| Fin Whale | Endangered | Endangered | No | Low/increasing or stable | Low-Moderate | The stock along the U.S. west coast, which includes Washington, is estimated at about 3,000 whales and is either increasing or stable. Ship strikes and fisheries entanglements may hinder recovery. |
| Gray Whale | None | Sensitive | Yes | Medium/stable | Low-Moderate | The eastern North Pacific stock of this whale has recovered from over-harvest and has been stable for several decades. Status of a small group within this stock, the Pacific Coast Feeding Group, whose range includes Washington, requires further assessment. |
| Humpback Whale | Endangered | Endangered | Yes | Low/increasing | Low-Moderate | Abundance of this species along the U.S. west coast, including Washington, has steadily grown in recent decades. Entanglements in fishing gear and ship strikes are relatively minor sources of mortality and injury. |
| Killer Whale | Endangered (southern residents only) | Endangered | Yes | Low/declining (southern residents); Moderate/unknown (transients, offshores) | Southern residents: Moderate-High; Transient/offshore: Low-Moderate | Of the three main populations occurring in Washington, southern resident Killer Whales have shown an overall decline since 1995, whereas transient and offshore populations are currently not of conservation concern. The reduced availability of depleted Chinook salmon populations has limited the southern resident population's productivity. High levels of chemical contaminants, noise and disturbance from vessels and other human activities, as well as large oil spills all have the potential to negatively impact the health and status of all three populations. |
| Minke Whale | None | | No | Low/unknown | Low-Moderate | The stock along the U.S. west coast, including Washington, is estimated at about 500 whales, with trend unknown. Ship strikes and fisheries entanglements may hinder population growth. |
| North Pacific Right Whale | Endangered | Endangered | No | Critical/ unknown | Moderate | The stock along western North America, including Washington, is critically endangered, with trend unknown. Threats to the stock are poorly known. |
| Sea Otter | None | Endangered | Yes | Low/increasing | Low-Moderate | Washington's population of Sea Otters has shown steady growth to almost 1,600 animals since its reintroduction in 1969 to 1970. Oil spills are the greatest potential threat to the population. |

| MAMMAL SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Sei Whale | Endangered | Endangered | No | Critical/ unknown | Low-Moderate | The stock along the U.S. west coast, which includes Washington, is quite small at about 125 whales, with trend unknown. Threats to the stock are poorly understood. |
| Sperm Whale | Endangered | Endangered | Yes | Low/stable | Low-Moderate | The stock along the U.S. west coast that includes Washington, numbers no more than several thousand whales, with trend probably stable. Fisheries entanglements are a relatively minor source of mortality and injury. |
| **UNGULATES** | | | | | | |
| Bighorn Sheep | None | None | Yes | Low/Some herds declining, others stable or increasing | Moderate | Although a game species and sustainably hunted, Bighorn Sheep remain a conservation reliant species. Bighorns currently occupy approximately 15 to 20 percent of their historical habitat in Washington, and connectivity among individual herds is difficult to establish. Bighorns are susceptible to pneumonia caused by bacteria routinely carried by domestic sheep and goats. |
| Columbian White-tailed Deer | Endangered | Endangered | Yes | Low/stable | Moderate-High | This subspecies exists in small, isolated populations, rendering it vulnerable to such factors as disease and stochastic events. Continued habitat degradation will impede recovery by further fragmentation of existing habitat and loss of areas for future range expansion. In addition, this species has the potential to be greatly affected by climate change due to sea level rise that will reduce island and lowland coastal habitats. |
| Woodland Caribou | Endangered | Endangered | Yes | Critical/ declining | High | The South Selkirk Woodland Caribou population has been adversely affected by predation and habitat change. The core range for this population, which overlaps into Washington, is in British Columbia. The population is at a perilously low level with recent annual calf mortality recorded at 40 to 70 percent mainly due to predation, severe weather, and malnutrition. |

## 3.1.2 BIRDS

**Birds Overview**

The Species of Greatest Conservation Need list for Washington includes 51 avian taxa. This diverse group of species includes waterfowl, upland game birds, marine birds and waterbirds, diurnal raptors (i.e., falcons, hawks and eagles), cranes, shorebirds, pigeons, cuckoos, owls, woodpeckers and perching birds. These species occupy a variety of habitats across the state, include year-round residents and migrants, have limited to widespread distributions in Washington, and are of concern for various reasons, as summarized below.

Because of the strong tendency for migration (or other seasonal movements) among birds, it is not surprising that about half of Washington's SGCN birds are migrants. Eight species reside in the state during winter after breeding elsewhere (i.e., six waterfowl species, two shorebird species), two species occur only as migrants (i.e., Short-tailed Albatross, Red Knot), one species (Brown Pelican) breeds to the south and migrates to the Washington coast for the post-breeding season, and a dozen species overwinter to the south and migrate north to breed in Washington (e.g. American White Pelican, Ferruginous Hawk, Flammulated Owl, Sage Thrasher). Some species have both resident and migrant individuals in the population (e.g. Burrowing Owl, Ferruginous Hawk, Snowy Plover).

**Distribution**

SGCN birds have varying distributions across the state and use a variety of cover types. Of the 51 taxa, 22 are found only or largely in western Washington (e.g. Surf Scoter, Marbled Murrelet), 21 are found in eastern Washington (e.g. Greater Sage Grouse, Pygmy Nuthatch) and eight are found in both western and eastern Washington (e.g. Peregrine Falcon, Bald Eagle, Golden Eagle). Some species have fairly large distributions; an example is the Northern Spotted Owl which is found on both slopes of the Cascade Range and the Olympic Peninsula, but which is now essentially extirpated from southwestern Washington and the Puget Trough. Other well-distributed species include Peregrine Falcon, Bald Eagle, and Western Screech-Owl. Conversely, a number of taxa have extremely limited ranges that are now less than five percent of the land area of Washington: Marbled Godwit, Red Knot, Rock Sandpiper, Sandhill Crane, Slender-billed White-breasted Nuthatch, Snowy Plover, Tufted Puffin, Upland Sandpiper, and Oregon Vesper Sparrow.

Nearly two-thirds of the taxa are commonly associated with three general cover types: 15 species in marine ecosystems, including marine waters (seabirds, waterbirds) and estuaries and beaches (shorebirds); nine species on conifer forest ecosystems (e.g. Spruce Grouse, Band-tailed Pigeon), and nine species in shrub-steppe ecosystems (e.g. Columbian Sharp-tailed Grouse, Burrowing Owl, Sage Thrasher). Other types include grasslands, freshwater, alpine, wetlands, and riparian.

Some avian taxa on the SGCN list are uncommon or rare subspecies or are represented by very small populations. Examples of uncommon or rare subspecies (overall, or the portion of the population that occurs in Washington) include Marbled Godwit, Oregon Vesper Sparrow, Sandhill Crane, Slender-billed White-breasted Nuthatch, and Streaked Horned Lark. Some of these and other taxa populations are very small and may number fewer than 100 individuals in Washington: Great Gray Owl, Oregon Vesper Sparrow, Rock Sandpiper, Sandhill Crane (breeding population), Short-tailed Albatross, Snowy Plover, Upland Sandpiper, and Yellow-billed Cuckoo. The latter two species have been virtually extirpated and neither has been documented breeding in the state for several decades or more and might be "functionally extinct."

**Conservation Concern**

Reasons for concern about the taxa are varied and most taxa are either of concern due to a factor related to habitat or for an unknown reason. Consequently, for a number of species there exists a need to gather basic information that may illuminate the cause for concern. Some reasons for concern include small population size that makes the taxon vulnerable to environmental impacts. Finally, other factors of concern are varied and include human disturbance, effects of oil spills, water management, fire suppression effects and even volcanic activity.  See Table 3-4 for more information on species status and conservation concerns.

**Population Trends**

Population trends of 41 of the 51 avian taxa are either declining (19) or unknown (22).  Four species are thought to have stable populations and six are increasing.  Some of the increasing populations are species that are recovering strongly and will likely be delisted in the future.  Other increasing populations are very small and the perceived increase may in fact reflect influence of other subspecies present in the state (e.g. Marbled Godwit).  Some landbirds impacted by conversion of shrub steppe exhibited declining trends from 1966 to 2013, although recent trends (2003 to 2013) for some were stable.  For these species stability is obviously at a new, lower level of abundance given the reduced carrying capacity of the remaining habitat, and future management will be directed at increasing populations to make them more robust to environmental change.

**Climate Change Considerations**

Many species evaluated as having low or low-moderate overall vulnerability to climate change are generalist species or are highly adaptable (e.g., occur within a range of habitats, including human-altered landscapes); e.g., Bald Eagle, American White and Brown Pelicans, Dusky Canada Goose and Peregrine Falcon.   Species evaluated with moderate-high or high vulnerability (but varying levels of confidence) included: Barrow's Goldeneye, Harlequin Duck, Greater Sage Grouse, Northern Spotted Owl, Sage Thrasher, Sagebrush Sparrow, Red Knot, Spruce Grouse, Surf Scoter, Western Snowy Plover, and White-tailed Ptarmigan.  Birds utilizing higher elevation habitats (e.g., White-tailed Ptarmigan and Spruce Grouse) and sagebrush-obligate species appear more vulnerable.   Coastal species such as Red Knot, Surf Scoter, and Western Snowy Plover exhibit higher vulnerability due to sea level rise impacts on nesting and/or foraging habitat, as well as climate-driven changes in timing mismatches.

**Conservation Success**

Lastly, it is appropriate to mention the species that are doing well.  These taxa are still identified as SGCN because listing status was a criterion used to identify species for the list.  Three species (Bald Eagle, Brown Pelican, and Peregrine Falcon) will have status reviews conducted and if they are formally delisted as expected, they will be removed from the SGCN list.  Other species may be doing well but risks remain or not enough is known about them to justify their removal from the SGCN list at this time.  For example, winter abundance of Marbled Godwit has increased in Washington but subspecies identity of Washington birds is uncertain (one subspecies totals only 2000 globally) and requires clarification.

**Alphabetical List of SGCN Birds**

1. American White Pelican
2. Bald Eagle
3. Band-tailed Pigeon
4. Barrow’s Goldeneye
5. Black Scoter
6. Brown Pelican
7. Burrowing Owl
8. Cinnamon Teal
9. Clark’s Grebe
10. Columbian Sharp-tailed Grouse
11. Common Loon
12. Dusky Canada Goose
13. Ferruginous Hawk
14. Flammulated Owl
15. Golden Eagle
16. Great Gray Owl
17. Greater Sage-grouse
18. Harlequin Duck
19. Lewis’ Woodpecker
20. Loggerhead Shrike
21. Long-tailed Duck
22. Marbled Godwit
23. Marbled Murrelet
24. Mountain Quail
25. Northern Spotted Owl
26. Oregon Vesper Sparrow
27. Peregrine Falcon
28. Purple Martin
29. Pygmy Nuthatch
30. Red Knot
31. Red-necked Grebe
32. Rock Sandpiper
33. Sage Thrasher
34. Sagebrush Sparrow
35. Sandhill Crane (Greater)
36. Short-eared Owl
37. Short-tailed Albatross
38. Slender-billed White-breasted Nuthatch
39. Spruce Grouse
40. Streaked Horned Lark
41. Surf Scoter
42. Tufted Puffin
43. Upland Sandpiper
44. Western Bluebird (W. Wash)
45. Western Grebe
46. Western High Arctic Brant
47. Western Screech Owl
48. Western Snowy Plover
49. White-headed Woodpecker
50. White-tailed Ptarmigan
51. White-winged Scoter
52. Yellow-billed Cuckoo

**Table 3-4: SGCN Birds Summary of Conservation Status**

**Please see Appendix A for a complete discussion of key threats and conservation actions needed for these species**

Please see Section 3.3 at the end of this chapter for an explanation of the terms used in the headings

| BIRD SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **WATERFOWL** | | | | | | |
| Barrow's Goldeneye | None | None | Yes | Low/ declining | High | This sea duck species breeds in Washington, has low population numbers and has been declining in Puget Sound. Sources of impacts have not been clearly identified. |
| Black Scoter | None | None | Yes | Moderate /declining | Moderate-High | This species has undergone significant population declines in Puget Sound. Sources of impacts have not been clearly identified. |
| Cinnamon Teal | None | None | No | Low/Stable | Moderate | Cinnamon Teal is a once fairly common breeding species in Washington that has declined significantly in the past 40 years. |
| Dusky Canada Goose | None | None | No | Low/Stable | Low-Moderate | Habitat changes on the dusky Canada goose breeding grounds on the Copper River Delta, Alaska have led to high predation pressure; combined with losses of wintering habitat in western Washington, these factors are responsible for a long-term population decline for this subspecies. |
| Harlequin Duck | Concern | None | Yes | Low/declining | Moderate-High | Declines in wintering numbers of Harlequin Ducks have occurred on Puget Sound. Sources of impacts have not been clearly identified. |
| Long-tailed Duck | None | None | No | Moderate/ declining | Moderate | This species has undergone significant population declines in Puget Sound. Sources of impacts have not been clearly identified. |
| Surf Scoter | None | None | Yes | Moderate/ declining | Moderate-High | This species has undergone significant population declines in Puget Sound. Sources of impacts have not been clearly identified. |
| White-winged Scoter | None | None | Yes | Low/declining | Moderate-High | This species has undergone significant population declines in Puget Sound. Sources of impacts have not been clearly identified. |
| Western High Arctic Brant | None | None | Yes | Low/stable | Moderate-High | Western High Arctic Brant include a small population which has experienced a long-term decline in numbers. Factors affecting population status and distribution are currently unknown. |
| **UPLAND GAME BIRDS** | | | | | | |
| Greater Sage-grouse | Candidate | Threatened | Yes | Low/stable | High | Greater Sage-grouse require large landscapes of sagebrush steppe, much of which has been degraded, fragmented, or lost. The primary threat is the combined impact of habitat loss, fragmentation, and degradation. |
| Columbian Sharp-tailed Grouse | Concern | Threatened | Yes | Low/declining | Moderate-High | The statewide population of Columbian Sharp-tailed Grouse is distributed in seven subpopulations that are not sustainable. Maintaining the species in Washington will require restoring habitat and increasing populations. |
| Mountain Quail | None | None | Yes | Low/Unknown | Moderate | Populations have declined to very low levels within the native range in Washington. The decline is thought to be due to loss or degradation of dense shrub communities, and hydroelectric and other development in riparian zones. |

| BIRD SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Spruce Grouse | None | None | No | Declining | High | Although a gamebird, the indirect effects of climate change including disease of trees and wildfire, the direct effects of clear-cut timber harvest, and the uncertainty about taxonomy mean that their conservation status is uncertain. |
| White-tailed Ptarmigan | Petitioned | None | No | Low | High | The greatest threat to the long-term survival of ptarmigan populations appears to be climate change, which may lead to a gradual loss of alpine habitats as the treeline moves upward. |
| **MARINE AND WATERBIRDS** | | | | | | |
| American White Pelican | None | Endangered | Yes | Low/increasing | Moderate | The abundance of American White Pelicans in Washington is relatively low and the population is somewhat vulnerable in that nesting is restricted to only one location in Washington. |
| Brown Pelican | Concern | Endangered | Yes | 7-10,000/ increasing | Moderate-High | This species has recovered from its previous population decline and has been federally delisted. This species will undergo a state status review and its SGCN status will be reassessed pending the outcome of that review. |
| Clark's Grebe | None | Candidate | Yes | Low/declining | Moderate | The small breeding population of this species in Washington, which occurs at a small number of Columbia Basin lakes and reservoirs, is strongly impacted by various threats relating to water drawdowns and recreational boating activity. |
| Common Loon | None | Candidate | Yes | Low/stable | Moderate | This species has a small breeding population in Washington. Its overall range has contracted northward. Due to life history and a small population in Washington it is highly vulnerable to impacts if not monitored and managed where appropriate. |
| Marbled Murrelet | Threatened | Threatened | Yes | Low/declining | Moderate-High | Because of its breeding association with old forests, Marbled Murrelet populations have been severely affected by loss of mature and old forest habitat. Food resources in the marine environment may also influence population status. |
| Red-necked Grebe | None | Monitor | Yes | Unknown/ unknown | Moderate-High | Status of this species is unclear. Wintering populations in Washington exhibit ecological traits identified as risk factors for marine birds that occur in the Salish Sea that are declining. |
| Short-tailed Albatross | Endangered | Candidate | No | Rare/increasing | Low-Moderate | The Short-tailed Albatross is vulnerable to extreme reduction and breeding capacity due to about 90% of nesting pairs located in one colony (Torishima Island, Japan). Unintentional bycatch in offshore fisheries is a mortality threat. |
| Tufted Puffin | Concern | Endangered | Yes | Low/declining | Moderate-High | In Washington, this species has experienced an order-of-magnitude population decline in recent decades and has disappeared from more than half of its historical breeding sites. Sources of impacts have not been clearly confirmed. |

| BIRD SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Western Grebe | None | Candidate | Yes | Low/declining | Moderate | The breeding and wintering populations of this species in Washington, which occur in freshwater and marine habitats, respectively, are strongly impacted by different groups of threats, such as fluctuating water levels at breeding sites, disruption of nesting activities, and reductions of prey at overwintering areas in the Salish Sea. |
| **FALCONS, HAWKS, EAGLES** | | | | | | |
| Bald eagle | Concern | Sensitive | Yes | Medium/ increasing | Moderate | This species has experienced recovery as a result of removal of DDT from most of its range. This species will undergo a status review and its SGCN status will be assessed pending the outcome of that review. |
| Ferruginous Hawk | Concern | Threatened | Yes | Low/declining | Low-Moderate | This species is impacted by the loss and fragmentation of shrub-steppe and grasslands from agriculture and residential development and associated declines in distribution and abundance of its primary prey, jackrabbits and ground squirrels. In addition, direct sources of mortality include shooting, electrocution, and collision with wind turbines. |
| Golden Eagle | None | Candidate | Yes | Low/unknown | Moderate-High | This species is of concern due to declines in the distribution and abundance of its primary prey species, jackrabbits and ground squirrels; across its range additional mortality factors include continued exposure to lead in the environment and collisions at wind energy facilities. |
| Peregrine Falcon | Concern | Sensitive | Yes | Low/increasing | Low | This species has experienced a remarkable recovery and the population continues to increase across Washington. This species will undergo a status review and its SGCN status will be assessed pending the outcome of that review. |
| **CRANES** | | | | | | |
| Sandhill Crane (greater) | None | Endangered | Yes | Critical/increasing | Moderate-High | The Washington population of Greater Sandhill Cranes numbers about 80 adult and sub-adult birds, with about 30 breeding pairs. Sandhill Cranes are long-lived, but have a low reproductive rate, and nests are vulnerable to predators, disturbance, and fluctuating water levels. |
| **SHOREBIRDS** | | | | | | |
| Marbled Godwit | None | None | Yes | Low/increasing | Moderate-High | Due to the extremely small size of the *beringiae* subspecies population and the localized area of foraging and roosting in coastal Washington, this species is vulnerable to oil spills or other actions that would degrade or impact its habitat. |
| Red Knot | None | None | Yes | Low/declining | Moderate | Limited information suggests the population has declined; its localized use of food resources in tidal areas along the flyway suggests it will be sensitive to climate change effects. |
| Rock Sandpiper | None | None | Yes | Low/unknown | Low-Moderate | Studies predicting vulnerabilities of Rock Sandpipers to climate change indicate no change in risk associated with wintering and migration habitats; all breeding habitat exists outside Washington State, and does have expected increased risk associated with climate change. |

| BIRD SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Upland Sandpiper | None | Endangered | Yes | Critical/unknown | Moderate-High | Habitat loss most likely contributed to population decline of this species in Washington. Incomplete information on distribution prevents meaningful protection should there be other extant small populations of breeding birds in the state. Lack of records suggests it no longer breeds in Washington. |
| Western Snowy Plover | Threatened | Endangered | Yes | Low/increasing | High | Washington's Snowy Plover population is very small and vulnerable to a variety of impacts such as predation, adverse weather, shoreline modification, dune stabilization, and recreational activities. Due to ongoing conservation efforts, regional and state populations are approaching targets established to indicate recovery. |
| **PIGEONS** | | | | | | |
| Band-tailed Pigeon | None | None | Yes | Low/declining | Low-Moderate | The Band-tailed Pigeon population, which is reliant on upland forests and limited mineral sources in western Washington, has declined due to a combination of factors. |
| **CUCKOOS** | | | | | | |
| Yellow-billed Cuckoo | Candidate | Candidate | Yes | Extirpated/ breeding Critical/migrant | Moderate-High | This species hasn't bred in Washington since about 1940 and has been a very rare migrant and summer resident since then. Recovery efforts are probably best directed at remnant nesting habitats still occupied in the southwest U.S. |
| **OWLS** | | | | | | |
| Burrowing Owl | Concern | Candidate | Yes | Low/declining | Low-Moderate | This species is associated with shrub-steppe and grassland habitats and has experienced a contraction of its range and decline in numbers due to loss of habitat and persecution of mammalian species that provide earthen burrows that owls use. |
| Flammulated Owl | None | Candidate | Yes | Low/unknown | Moderate | Flammulated Owls are probably impacted by habitat loss (and degradation) and fire suppression in dry forest landscapes. |
| Great Gray Owl | None | Monitor | No | Low/unknown | Moderate-High | Little is known about this species, and although impacts and range contraction may have occurred over the last century, current threats and impacts are not understood. |
| Northern Spotted Owl | Threatened | Endangered | Yes | Low/declining | High | Impacts from habitat loss are now exacerbated by effects of competition with Barred Owls for prey and habitat. As the population declines and becomes even smaller, other threat factors may become more relevant. |
| Short-eared Owl | None | None | Yes | Low/unknown | Low-Moderate | This species is thought to be experiencing a range-wide, long-term decline in North America. The primary threat is the combined impact of habitat loss, fragmentation, and degradation. |
| Western Screech Owl | None | None | No | Unknown | Low-Moderate | This species appears to have been impacted by the presence of Barred Owls in western Washington. More information is needed to assess whether its population has declined or if suspected changes reflect only behavioral response to Barred Owls. |

| BIRD SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **WOODPECKERS** | | | | | | |
| Lewis' Woodpecker | None | Candidate | Yes | Low/declining | Low-Moderate | This species may be impacted by habitat loss and effects of fire suppression practices. Salvage harvest of trees in recently-burned forest may preclude or limit breeding in such areas for this fire-dependent species. Historically, breeding records included many areas in western Washington, but there have been no records for decades. |
| White-headed Woodpecker | None | Candidate | Yes | Low/declining | Low-Moderate | White-headed Woodpeckers are probably impacted by habitat loss (and degradation) and fire suppression in dry forest landscapes. |
| **PERCHING BIRDS** | | | | | | |
| Loggerhead Shrike | Concern | Candidate | Yes | Low/stable | Low-Moderate | This species is strongly associated with shrub-steppe in Washington and has likely experienced a population decline in accordance with loss and conversion of shrub-steppe habitat. |
| Oregon Vesper Sparrow | Concern | Candidate | Yes | Low/declining | Moderate | Due to loss and degradation of habitat this subspecies is now in danger of extirpation in Washington. |
| Purple Martin | None | Candidate | Yes | Low/stable | Low-Moderate | The population of Purple Martins in Washington is small and largely dependent on humans to provide nest structures. Consequently, persistence of the population likely requires ongoing human intervention (e.g. erecting and maintaining nest structures). |
| Pygmy Nuthatch | None | Monitor | Yes | Low/unknown | Moderate-High | The Pygmy Nuthatch is dependent on old ponderosa pine forests to provide suitable nesting cavities in dead and decadent trees and a year round food source of pine seed. Historic logging and fire suppression have altered the structure and composition of ponderosa pine forests. |
| Sage Thrasher | None | Candidate | Yes | Low/declining | High | This sagebrush obligate is vulnerable to population declines and range contractions due to loss or degradation of shrub steppe habitat. |
| Sagebrush Sparrow | None | Candidate | Yes | Low/declining | High | The Sagebrush Sparrow is a species of concern because large expanses of big sagebrush, its preferred habitat, have been lost or degraded. |
| Slender-billed White-breasted Nuthatch | Concern | Candidate | Yes | Critical/declining | Low-Moderate | This species is of concern due to its dependence on large, mature oak trees to provide nest cavities and food (mast) and due to the fragmentation of oak tree stands from agriculture and residential development. |
| Streaked Horned Lark | Candidate | Endangered | Yes | Critical/unknown | Moderate-High | The Streaked Horned Lark is a subspecies only found in southwest Washington and western Oregon, with a population estimated at less than 2,000. Primary concerns are loss and degradation of habitat and human-related disturbance and mortality (e.g. mowing of grass) at breeding sites. |
| Western Bluebird – Western Washington | None | Monitor | No | Low/declining | Moderate-High | Declines in recent decades were caused primarily by habitat loss. Recent reintroductions onto San Juan Island may need additional translocations and removal of competitor's nests from nestboxes to be successful. |

### 3.1.3 AMPHIBIANS AND REPTILES

**Amphibians and Reptiles Overview**
Approximately half the amphibian and reptile species native to Washington qualify as Species of Greatest Conservation Need. This includes eight salamanders, four frogs, two toads, four turtles, three lizards and five snakes. These species were generally included as SGCN for one or more of the following reasons; the species is listed in state or federal endangered species programs, only a small number of populations occur in the state, declines have been noted in certain ecoregions of the state, or the species is closely associated with a habitat type in Washington that is declining.

**Distribution**
SGCN amphibians and reptiles occur throughout the state with the exception of the North Cascades, Okanogan Highlands and the Northeast corner. Northern Leopard Frogs, Washington's most imperiled frog, occurred historically in some of these regions but it is now presumed extirpated except in the Columbia Basin near Moses Lake. Leopard Frogs, along with Oregon Spotted Frogs, Western Pond Turtles and Striped Whipsnakes are SGCN because so few populations occur that the persistence of the species in the state is at risk. Oregon Spotted Frogs occur in six watersheds in the Puget Sound Lowlands and southeastern Cascades, Western Pond turtles occur at two sites in Puget Sound and four in the Columbia River Gorge, and Striped Whipsnakes are confirmed extant from only one area of the Columbia Basin.

Nine of the SCGN amphibians and reptiles are included primarily because they are globally rare and/or have small ranges in Washington with specialized habitat requirements. The majority of these species are restricted to streams and seepages in moist coniferous forests and all but two occur in western Washington. Two of the species are Washington endemics: The Olympic Torrent Salamander is found only in the Olympia Peninsula and the Van Dyke's Salamander is found in the Olympic Peninsula, Willapa Hills and Southwest Cascades. Cope's Giant Salamander has a similar distribution to Van Dyke's Salamander and is nearly a Washington endemic with only a small portion of its range in Oregon. The Washington ranges of the Columbia Torrent Salamander and Dunn's Salamander are limited to the Willapa Hills and the Cascade Torrent Salamander and Larch Mountain Salamander occur only in the Southern Cascades and Columbia River Gorge. The Larch Mountain Salamander is closely associated with talus and other rocky habitats and the Rocky Mountain Tailed Frog occurs only in the Blue Mountains. The California Mountain Kingsnake occurs along a 20 mile stretch of the Columbia River Gorge and is isolated from the rest of the species' range by approximately 200 miles.

Six SGCN species are closely associated with shrub-steppe habitat in Washington's Columbia Basin. Today, less than 50 percent of Washington's shrub-steppe remains and much of it is degraded and fragmented. Of the habitat that remains, much of the vegetation has been altered by historic unsustainable grazing, invasion by exotic plants, and changes in fire frequency and intensity. In some areas of the basin, water withdrawal for agriculture is resulting in loss of surface water. Consequently, the amphibian and reptile species closely associated with shrub-steppe habitat may be at risk for declines. These species include Tiger Salamander, Woodhouse's Toad, Pygmy Horned Lizard, Sagebrush Lizard, Side-blotched Lizard, and Desert Nightsnake. With the exception of the nightsnake, these species can be common where they occur but all may experience local declines if the trend toward habitat loss and degradation continues. Tiger Salamanders, Pygmy Horned Lizards, and Desert Nightsnakes are found throughout the Columbia Basin. Woodhouse's Toads are found only along the Snake River and portions of the Columbia River. Side-blotched Lizards are limited primarily to the central Columbia Basin. Sagebrush Lizards are associated with inland sand dunes in Washington and more than 70 percent of this habitat has been lost since the 1970s. While the Western Toad and Columbia Spotted Frog have large ranges in Washington and remain common in many places, they are SCGN because of regional declines. The Western Toad was once common in the lowland Puget Sound but now is relatively rare and has declined in the lower Columbia River Gorge. The concern for the Columbia Spotted Frog is in the Columbia Basin where the species appears to have been extirpated from the central basin and is declining from other areas within shrub-steppe habitat.

Current information available in the WDFW database regarding Ring-necked Snakes and Sharp-tailed Snakes suggest these species have limited distributions in Washington and are patchy on the landscape. However, finding Ring-necked Snakes and Sharp-tailed Snakes is challenging due to their small size and secretive habits including activity that takes place within and under surface litter, woody debris, and below ground. Consequently, it is possible that they are more common than current information indicates. More surveys targeted specifically for these species are needed to better understand their status.

Sea turtles are occasional visitors to Washington's outer coastal waters and all have Federal Endangered or Threatened status. Leatherback Sea Turtles are adapted to colder waters and may occur in Washington waters more than is currently recognized.

**Population Sizes and Trends**
For SCGN amphibians and reptiles, the population sizes are almost never known with the exception of the rarest species such as the Oregon Spotted Frog and Western Pond Turtle that are intensely monitored. Even for these species, estimating population size can be challenging. Many amphibian and reptiles species can be difficult to find even when common because they spend so much time inactive below the surface. For some species, such as the Torrent Salamanders, they can be common to abundant where they occur, but they have limited distributions and highly specific habitat requirements that make them vulnerable to habitat disturbance or alteration. Therefore, for most species the trend is unknown. Where trend is indicated, it is based on factors such as documented loss of habitat or populations. With population trends unknown for almost all the amphibian and reptile species, this information represents a clear need for future inventory, monitoring and research efforts. See Table 3-5 and 3-6 for more information about species status and conservation concerns.

**Conservation Concern**
The main threat to SGCN amphibians and reptiles is the loss, fragmentation, and degradation of habitat. An assessment by the International Union for Conservation of Nature (IUCN) found the number of amphibian species impacted by habitat loss and degradation to be almost four times greater than the next most common threat evaluated. Consequently, addressing habitat loss and degradation is paramount for conserving these species and highlighted in our conservation actions. The small size of these animals prevents them from dispersing long distances to find new suitable habitat. Many species have a strong association to certain habitat features such as breeding ponds and overwinter sites (*e.g.,* snake dens) that they return to annually. The fidelity to these sites and, perhaps, the scarcity of these unique habitat features, prevents them from leaving areas even if their habitat is degraded. When they do attempt to disperse, they encounter many barriers such as roads.

Some species, such as Western Pond Turtles, require occasional habitat disturbance to provide open sunny areas for basking and nesting. Many of the natural disturbance processes that set back plant succession, such as fires, have been altered in modern times and are either less frequent or more intense than in the past. Invasive plant species are another major issue because these plants can completely alter the vegetation structure and plant species composition; reed canarygrass and cheatgrass are particularly problematic. Many SCGN species are also threatened by non-native predatory animals such as American Bullfrogs and predatory fish. Most of Washington's native amphibians do not have strong defense mechanisms against these species or the diseases they carry. In the case of Washington's endangered Western Pond Turtles, hatchlings are small enough that bullfrogs eat them. Where there are high densities of bullfrogs and small numbers of Western Pond Turtles, bullfrog predation can reduce natural recruitment of young Western Pond Turtles to almost zero.

**Other Issues**

The fact sheets presented in Appendix A highlight threats that are known -- of these, habitat loss and degradation are by far the greatest threat. Less is known about how a number of other threats may be impacting SGCN amphibians and reptiles. These threats and stressors include but are not limited to 1) pollution and chemical contaminates including herbicides, pesticides, fungicides, nitrogen fertilizers and heavy metals, 2) increasing ambient levels of UV-B radiation, and 3) impacts from climate change. The relevance and intensity of these stressors vary in space and time as do the tolerances of different species and populations.

Emerging diseases caused by viruses, fungi, bacteria and protozoans are a relatively new issue and one of growing concern for both amphibians and reptiles. Emerging diseases are those diseases that have increased in occurrence or range, have become more virulent, have shifted to new hosts or have recently evolved new strains. An example is chytridiomycosis caused by the chytrid fungus Batrachochytrium dendrobatidis (Bd). This emerging disease has had severe impacts on amphibian populations around the world including mass mortality events in the Americas, Australia and elsewhere. It is the first emerging disease known to cause decline or extinction in hundreds of species that otherwise were not threatened.

It is difficult to predict how a species or population will respond to an emerging disease. For chytridiomycosis, susceptibility varies by species with frogs affected to a greater extent than salamanders. Certain microhabitat thermal conditions appear to play a role. Frogs that live at higher elevations and are associated with permanent water, particularly streams, appear to be most susceptible. Some frog species are much less susceptible and may act as carriers including species that occur in Washington such as the native Northern Leopard Frog and Pacific Treefrog and the non-native but wide-spread American Bullfrog and the newly detected African Clawed Frog. Oregon Spotted Frogs also have been found to be resistant to mortality from chytrid. Resistance to chytrid may be conferred by genetically-based immune differences, anti-microbial skin flora or behavior that favors warmer and/or drier conditions that help clear the infection.

**Alphabetical List of Reptiles**

1. California Mountain Kingsnake
2. Desert Nightsnake
3. Green Sea Turtle
4. Leatherback Sea Turtle
5. Loggerhead Sea Turtle
6. Night Snake
7. Ringneck Snake
8. Sagebrush Lizard
9. Sharp-tailed Snake
10. Pygmy Horned Lizard
11. Side-blotched Lizard
12. Striped Whipsnake
13. Western Pond Turtle

**Alphabetical List of Amphibians**

1. Cascade Torrent Salamander
2. Columbia Spotted Frog
3. Columbia Torrent Salamander
4. Cope's Giant Salamander
5. Dunn's Salamander
6. Larch Mountain Salamander
7. Northern Leopard Frog
8. Olympic Torrent Salamander
9. Oregon Spotted Frog
10. Rocky Mountain Tailed Frog
11. Tiger Salamander
12. Van Dyke's Salamander
13. Western Toad
14. Woodhouse's Toad

**Table 3-5: SGCN Amphibians Summary of Conservation Status**

**Please see Appendix A for a complete discussion of key threats and conservation actions needed for these species**

Please see Section 3.3 at the end of this chapter for an explanation of the terms used in the headings

| AMPHIBIAN SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **SALAMANDERS** | | | | | | |
| Tiger Salamander | None | Monitor | No | Medium/ unknown | Moderate-High | The Washington status is based on the small number of populations, a range that is restricted to a region that has been heavily altered, and a lack of information about this species. Of greatest concern is the drastic decline in stream flows and water body volume in much of Lincoln County and adjacent portions of Grant and Adams Counties caused by water withdrawal for agriculture. Larger remaining water bodies may not be suitable habitat because they may contain introduced predatory fish that eat larval salamanders. |
| Cope's Giant Salamander | None | Monitor | No | Unknown/ probably stable | High | The main concerns for this species have to do with protection of stream integrity. Activities that alter the integrity of small and medium-sized forested streams are of concern, especially those actions that increase water temperature and sedimentation. Sedimentation is particularly problematic in low-gradient streams, as increased silt deposition may fill crucial microhabitats such as the spaces between rocks and logs that are used as sheltering, hiding and nesting sites. |
| Cascade Torrent Salamander | None | Candidate | Yes | Medium/ unknown | High | This species is sensitive to temperature variation and increased sedimentation that may be caused by disturbances such as logging and road construction. Some populations are isolated by surrounding areas of unsuitable habitat and are vulnerable to extirpation through stochastic events exacerbated by habitat loss. Temperature sensitivity and limited dispersal ability makes this species potentially sensitive to climate change. |
| Columbia Torrent Salamander | None | Monitor | No | Medium/ unknown | High | The Washington status is based on the small global range, narrow environmental specificity and the potential concern that the species' headwater habitat may not be fully protected. In Washington, some occurrences are in protected areas (e.g., Natural Area Preserves) and some riparian habitat protections occur through forest practices rules and Habitat Conservation Plans. The temperature sensitivity limited dispersal ability makes this species potentially sensitive to climate change. |

| AMPHIBIAN SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Olympic Torrent Salamander | None | Monitor | No | Medium/ unknown | High | The status is based on the small global range (Washington endemic) and narrow environmental specificity. Most known occurrences (77 percent) are within Olympic National Park with an additional 15 percent of locations on the Olympic National Forest. National Forest occurrences are within Late-Successional Reserves and Adaptive Management Areas that provide some level of riparian habitat protection. Occurrence in landscapes with more intact, mature habitat with legacy structures (e.g., coarse woody debris) will likely buffer some impacts of climate change for this temperature-sensitive, species with limited dispersal ability. |
| Dunn's Salamander | None | Candidate | Yes | Low/stable | Moderate-High | The Washington status is based on the small state range, narrow environmental specificity and concern that riparian habitats the species relies upon may not be fully protected. The need for retention of large woody debris is also of concern. |
| Larch Mountain Salamander | None | Sensitive | Yes | Low/unknown | High | The status is based on the small global range, narrow environmental specificity and concern that there is not adequate protection for this species' specialized habitat of rocky accumulations and talus. Any ground-disturbing activity or land use that changes the moisture regimes and permeability of inhabited rocky substrates, such as over-story tree removal and gravel removal, may threaten populations. In addition, the sedentary habits and specific habitat requirements likely hinder dispersal and colonization to new areas as well as limiting gene flow between populations. |
| Van Dyke's Salamander | None | Candidate | Yes | Low/unknown | High | Van Dyke's Salamander is one of relatively few vertebrate species endemic to Washington. It is at risk due to its limited distribution and apparently small, isolated populations. |
| **TOADS** | | | | | | |
| Western Toad | None | Candidate | Yes | In lowland Puget Sound: unknown | Moderate | In Washington, Western Toad declines have been documented in the Puget Trough and the lower Columbia River below Bonneville Dam. Of about 107 historical sites in those areas, only about 19 are thought to still remain. Elsewhere in the state, toads are locally common in many areas. |
| Woodhouse's Toad | None | Monitor | No | Unknown/ unknown | Moderate-High | The Washington State status is based on the small number of populations, a limited distribution restricted to shrub-steppe habitat in a region heavily altered for agriculture and urban development (e.g., Tri-Cities area), and a lack of information about the species. |
| **FROGS** | | | | | | |
| Rocky Mountain Tailed Frog | None | Candidate | Yes | Low/ unknown | Moderate-High | This species is vulnerable to management practices that alter the riparian or aquatic zones of streams, especially those practices that change the moisture regime, increase sediment load, reduce woody debris input and change stream bank integrity. Protection of headwater streams is particularly important. |

| AMPHIBIAN SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Columbia Spotted Frog | None | Candidate | Yes | In Columbia Basin: Low/ unknown | Moderate-High | Populations of this species in the Columbia Basin are declining, likely due primarily to habitat loss and alteration, although other factors such as fish stocking may also cause declines. This species is aquatic, so drying of ponds and creeks related to agricultural water withdrawals is a threat in the region. |
| Oregon Spotted Frog | Threatened | Endangered | Yes | Low/declining | Moderate-High | The Washington State status is based on the rarity of the species. Human-caused stressors include wetland loss and alteration, loss of disturbance processes that set back succession, introduction of non-native/invasive flora and fauna and alteration of creek and river channels. Only six watersheds are currently known to be occupied in Washington. Within a watershed, most breeding populations are small and many are isolated from other breeding populations. They require breeding sites in shallow water with short vegetation and full sun exposure. This habitat type is rapidly lost to invasive grasses without management such as grazing, haying, mowing or restoration to native flora. |
| Northern Leopard Frog | None | Endangered | Yes | Low/ declining | Moderate-High | Only one known population remains in Washington; there is limited information about population status and trends; efforts are underway to determine the feasibility of translocations to portions of the former range. |

## Table 3-6: SGCN Reptiles Summary of Conservation Status

| REPTILE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **TURTLES** | | | | | | |
| Green Sea Turtle | Threatened | Threatened | No | Low/unknown | Moderate | A rare visitor off the outer Washington coast, this declining species is threatened by a number of factors occurring primarily outside of the state. However, issues related to consumption of plastic pollution could be addressed in Washington. |
| Leatherback Sea Turtle | Endangered | Endangered | No | Low/unknown | Moderate | This declining species, which may occur more regularly off the outer Washington coast than previously known, is threatened by numerous factors happening primarily outside of the state. However, issues related to oil spills and fishing gear entanglement as well as consumption of plastic pollution could be addressed in Washington. |
| Loggerhead Sea Turtle | Endangered | Threatened | No | Low/unknown | Moderate | A very rare visitor off the outer Washington coast, this declining species is threatened by factors occurring primarily outside of the state. However, issues related to consumption of plastic pollution could be addressed in Washington. |
| Western Pond Turtle | In review | Endangered | Yes | Low/increasing | Moderate | In the 1990s, only two populations remained in the Columbia River Gorge with estimates of less than 200 individuals. Because of recovery efforts, currently there are six populations with approximately 800 turtles. Many issues remain for the recovery of this species. Habitat must be managed to |

| REPTILE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| | | | | | | prevent invasive weeds from overgrowing the nesting areas. Predation by non-native American Bullfrogs on hatchlings, as well as mammalian predation on nests, prevents natural recruitment of hatchlings at many sites. Disease has emerged as a major concern in recent years due to the discovery that a substantial number of turtles have ulcerative shell disease. The cause of the disease is under investigation but is not yet known. |
| **LIZARDS** | | | | | | |
| Pygmy Horned Lizard | None | Monitor | No | Medium/ unknown | Moderate-High | The conservation concern for this species is because its distribution is primarily restricted to the highly altered and fragmented shrub-steppe in Eastern Washington. |
| Sagebrush Lizard | None | Candidate | Yes | Low/declining | High | The Washington status is based on the species' obligate association with sand dunes in the Columbia Basin where greater than 70 percent of this habitat type has been lost since the 1970s. |
| Side-blotched Lizard | None | None | No | Medium/ unknown | Moderate-High | The Washington State status is based on the small number of populations and a distribution that is restricted to the heavily altered shrub-steppe of Eastern Washington. |
| **SNAKES** | | | | | | |
| California Mountain Kingsnake | None | Candidate | Yes | Low/unknown | Low-Moderate | In Washington, occurs at the northern extreme of its range and the population is isolated from the rest of its range by approximately 200 miles. The species' range in Washington is small with few individuals documented. They occur in the Columbia River Gorge in an area of the state that is highly desirable and is likely to see increased development and vehicular traffic over the next decade. |
| Desert Nightsnake | None | Monitor | No | Medium/ unknown | Moderate-High | The Washington State status is based on a distribution that is primarily restricted to the shrub-steppe vegetation that has been heavily altered in Washington. |
| Ring-necked Snake | None | Monitor | No | Unknown/ unknown | Low-Moderate | The Washington State status is based on the small number of observations, patchy distribution and lack of information. Some of the distribution is in the Columbia Basin, a heavily altered region of the state. |
| Sharp-tailed Snake | None | Candidate | Yes | Low/unknown | Moderate | The Washington status and concern is based on the small number of populations, patchy distribution and lack of information. |
| Striped Whipsnake | None | Candidate | Yes | Low/declining | Moderate | The Washington status is based on the small number of populations. Currently only two populations are verified extant. Threats include conversion of habitat to agriculture, degradation of native shrub-steppe habitat from irrigation water and invasive weeds, basalt mining, single home construction and increasing vehicular traffic on roads and highways that bisect the occupied areas. |

### 3.1.4 FISH

**Fish Overview**
There are 51 fish species or species units included on Washington's SGCN list. A species unit is an "evolutionarily significant unit" (ESU) or a "distinct population segment" (DPS) designated by NOAA-National Marine Fisheries Service and the U.S. Fish and Wildlife Service, respectively, as entities of a taxonomic species for ESA-listing purposes, or is a geographically designated population grouping (e.g., bull trout-coastal recovery unit). The 18 exclusively marine species represent about 7.5 percent of Puget Sound-area marine fishes or about 4.5 percent of marine fishes in all of Washington's marine waters. Of about 50 native freshwater and anadromous (freshwater and marine phases) fishes in Washington, the number of taxonomic species (22) on SGCN list represent 44 percent of these. Rockfish (genus *Sebastes*) and Pacific salmon and steelhead (genus *Oncorhynchus*) form about half of the SGCN list, but species diversity ranges from the Olympic Mudminnow (a Washington freshwater endemic) to the Bluntnose Sixgill Shark. Distribution of these fishes ranges from Pacific coastal waters to mountain streams of the interior Columbia Basin. Threats in common across a broad diversity of SGCN fishes include habitat loss and degradation from land and water uses, lack of abundance trend data, unintentional over-harvesting, and passage barriers due to dams, road crossings, diking, and other artificial structures. Many of these threats will be exacerbated by long-term climate change.

**Distribution**
Of the 18 SGCN species that live exclusively in marine environments, seven occur only within the confined marine waters of the Salish Sea (Puget Sound, Strait of Juan de Fuca, and Strait of Georgia). The other marine fishes and the anadromous fishes occur in these waters and in the Pacific Ocean. Most of the anadromous salmonids have a large Pacific Ocean range during marine phases of their life histories. In freshwater, anadromous fishes generally have well-defined spawning distributions, but rearing distributions may range more widely. Migration corridors between marine and freshwater habitats are essential elements of anadromous fishes' natural distributions, and include vital estuarine habitats. Due to their varied life histories, anadromous fishes are present year-round in freshwater habitats. Of the 13 exclusively freshwater SGCN species (including the non-anadromous salmonid species), eight occur only east of Cascades Mountains crest in Columbia Basin streams and lakes. Only two of the exclusively freshwater fishes (Olympic Mudminnow and Salish Sucker) do not occur in the Columbia Basin. Several freshwater species have relatively small or limited distributions in Washington.

**Abundance Status - Size and Trends**
Quantitative abundance and trend data for many SGCN fish species are lacking. Current population or unit size was unknown for 49 percent of the species, and abundance trend was unknown for 59 percent of the species. In many cases, information used to judge abundance status is qualitative, based on fishery-dependent data, or based on few, short-term surveys. Data insufficiency is considered a conservation threat for many SGCN fishes. Of the seven marine fish with abundance status ratings, five were rated at critical and two were rated at low abundances, and trends were rated as stable. All of the ESA-listed anadromous salmonids have long-term abundance data to assess status. For abundance ratings, 11 were low and three were medium; for trend ratings, two were declining, seven were stable, four were increasing and one was unknown. Only one of the freshwater species (Westslope Cutthroat Trout) was rated, and it had medium abundance and stable trend. Acquiring quantitative data for SGCN species is an action that will clearly benefit the design and evaluation of conservation actions.

**Conservation Concerns**
To effectively conserve SGCN fish we must attend to multiple sources of habitat degradation and loss. For many of the marine species, we need to curtail the loss of and restore degraded nearshore breeding and

rearing habitats, such as spawning beaches for herring, sand lance, surf smelt, eelgrass and algal habitats. In Puget Sound, residential and industrial shoreline uses and development that reduces and degrades marine habitats and water quality require management by multiple jurisdictions. In freshwater environments, we need to continue mitigation and elimination of impacts from dams, culverts, road crossings, and other instream modifications. Dams pose threats to all anadromous and some freshwater species by reducing, fragmenting, and modifying river habitats and by altering natural flow regimes and water quality. Dams may still impede juvenile and adult passage even where artificial passage has been constructed. Agricultural, urban, residential and commercial (e.g., forestry) land-uses have removed, modified, or degraded estuarine, floodplain, riverine, riparian, and wetland habitats essential to anadromous and freshwater fishes. Restoration of these habitats must continue in order to improve abundance, productivity and persistence of numerous SGCN. Threats from habitat loss and degradation are intensified for species with small or restricted ranges such as Olympic Mudminnow, Margined Sculpin, Salish Sucker, and Burbot. See Table 3-7 for more information on species status and conservation concerns.

For anadromous salmonid SGCN, hatchery production and hatchery-origin fish pose several kinds of threats to natural populations. Management of these risks is on-going and must continue in order to meet ESA-related recovery goals. For many SGCN fish species, mortality due to fishery-related impacts (unintentional or incidental catch, illegal harvest) is a threat that continues to need direct management and public education. The freshwater salmonid species continue to face threats from interbreeding with hatchery bred and released non-native salmonids. Invasive non-native freshwater fishes pose competition and predation threats to various SGCN species, especially those with limited native ranges (e.g., Pygmy Whitefish). Lack of data, such as on abundance, distribution, breeding habitats and/or viability status, is considered a threat for many SGCN species and will require significant investment to rectify.

**Conservation Success**

The status of Hood Canal Summer Chum Salmon ESU has improved considerably since ESA-listing in 1999. Threat reduction actions, such as eliminating excessive harvest, and supplementing natural production by short-term hatchery propagation, both of which began prior to ESA-listing, have led to large increases in abundance for the ESU’s two independent populations. Re-introductions of chum to rivers that historically had sub-populations have occurred and continue to be monitored. Improvements to spawning and rearing habitats also have been made. Overall viability conditions are at a relatively high level.

**Alphabetical list of Fish SGCN**

1. Bluntnose Sixgill Shark
2. Bocaccio (Puget Sound/Georgia Basin DPS)
3. Broadnose Sevengill shark
4. Brown rockfish
5. Bull Trout - Coastal Recovery Unit
6. Bull Trout - Mid-Columbia Recovery Unit
7. Burbot
8. Canary Rockfish (Puget Sound/Georgia Basin
9. China Rockfish
10. Columbia River Chum Salmon ESU
11. Copper Rockfish
12. Eulachon (southern DPS)
13. Green Sturgeon (southern DPS)
14. Greenstriped Rockfish
15. Hood Canal Summer Chum Salmon ESU
16. Inland Redband Trout (landlocked populations)
17. Lake Chub
18. Leopard Dace
19. Lower Columbia Chinook Salmon ESU
20. Lower Columbia Coho ESU
21. Lower Columbia Steelhead DPS
22. Margined Sculpin
23. Middle Columbia Steelhead DPS
24. Mountain Sucker
25. Olympic Mudminnow
26. Ozette Sockeye ESU
27. Pacific Cod (Salish Sea population)
28. Pacific Hake (Georgia Basin DPS)
29. Pacific Herring (Georgia Basin DPS)
30. Pacific Lamprey
31. Pacific Sand Lance
32. Puget Sound Chinook Salmon ESU
33. Puget Sound Steelhead DPS
34. Pygmy Whitefish
35. Quillback Rockfish
36. Redstripe Rockfish
37. River Lamprey
38. Salish Sucker
39. Snake River Spring/Summer Chinook Salmon
40. Snake River Basin Steelhead DPS
41. Snake River Fall Chinook Salmon ESU
42. Surf Smelt
43. Tiger Rockfish
44. Tui Chub
45. Umatilla dace
46. Upper Columbia River Spring Chinook Salmon
47. Upper Columbia Steelhead DPS
48. Walleye Pollock (South Puget Sound)
49. Westslope Cutthroat Trout
50. White Sturgeon (Columbia River)
51. Yelloweye Rockfish (Puget Sound/Georgia

**Table 3-7: SGCN Fish Summary of Conservation Status**

**Please see Appendix A for a complete discussion of key threats and conservation actions needed for these species**

Please see Section 3.3 at the end of this chapter for an explanation of the terms used in the headings

| FISH SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **MARINE FISH** | | | | | | |
| Bluntnose Sixgill Shark | None | None | No | Unknown/ unknown | Moderate | This is a large and long-lived species that uses Puget Sound as a nursery/pupping ground. Relatively little is known about their life history, population structure, or abundance trend. |
| Broadnose Sevengill Shark | None | None | No | Unknown/ unknown | Moderate | Abundance estimates are data deficient for the population known to occur in Washington waters. Willapa Bay may be critical habitat for breeding and seasonal feeding grounds. |
| Bocaccio – Puget Sound/Georgia Basin DPS | Endangered | Candidate | Yes | Critical/ unknown | Moderate-High | Bocaccio once supported a commercial set-net fishery in south Puget Sound but catches declined precipitously in the 1990s. Bocaccio are now rarely encountered, and abundance is considered at a critical level. |
| Brown Rockfish | None | Candidate | Yes | Unknown/ unknown | Moderate-High | A complete population assessment for this species is limited due to their wide distribution in Puget Sound and nearshore coastal habitats. They have been encountered rarely during WDFW Remotely Operated Vehicle (ROV)-based surveys (approximately 25 individuals between 2004 and 2014). |
| Canary Rockfish – Puget Sound /Georgia Basin DPS | Threatened | Candidate | Yes | Low/ unknown | Moderate-High | The species has been declared overfished along the entire West Coast of North America and this DPS's Threatened status is due to severely reduced populations in Puget Sound and Georgia Basin. |
| China Rockfish | None | Candidate | Yes | Unknown/ unknown | Moderate-High | China Rockfish population status is unknown, early life history is especially poorly understood, and relatively few are landed in the coastal recreational fishery. |
| Copper Rockfish | None | Candidate | Yes | Critical/stable | Moderate-High | A complete assessment for this species is limited due to their wide distribution in Puget Sound and nearshore coastal habitats. In a 2008 San Juan Islands survey, they were most abundant rockfish species encountered, other than Puget Sound rockfish. Overall, populations have declined recently. |
| Greenstriped Rockfish | None | Candidate | Yes | Unknown/unknown | Moderate-High | Abundance and distribution of this species are poorly known. A status assessment of Greenstriped Rockfish in Puget Sound concluded that federal ESA listing was not warranted. |
| Quillback Rockfish | None | Candidate | Yes | Critical/stable | Moderate-High | This species is currently considered depleted in both North and South Puget Sound, though increased fishery regulations and reductions in harvest have produced an increasing abundance trend in some areas. |

| FISH SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Redstripe Rockfish | None | Candidate | Yes | Unknown/ unknown | Moderate-High | Abundance and distribution of this species is poorly known. A 2010 status assessment of Redstripe Rockfish in Puget Sound concluded that federal ESA listing was not warranted. |
| Tiger Rockfish | None | Candidate | Yes | Unknown/ unknown | Moderate-High | Tiger Rockfish population size and structure in Washington waters are unknown, early life history is poorly understood, individuals of all life history stages are rare in WDFW ROV surveys, and none have been captured in WDFW trawl surveys. |
| Yelloweye Rockfish – Puget Sound/Georgia Basin DPS | Threatened | Candidate | Yes | Critical/unknown | Moderate-High | The species is declared overfished along the entire West Coast and has ESA Threatened status due to severely declining populations in Puget Sound and Georgia Basin. |
| Pacific Cod – Salish Sea Population | None | Candidate | Yes | Unknown/ unknown | Moderate-High | Abundance and distribution patterns of Pacific Cod in Washington waters are incompletely known. Historic over-harvest has led to dramatic declines in encounter rate and the curtailment of both commercial and recreational fisheries. |
| Pacific Hake – Georgia Basin DPS | None | Candidate | Yes | Unknown/ stable | Low-Moderate | Pacific Hake populations in Puget Sound have not been assessed in over a decade, but prior to this time a marked decline was observed, resulting in cessation of commercial fisheries. |
| Pacific Herring – Georgia Basin DPS | Not Warranted | Monitor | Yes | Critical/stable | Moderate | A 2006 status assessment determined that ESA listing was not warranted. However, the Cherry Point stock is at critically low abundance, the Squaxin Pass stock is stable, and abundance of all other stocks has fluctuated substantially since the 1970s but exhibits a slight downward trend. |
| Pacific Sand Lance | None | None | Yes | Unknown/ unknown | Moderate-High | Pacific Sand Lance abundance and distribution in Washington are almost completely unknown. The species is ubiquitous in beach seining surveys but difficult to capture with most traditional sampling methods. |
| Surf Smelt | None | None | Yes | Unknown/ unknown | Moderate-High | Surf smelt abundance and distribution in Washington are almost completely unknown. The species is ubiquitous in beach seining surveys but has not been sampled comprehensively due to lack of funding and personnel. |
| Walleye Pollock – South Puget Sound | None | Candidate | Yes | Low unknown | Moderate | Walleye Pollock abundance and distribution in South Puget Sound are incompletely known. Declines in encounter rate have led to increased fishery regulation and decreased harvest in recent years, especially in southern Puget Sound. |
| **ANADROMOUS FISH – NON-SALMONIDS** | | | | | | |
| Eulachon – Southern DPS | Threatened | Candidate | Yes | Highly variable/ highly variable | Moderate-High | A complete population assessment for this species is unavailable but precipitous declines in spawner abundance in the Fraser and Columbia Rivers led to the Southern DPS being ESA-listed in 2010. |

| FISH SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Pacific Lamprey | None | Monitor | Yes | Unknown/ unknown | Moderate-High | The declining status of Pacific Lamprey led to a west coast-wide joint tribal/federal/state “Pacific Lamprey Conservation Initiative”. Limiting factors include passage obstruction and mortality at mainstem dams and tributary water diversion dams and intakes, and low abundance in upper Columbia. |
| River Lamprey | None | Candidate | Yes | Unknown/ unknown | Moderate-High | Abundance and distribution information is inadequate for status assessment. Breeding and rearing freshwater habitats are likely at risk throughout much of distribution from land-use degradation; dams and other passage barriers (e.g., culverts) impede or prevent migration. |
| Green Sturgeon – Southern DPS | Threatened | None | Yes | Medium/ declining | Moderate | Southern DPS Green Sturgeon has one spawning population with multiple habitat-related threats, and juvenile production may be declining. Harvest-related risks and estuarine degradation are threats in Washington. |
| White Sturgeon – Columbia River | None | None | Yes | Low to abundant/ declining to stable | Moderate | Although stable and numerous in lower Columbia River, they are increasingly rare upstream. Dams impede and prevent passage and have negatively impacted spawning habitat. |
| **SALMONIDS** | | | | | | |
| Lower Columbia River Chinook Salmon ESU | Threatened | Candidate | Yes | Low/stable | Moderate-High | Overall, this ESU is at substantial risk because of very low natural-origin spawner abundance, high hatchery fraction, habitat degradation, and harvest impacts. |
| Puget Sound Chinook Salmon ESU | Threatened | Candidate | Yes | Low/stable | Moderate-High | All populations in ESU are well below recovery plan target ranges for spawner levels. Risk factors are still present, including high fractions of hatchery fish and widespread habitat loss and degradation. |
| Upper Columbia River Spring Chinook ESU | Endangered | Candidate | Yes | Low/stable | Moderate-High | Although there have been increases in natural-origin spawner abundance, average productivity levels remain extremely low. Risks due to relatively high percent of hatchery-origin fish on spawning grounds, habitat degradation, and dam impacts are major concerns. |
| Snake River Fall Chinook Salmon ESU | Threatened | Candidate | Yes | Medium/ increasing | Moderate-High | This ESU includes one extant population. Abundance has improved substantially since ESA-listing, however hatchery-origin spawner proportions are high and dams continue to compromise habitat. |
| Snake River Spring/Summer Chinook Salmon ESU | Threatened | Candidate | Yes | Low/ increasing | Moderate-High | The entire ESU is rated at high extinction risk. Besides low abundance, risks due to percent of hatchery-origin fish on spawning grounds, habitat degradation, and dam impacts are major concerns. |
| Columbia River Chum Salmon ESU | Threatened | Candidate | Yes | Low/declining | Moderate | After near extirpation, abundance of this ESU remains very low, and extinction risk was rated very high. |

| FISH SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Hood Canal Summer Chum Salmon ESU | Threatened | Candidate | Yes | Medium/ increasing | Moderate-High | Abundance has improved significantly since time of ESA-listing, but viability conditions have not been met completely. Evaluation of efficacy of habitat improvements and reintroductions is needed. |
| Lower Columbia Coho ESU | Threatened | None | Yes | Low/ unknown | Moderate-High | Washington coho populations in this ESU are dominated by hatchery-origin spawners, are not demonstrably self-sustaining, and considered at very high extinction risk. |
| Ozette Sockeye ESU | Threatened | Candidate | Yes | Low/stable | Moderate | Ozette Sockeye are at very low abundance compared to historic condition, and quantity and quality of adequate lake beach spawning habitat may be declining. |
| Lower Columbia Steelhead DPS | Threatened | Candidate | Yes | Low/stable | Moderate-High | Most populations are rated at high or very high extinction risk, and dams block several large areas of historic range. Habitat degradation and hatchery-related impacts are other limiting factors. |
| Middle Columbia Steelhead DPS | Threatened | Candidate | Yes | Intermediate/stable | Moderate | Many populations are rated at high extinction risk. Dams impede passage and reduce or modify access to large areas of historic range, and other habitat degradation limits distribution and productivity. |
| Puget Sound Steelhead DPS | Threatened | None | Yes | Low/declining | Moderate-High | In 2011, most populations showed declining growth rates and extinction risks were relatively high overall, especially for central/south Puget Sound populations. Habitat degradation and poor early marine survival may be impeding productivity. |
| Snake River Basin Steelhead DPS | Threatened | Candidate | Yes | Low/stable | Moderate-High | Extant populations are at moderate to high extinction risk. Dams impede passage, reduce access to large areas of historic range, and limit productivity. Proportions of hatchery-origin spawners are a concern. |
| Upper Columbia Steelhead DPS | Threatened | Candidate | Yes | Low/ increasing | Moderate-High | Extant populations are rated at high extinction risk. Dams impede passage and reduce access to large areas of historic range, and limit productivity. Proportions of hatchery-origin spawners are a concern. |
| Bull Trout – Coastal Recovery Unit | Threatened | Candidate | Yes | Unknown/ unknown | Moderate-High | Many of the Washington core area populations have unknown status. Bull trout face threats from habitat degradation and fragmentation, poor water quality, and introduced non-native fish species. |
| Bull Trout – Mid-Columbia Recovery Unit | Threatened | Candidate | Yes | Unknown/ unknown | Moderate | Many of the Washington core area populations have unknown status. Bull trout face threats from habitat degradation and fragmentation, poor water quality, and introduced non-native fishes. |
| Inland Redband Trout | None | None | Yes | Unknown/ unknown | Moderate-High | Species is widespread, but some populations are at risk from non-native hatchery trout competition and interbreeding. Water quality issues threaten most locations, and barriers fragment populations. |

| FISH SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Westslope Cutthroat Trout | None | None | Yes | Medium/ stable | Low-Moderate | Westslope Cutthroat Trout is stable and abundant in its range, but faces threats to its habitat and threats from genetic introgression. |
| **FRESHWATER FISH** | | | | | | |
| Burbot | None | None | No | Unknown/ unknown | Moderate | Burbot are restricted to only 11 deep, cold-water lakes in Washington. Little is known about abundance, age structure, or productivity of any of the populations. |
| Lake Chub | None | Candidate | Yes | Unknown/ unknown | Moderate | The status of this species is unknown and its major threat is habitat alteration. |
| Tui Chub | None | None | No | Unknown/ unknown | Low-Moderate | This species is confined to a small part of the Columbia Basin and its biggest threat is predation by non-native predators. |
| Leopard Dace | None | Candidate | Yes | Unknown/ unknown | Moderate-High | The status of this species is unknown and it faces threats to its habitat. |
| Umatilla Dace | None | Candidate | Yes | Unknown/ unknown | Moderate | This species' status is unknown and it faces threats from human development and habitat alterations. |
| Olympic Mudminnow | None | Sensitive | Yes | Unknown/ unknown | Moderate | Populations of this endemic species are confined to a very small lowland portion of western Washington and its biggest threat is loss of habitat. |
| Margined Sculpin | None | Sensitive | Yes | Medium/ unknown | Moderate | This species is confined to three rivers in southeastern Washington and faces threats to its habitat. |
| Mountain Sucker | None | Candidate | Yes | Unknown/ unknown | Low-Moderate | The status of this species is unknown and it faces threats to its habitat. |
| Salish Sucker | None | Monitor | No | Unknown/ unknown | Moderate-High | This species is only found in western Washington and faces threats from loss of habitat and degradation to water quality. |
| Pygmy Whitefish | None | Sensitive | Yes | Unknown/ unknown | Low-Moderate | Pygmy Whitefish status in Washington is unknown and it faces threats to habitat and water quality. |

### 3.1.5 INVERTEBRATES

**Invertebrates Overview**

The Species of Greatest Conservation Need (SGCN) list for Washington includes 95 invertebrate taxa; a diverse group that includes butterflies, moths, beetles, bumblebees, stoneflies, dragonflies, caddisflies, terrestrial and freshwater snails and mussels, an earthworm, and a millipede. The increased number of SGCN invertebrates since 2005, reflects the increased information available for some invertebrate groups, such as terrestrial snails and slugs, and new threats and population declines in others, such as bumblebees. Worldwide, invertebrate species represent about 99 percent of animal diversity. Invertebrates play critical roles in nutrient cycling, soil formation, pollination, seed dispersal, water filtration, and as food for birds, fish, amphibians and reptiles, and bats and other mammals. Some species, such as bees and freshwater mussels and bivalves, are good indicators of environmental quality, the 'canary in the coal mine' that we ignore at our peril. Given their tremendous diversity, ecological importance, restricted species distributions, and vulnerability to pollution and habitat loss, the conservation of invertebrates has been historically underemphasized, and relatively few have received any conservation attention or regulatory protection. Although terrestrial vertebrate extinctions are well documented, invertebrate extinctions often go unnoticed by the general public, by most biologists, and by many conservation agencies.

Some species groups have been severely affected by human activities. For example, North America has a greater diversity of freshwater bivalves than any other region in the world, and an extraordinary number of species are imperiled or extinct as a result of dams, strip-mining, and pollution. In the United States alone, 37 species of freshwater mussels are presumed extinct. Though Washington has few freshwater bivalve species, it hosts a high diversity of slugs and terrestrial snails, as well as insects associated with mountain streams. In addition to the taxa recognized in this list, there are groups, such as native earthworms, that likely contain additional taxa at risk that may need to be added to the SGCN list in the future, but information is generally insufficient to evaluate at this time.

**Distribution**

Many of the SGCN invertebrates have very limited distributions. Some species have very special ecological requirements, such as stonefly species only found in alpine springs and seeps, and some snails are associated with lowland forest with old Big-leaf Maples and hardwood debris. Other species may have become differentiated from related taxa in place and never spread very far, while many others were formerly widespread, but only survive in discrete sites where the environment has been less affected by climate and habitat changes since the last glaciation, or land cover changes associated with human activities. For example, species with limited distributions include several snails only known from eastern Chelan County, others only from the Snake River Canyon, and others only from the Columbia Gorge – relative 'hotspots' of endemic snails; some butterflies have declined with their associated prairie habitat, and some freshwater bivalves were eliminated from much of the Columbia and Snake Rivers by dams.

**Populations and Trends**

Almost without exception, there are few data on historical populations of SGCN invertebrates. Population trends are assumed based on loss or degradation of their habitat, and the absence of the species at historical sites. Many of these species have been selected either because their habitat has been reduced dramatically (e.g. west-side prairie, undammed rivers), or because their populations are only found at a few sites that are very vulnerable to land use activities. Some formerly very abundant species are still relatively widespread, but have declined dramatically. For example, freshwater mussels are still abundant in scattered locations, but some of the populations have been unable to reproduce for over 20 years, and will go extinct without substantial improvement in water quality.

**Threats and Conservation Actions Needed**
The major threats to SGCN invertebrates include habitat loss and degradation through siltation and pollution of surface waters, development, unsustainable agricultural and logging practices, wildfires, mining of talus, unsustainable grazing of riparian sites, pesticides, introduced species (diseases, invasive animals, invasive plants), and drying of seeps, springs, and streams with water withdrawals or climate change. Basic information needs are much more often a priority conservation action for invertebrates than for better known vertebrates. Many of these species need additional inventory surveys to more clearly delineate their distribution, or for the rarer taxa, to identify key sites in need of protection. Some of these taxa, though recognized as a unique form, have not yet been formally described and named, and some groups need to be studied to clarify relationships and the number of species present in Washington. Dramatic technological advances in recent years in genetic analysis provide the tools to investigate these questions. The life history of some species, for example some stoneflies, is largely unknown. Some of these investigations are more likely to be done by taxa experts at universities than by WDFW. Addressing these taxonomic, distribution, and life history information needs, will help in the development of management recommendations needed for conservation of these invertebrates. See Table 3-8 for more information on species status and conservation concerns.

While the conservation of so many invertebrate species may seem like a daunting task, the good news is that the conservation of many of these species can be addressed by identifying and protecting the small number of sites where they are found. Protection may require landowner incentive programs, conservation easements, acquisition of water rights, or a management plan for sites on public lands.

**Figure 3-1: Pollination: An Essential Function**

**Pollination:**
**An Essential Function for Ecosystems**

The term 'pollination' encompasses vital relationships between many plants and animals. Around 75% of the world's flowering plants rely on pollinators for an essential act of survival: reproduction. Pollinators include a diverse group of species, from mammals to birds and insects, though the majority are insects: wasps, flies, beetles, ants, bees and others.

The importance of insect pollinators for both natural systems and crops has come to light recently as their vital ecological function has become better understood and as populations of key pollinator species have dramatically declined. The Obama Administration highlighted this situation with a Presidential Memorandum in 2014, directing federal agencies to promote the health of pollinators. As a group, insect pollinators are threatened by many of the same factors as other wildlife species, namely habitat loss and fragmentation, but are also uniquely threatened by disease and exposure to pesticides.

This SWAP includes several key pollinators as SGCN that have information sufficient to document significant declines in abundance and distribution; however, there is a vast number of insect pollinator species in Washington for which little is known. Additional study and action by WDFW and other state, federal, tribal, research institutions, and NGO partners focused on identifying and conserving key pollinator species is an important need for future research to best protect this ecologically and economically important group of animals.

If there is a need in the next 10 years to use State Wildlife Grants to address conservation needs for a species not identified as SGCN, the need could be addressed by working with the USFWS to identify an "emerging issue" to fund work for the new species or habitat.

**Alphabetical list of Invertebrate SGCN**

1. Caddisflies (six taxa included)
7. Mayflies (four taxa included)
11. Noctuid Moths (three taxa included)
14. Ashy Pebblesnail
15. Barren Juga
16. Beller's Ground Beetle
17. Bluegray Taildropper
18. Brown Juga
19. California Floater
20. Cascades Needlefly
21. Chelan Mountainsnail
22. Chinquapin Hairstreak
23. Columbia Clubtail
24. Columbia Oregonian
25. Columbia River Tiger Beetle
26. Crowned Tightcoil
27. Dalles Hesperian
28. Dalles Juga
29. Dalles Sideband
30. Dry Land Forestsnail
31. Giant Palouse Earthworm
32. Great Arctic
33. Hatch's Click Beetle
34. Hoary Elfin
35. Hoder's Mountainsnail
36. Hoko Vertigo
37. Idaho Vertigo
38. Island Marble
39. Johnson's Hairstreak
40. Juniper Hairstreak
41. Leschi's Millipede
42. Limestone Point Mountainsnail
43. Mad River Mountainsnail
44. Makah Copper
45. Mann's Nollusk-eating Ground Beetle
46. Mardon Skipper
47. Masked Duskysnail
48. Meadow Fritillary
49. Mission Creek Oregonian
50. Monarch
51. Morrison's Bumblebee
52. Nimapuna tigersnail
53. Northern (pinto) abalone
54. Northern Forestfly
55. Olympia oyster
56. Olympia Pebblesnail
57. One-band Juga
58. Oregon Branded Skipper
59. Oregon Megomphid
60. Oregon Silverspot
61. Pacific Clubtail
62. Pacific Needlefly
63. Pacific Vertigo
64. Poplar Oregonian
65. Propertius' Duskywing
66. Puget Blue
67. Puget Oegonian
68. Puget Sound Fritillary
69. Rainier Roachfly
70. Ranne's Mountainsnail
71. Salmon River Pebblesnail
72. Sand-verbena Moth
73. Sasquatch Snowfly
74. Shortface Lanx
75. Silver-bordered Fritillary
76. Siuslaw Sand Tiger Beetle
77. Sonora Skipper
78. Spotted Taildropper
79. Straits Acmon Blue
80. Subarctic Bluet
81. Suckley Cuckoo Bumblebee
82. Talol Springfly
83. Taylor's Checkerspot
84. Three-band Juga
85. Valley Silverspot
86. Washington Duskysnail
87. Wenatchee Forestfly
88. Western Bumblebee
89. Western Pearlshell
90. Western Ridged Mussel
91. White-belted Ringtail
92. Winged Floater
93. Yosemite Springfly
95. Yuma Skipper

**Table 3-8: SGCN Invertebrates Summary of Conservation Status**

**Please see Appendix A for a complete discussion of key threats and conservation actions needed for these species**

Please see Section 3.3 at the end of this chapter for an explanation of the terms used in the headings

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **MILLIPEDE** | | | | | | |
| Leschi's Millipede | None | Candidate | Yes | Unknown/unknown | N/A | Very little is known of this cryptic species, which was discovered and identified in 2004. It has only been detected within a small area in Thurston County. |
| **MAYFLIES** | | | | | | |
| *Cinygmula gartrelli* | None | None | No | Low/unknown | Low-Moderate | These mayfly species are generally rare and have very restricted distributions. Mayflies are very sensitive to pollution, and as such are usually only found at high quality, minimally polluted sites. Mayflies are a commonly used index of water quality and aquatic ecosystem health. |
| *Paraleptophlebia falcula* | None | None | No | Low/unknown | Low-Moderate | |
| *Paraleptophlebia jenseni* | None | None | No | Low/unknown | Low-Moderate | |
| *Siphlonurus autumnalis* | None | None | No | Low/unknown | Low-Moderate | |
| **DRAGONFLIES AND DAMSELFLIES** | | | | | | |
| Subarctic Bluet | None | None | No | Low/unknown | Moderate-High | The Subarctic Bluet is a species of damselfly that is restricted to boreal fens and bogs in the northeastern corner of the state. Only two populations of Subarctic Bluet have been located in Washington. |
| **Family Gomphidae – CLUBTAIL DRAGONFLIES** | | | | | | |
| Columbia Clubtail | None | Candidate | Yes | Low/unknown | Moderate-High | These three dragonflies in the Gomphidae family are SGCN in Washington due to the small number of isolated populations and continued threats to aquatic habitats. |
| Pacific Clubtail | None | Candidate | Yes | Critical/declining | Moderate-High | |
| White-belted Ringtail | None | None | No | Low/unknown | Moderate-High | |
| **STONEFLIES** | | | | | | |
| Sasquatch Snowfly | None | None | No | Low/unknown | Moderate | Stoneflies generally require cold, clear, running water and are especially sensitive to human disturbance; they are excellent indicators of water quality. An estimated 43% of North American stoneflies are vulnerable to extinction, imperiled, or extinct. Adults are weak fliers, and there is a high level of endemism; four of these species have only been found in Washington. Some of these species are restricted to glacier-fed streams, and likely to be at-risk due to climate change. |
| Northern Forestfly | Candidate | None | No | Low/unknown | High | |
| Wenatchee Forestfly | None | None | No | Low/unknown | Moderate-High | |
| Pacific Needlefly | None | None | No | Low/unknown | Moderate-High | |
| Cascades Needlefly | None | None | No | Low/unknown | Moderate-High | |
| Yosemite Springfly | None | None | No | Low/unknown | High | |
| Talol Springfly | None | None | No | Low/unknown | Moderate | |
| Rainier Roachfly | None | None | No | Low/unknown | Moderate-High | |
| **BEETLES** | | | | | | |
| Hatch's Click Beetle | None | Candidate | Yes | Low/declining | Moderate-High | Hatch's Click Beetle is a species of conservation concern due to its small number of isolated populations, highly limited distribution and range, and use of specialized, highly restricted, and threatened Sphagnum moss bog habitat. |

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| **Family Carabidae – GROUND AND TIGER BEETLES** | | | | | | |
| Mann's Mollusk-eating Ground Beetle | None | Candidate | Yes | Low/unknown | Moderate-High | These four beetle species are Species of Greatest Conservation Need due to the small number of isolated populations, highly limited distribution and range, and dependence on specialized, restricted and threatened habitats. |
| Beller's Ground Beetle | None | Candidate | Yes | Low/unknown | Moderate-High | |
| Columbia River Tiger Beetle | None | Candidate | Yes | Possibly Extirpated | Moderate | |
| Siuslaw Sand Tiger Beetle | None | Monitor | No | Critical/unknown | Moderate-High | |
| **CADDISFLIES** | | | | | | |
| *Allomyia acanthis* | None | None | No | Low/unknown | High | Caddisflies are aquatic insects. They are very sensitive to water quality and changes in water flow. Certain species have been used as biotic indicators of pollution. |
| *Goereilla baumanni* | None | None | No | Low/unknown | High | |
| *Limnephilus flavastellus* | None | None | No | Low/unknown | Moderate-High | |
| *Psychoglypha browni* | None | None | No | Low/unknown | Moderate-High | |
| *Rhyacophila pichaca* | None | None | No | Low/unknown | Moderate | |
| *Rhyacophila vetina* | None | None | No | Low/unknown | High | |
| **MOTHS** | | | | | | |
| **Genus Copablepharon** | | | | | | |
| Sand Verbena Moth | In review | Candidate | No | Low/unknown | Moderate-High | These four Copablepharon moths (Family Noctuidae) are imperiled due to rare habitat types, small number of isolated populations, extremely limited range, and known threats to their habitats. Sand Verbena Moth was petitioned for listing under the Endangered Species Act and received a positive 90-day finding indicating that "the petition presents substantial information indicating that listing the sand verbena moth may be warranted". |
| *Copablepharon columbia* | None | None | No | Critical/declining | Moderate | |
| *Copablepharon mutans* | None | None | No | Critical/declining | Moderate | |
| *Copablepharon viridisparsa hopfingeri* | None | None | | Critical/declining | Moderate | |
| **BUTTERFLIES** | | | | | | |
| Great Arctic | None | Candidate | Yes | Critical/unknown | Low-Moderate | A Pacific Northwest endemic, this butterfly has been found on a single site within the United States, in northwestern Washington; it also occurs in southwestern British Columbia, and may occur on other sites with similar habitat. It is a species of conservation concern due to its restricted range and many threats to its grassland-forest edge habitat. |
| Island Marble | In review | Candidate | Yes | Critical/declining | Moderate-High | The Island Marble is a rare butterfly, restricted to two San Juan Islands. The species was petitioned for listing under the Endangered Species Act and received a positive 90-day finding indicating that "the U.S. Fish and Wildlife Service found "listing the island marble butterfly as an endangered species may be warranted". |

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Monarch Butterfly | In review | None | No | Low/declining | Moderate | The Monarch butterfly faces significant threats in both summer and winter habitats, and action is needed to restore populations. Western Monarchs, including those breeding within Washington have declined by more than 50% since 1997. |
| Taylor's Checkerspot | Endangered | Endangered | Yes | Critical/stable | Moderate-High | This subspecies is currently restricted to a small scattering of 8 populations in Washington, a single population in British Columbia, and 2 populations in Oregon. The decline of Taylor's Checkerspot has accompanied the loss of open, prairie and grassland habitats. Taylor's Checkerspot was listed by the Washington Fish and Wildlife Commission as endangered in 2006, and listed as federally endangered by the U.S. Fish and Wildlife Service in 2013. |
| **Family Lycaenidae – GOSSAMER WING BUTTERFLIES** | | | | | | |
| Makah Copper | None | Candidate | Yes | Low/declining | Moderate-High | Seven Lycaenid butterflies were recognized as Species of Greatest Conservation Need due to their rare and restricted host plants and habitat types, small number of isolated populations, highly limited range and distribution, and threats to their habitat. |
| Golden Hairstreak | None | Candidate | Yes | Critical/declining | N/A | |
| Johnson's Hairstreak | None | Candidate | Yes | Low/unknown | Moderate-High | |
| Juniper Hairstreak | None | Candidate | Yes | Low/unknown | Moderate | |
| Hoary Elfin | None | Monitor | No | Critical/declining | Low-Moderate | |
| Puget (Blackmore's) Blue | None | Candidate | Yes | Low/declining | N/A | |
| Straits Acmon Blue | None | None | No | Critical/declining | Moderate-High | |
| **Subfamily Heliconiinae – FRITILLARY BUTTERFLIES** | | | | | | |
| Puget Sound Fritillary | None | None | No | Low/declining | Low-Moderate | These species were recognized as Species of Conservation Need in Washington due to their rare and restricted host plants and habitat types, small number of isolated populations, limited range and distribution, and known threats to their habitats. |
| Valley Silverspot | None | Candidate | Yes | Critical/declining | Low-Moderate | |
| Oregon Silverspot | Threatened | Endangered | Yes | Extirpated | Moderate | |
| Meadow Fritillary | None | None | No | Low/declining | Low-Moderate | |
| Silver-bordered Fritillary | None | Candidate | Yes | Low/declining | Moderate-High | |
| **Family Hesperiidae – SKIPPER BUTTERFLIES** | | | | | | |
| Propertius Duskywing | None | None | No | Low/declining | Moderate | These five butterflies in the Skipper Family were recognized as Species of Greatest Conservation Need throughout their ranges due to the small number of isolated populations, specialized and restricted habitat, and known threats to their habitat. |
| Oregon Branded Skipper | None | None | No | Critical/declining | Moderate | |
| Mardon Skipper | None | Endangered | Yes | Low/declining | Moderate-High | |
| Sonora Skipper | None | None | No | Critical/declining | Low-Moderate | |
| Yuma Skipper | None | Candidate | Yes | Critical/declining | Moderate | |
| **BUMBLE BEES** | | | | | | |
| **Genus Bombus – BUMBLE BEES** | | | | | | |
| Western Bumble Bee | None | None | No | Low/declining | Moderate-High | Bumble bees have recently become the focus of conservation concern and efforts due to their precipitous population |
| Morrison's Bumble Bee | None | None | No | Critical/unknown | Moderate | |

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Suckley Cuckoo Bumble Bee | None | None | No | Critical/declining | Moderate | declines and prodigious capabilities as pollinators. In a recent status assessment, IUCN (International Union of Conservation of Nature) identified three Washington species as facing high or extremely high risk of extinction: Western Bumble Bee and Morrison's Bumble Bee were ranked Vulnerable, and Suckley Cuckoo Bumble Bee was ranked Critically Endangered. |
| **MOLLUSKS** | | | | | | |
| **Family Oreohelicidae -- MOUNTAINSNAILS** | | | | | | |
| Chelan Mountainsnail | In review | None | No | Critical/declining | Low-Moderate | Many Mountainsnail species and subspecies have specialized habitat requirements and very restricted ranges, low ability to disperse, and are vulnerable to disturbances such as logging, fire, intensive grazing, or introduced predators. Most mountainsnail species and subspecies (approximately 91 percent) are considered imperiled or critically imperiled by NatureServe. |
| Hoder's Mountainsnail | None | None | No | Critical/declining | Low-Moderate | |
| Mad River Mountainsnail | None | None | No | Critical/declining | Low-Moderate | |
| Ranne's Mountainsnail | None | None | No | Critical/declining | Low | |
| Limestone Point Mountainsnail | None | None | No | Critical/declining | Low-Moderate | |
| **Family Polygyridae – FORESTSNAILS, DUSKYSNAILS, OREGONIANS, AND HESPERIANS** | | | | | | |
| Dry Land Forestsnail | None | None | No | Low/unknown | Low-Moderate | These snails are of conservation concern because they have specialized habitat requirements, such as moist mature forest with a hardwood component, or moist sites in otherwise dry environments. Snails do not readily disperse and populations are isolated. They are vulnerable to alteration of these sites, including from logging, development, use of talus for road-building, and unsustainable livestock grazing at springs. |
| Washington Duskysnail | None | None | No | Low/declining | Low-Moderate | |
| Columbia Oregonian | In review | Candidate | Yes | Critical/declining | Moderate-High | |
| Puget Oregonian | In review | None | No | Low/declining | Low-Moderate | |
| Poplar Oregonian | None | Candidate | Yes | Low/declining | Low | |
| Mission Creek Oregonian | None | None | No | Low/unknown | N/A | |
| *Cryptomastix mullani* hemphilli | None | None | No | Low/unknown | | |
| Dalles Hesperian | None | None | No | Low/unknown | Moderate-High | |
| **Family Vertiginidae** | | | | | | |
| Hoko Vertigo | In review | None | No | Critical/unknown | Low-Moderate | These three very rare Vertigo species are small snails are found in small isolated populations, perhaps remnants of a previously much wider range. These small populations, associated with old growth and/or riparian hardwoods are very vulnerable to logging, road building, fires, and other disturbances. |
| Pacific Vertigo | None | None | No | Critical/extirpated? | Low-Moderate | |
| Idaho Vertigo | None | None | No | Critical/unknown | Low-Moderate | |
| **OTHER TERRESTRIAL SNAILS** | | | | | | |
| Oregon Megomphix | None | None | No | Low/unknown | Low-Moderate | These terrestrial snails are very rare and have distributions that include small isolated populations, perhaps remnants of previously much wider ranges. These small isolated populations, often associated with old growth and/or riparian hardwoods, are very vulnerable to logging, road building, fires, and other disturbances. |
| Dalles Sideband | In review | Candidate | Yes | Low/unknown | Low-Moderate | |
| Crowned Tightcoil | None | None | No | Low/unknown | Low-Moderate | |
| Nimapuna Tigersnail | None | None | No | Critical/unknown | N/A | |
| **Families – Lymnaeidae and Hydrobiidae** | | | | | | |

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Shortface Lanx *or* Giant Columbia River Limpet | None | Candidate | Yes | Uncommon/declining | Moderate | These species require clear, cold, well-oxygenated waters, and are threatened by pollution and siltation. North America once had approximately 700 species of native freshwater snails from 16 families. Currently, 67 species (10 percent) are considered likely extinct, 278 (40 percent) endangered, 102 (15 percent), threatened, 73 (10 percent) vulnerable, and 26 (4 percent) have uncertain taxonomic status. |
| Masked Duskysnail | None | None | No | Critical/declining | Low-Moderate | |
| Olympia Pebblesnail | None | None | No | Low/unknown | Low-Moderate | |
| Salmon River Pebblesnail | None | None | No | Low/unknown | N/A | |
| Ashy Pebblesnail | None | Candidate | Yes | Uncommon/declining | Moderate | |
| **Family Pleuroceridae (Genus *Juga*) – FRESHWATER AQUATIC SNAILS** | | | | | | |
| Barren Juga | None | None | No | Low/unknown | Moderate-High | These species require cold, clear, well-oxygenated water; they are sensitive to pollution, and intolerant of warm waters, low dissolved oxygen, or major seasonal fluctuations. Destruction of springs by historical unsustainable grazing and logging practices, and diversions (e.g. for water supply, fish hatcheries) has already caused extensive extinction of species throughout western North America. |
| Dalles Juga | None | None | No | Low/unknown | Moderate-High | |
| Brown Juga | None | None | No | Low/unknown | Moderate-High | |
| Three-band Juga | None | None | No | Low/unknown | Moderate-High | |
| One-band Juga | None | None | No | Low/unknown | Moderate-High | |
| **SLUGS** | | | | | | |
| **TAILDROPPER SLUGS** | | | | | | |
| Bluegray Taildropper | None | Candidate | Yes | Low/declining | Low-Moderate | These endemic taildropper slugs are of concern due to their rarity. The Spotted Taildropper is only found in part of one county, and the rarity of both species suggest they have specific habitat needs that may make them sensitive to land use activities, such as logging and loss of coarse woody debris. |
| Spotted Taildropper | None | None | No | Critical/unknown | Low-Moderate | |
| **FRESHWATER BIVALVES** | | | | | | |
| **Families Unionidae and Margaritiferidae: FRESHWATER MUSSELS** | | | | | | |
| California Floater | None | Candidate | Yes | Low/declining | Moderate | Freshwater mussels have been greatly affected by dams and annual water drawdowns, as well as degraded water quality resulting from development and unsustainable agriculture. Many historical sites no longer support mussels, and many local populations no longer successfully reproduce. |
| Winged Floater | None | None | No | Low/declining | Moderate | |
| Western Ridged Mussel | None | None | No | Uncommon/declining | Moderate | |
| Western Pearlshell | None | None | No | Uncommon/declining | Moderate | |
| **MARINE BIVALVE** | | | | | | |
| Olympia Oyster | None | Candidate | Yes | Low/stable | High | Washington's only native oyster, it is currently present in diminished abundance (less than 5 percent) due to overharvest and habitat alterations throughout most of the species historical range (ca 1850) in Washington. Evidence of natural recruitment and restoration success observed but lack of suitable habitat limits further increases. |
| **MARINE GASTROPOD** | | | | | | |

| INVERTEBRATE SPECIES | Federal Status | State Status | PHS | Population size/trend | Climate Vulnerability | Summary of Conservation Concern |
|---|---|---|---|---|---|---|
| Pinto Abalone | None | Candidate | Yes | Uncommon/declining | N/A | The Pinto Abalone has failed to recover from dramatic declines resulting from excessive recreational and illegal harvest, despite fishery closure. There is strong evidence of recruitment failure, perhaps because the densities of remaining populations are below the threshold for successful reproduction. |
| **EARTHWORM** | | | | | | |
| Giant Palouse Earthworm | None | Candidate | Yes | Unknown/unknown | Low-Moderate | Data on this species are sparse. It is difficult to detect and few surveys have been performed to determine its distribution and abundance. There has been an obvious reduction of range in the Palouse region of Washington with conversion of prairie to cropland. Introduced worm species appear to exclude native species, including this one. |

## 3.2 Summary of Threats and Conservation Actions

### 3.2.1 Methodology

Stressors and conservation actions for each SGCN species were categorized in "TRACS" (Tracking and Reporting Actions for the Conservation of Species) terminology, which comes from the tracking and reporting system for conservation and related actions funded by the US Fish and Wildlife Services (USFWS), and the Wildlife and Sport Fish Restoration (WSFR) Program. We used this tracking and reporting system for categorizing stressors and conservation actions for the following reasons:

- The State Wildlife Action Best Practices guide encourages the use of standardized descriptions of threats and actions.
- The Wildlife TRACS system will be used for application for and reporting on State Wildlife Grants (SWG). Understanding stressors and needed actions for SGCN in terms of this language will help in identifying projects appropriate for funding through the SWG program.
- The Wildlife TRACS system potentially enables cross referencing of Washington's data on key stressors with other states or other organizations also using this system.
- Standardized descriptions facilitate "roll up" of data to determine trends or patterns for additional investigation.

For each threat or stressor, a conservation action was identified and several qualifiers added to the action, including adequacy of investment and lead. The adequacy of investment in the conservation action was based on whether it was sufficient (action is currently underway and we should stay the course), or insufficient (some action underway, but more needed), or whether a new action was needed (meaning no action was underway and new action needed to be initiated). The lead entity qualifier concerned whether WDFW or another partner was the appropriate lead for an action, or whether there was a co-lead role.

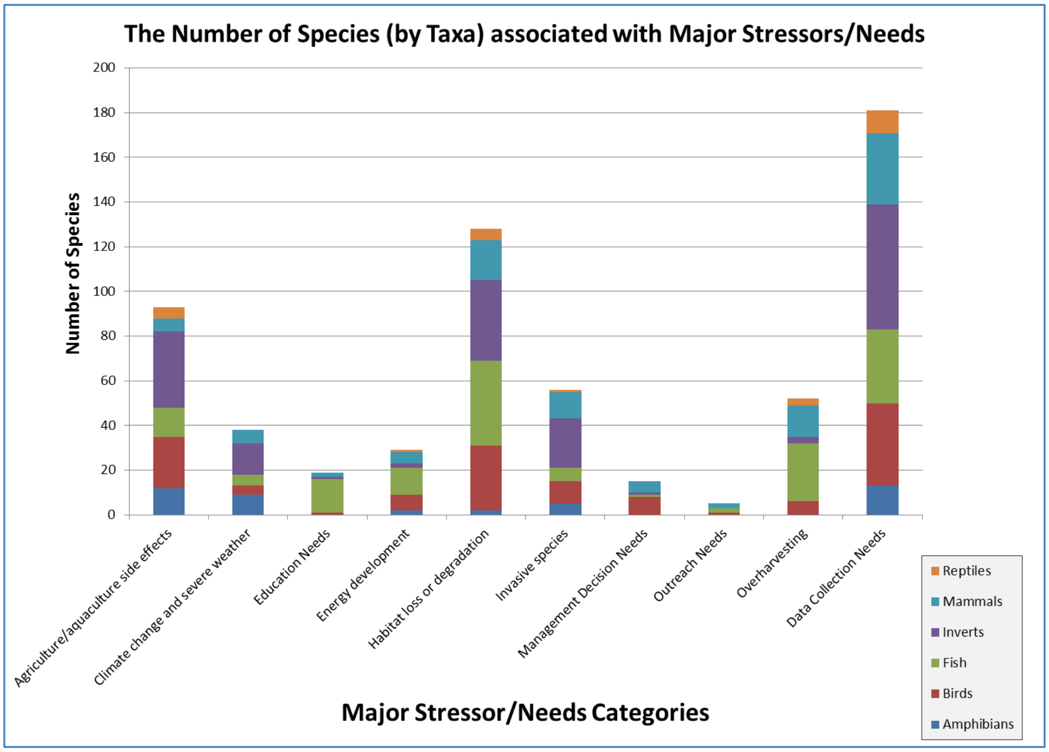
### 3.2.2 Discussion

Looking at these data collectively is a way to surface possible trends and opportunities to increase the effectiveness of our investments. For example, habitat loss and degradation as well as a lack of baseline and monitoring data were most frequently cited as the primary stressors or needs for SGCN species. Further evaluation could include assessing the adequacy of the resources dedicated towards these needs, and explore other opportunities to address these needs. For fishes, dams/barriers and overharvesting are the most frequently cited stressors, and climate change appears as a prominent threat for both fish and invertebrates as compared with the other taxa. Further evaluation of the focus of our conservation investments relative to needs may help identify ways to increase effectiveness.

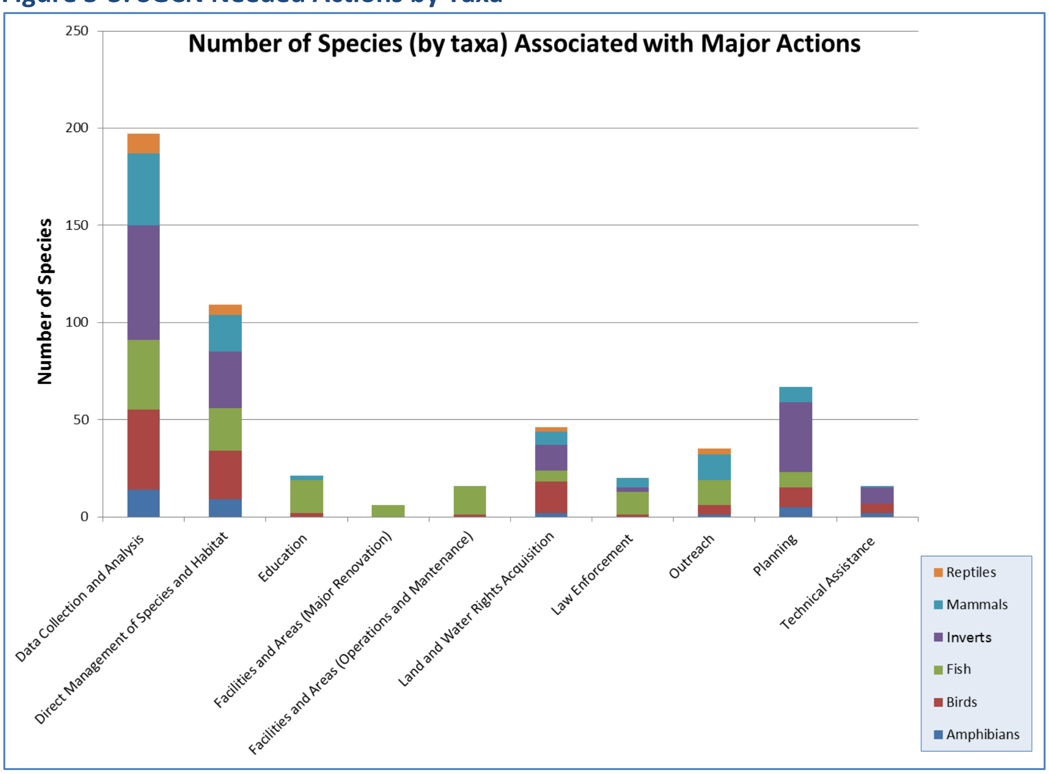
The biologists preparing this information were asked if the lead for a given action was primarily WDFW, primarily an external partner, or shared by both. It is interesting to note that the vast majority ranked both WDFW and conservation partners as shared lead, emphasizing the importance of investing in partnerships in achieving our conservation outcomes. Finally, biologists were also asked to assess the adequacy of our collective (WDFW or partners) investment for each threat and corresponding action. In many instances, the adequacy was determined to be insufficient, meaning the need to secure resources and funding continues to be one of the most important overarching actions we can take.

Please see the figures below for a graphical representation of some of these data.

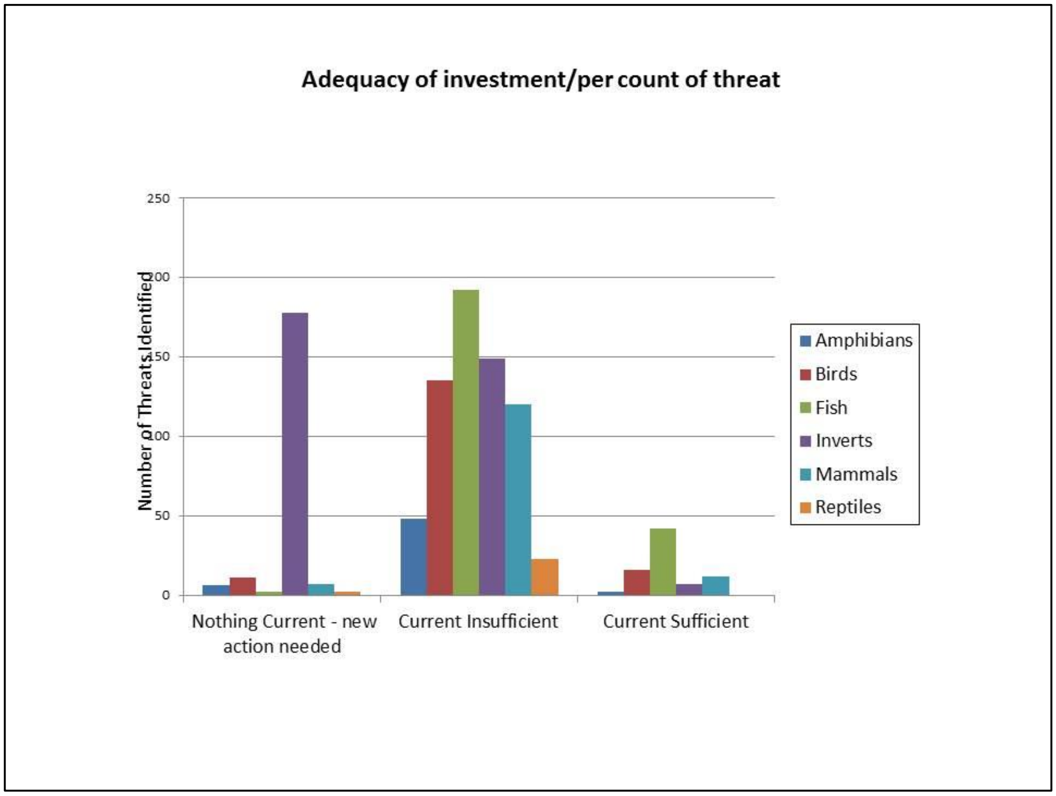
### Figure 3-2: SGCN Threats, by taxa



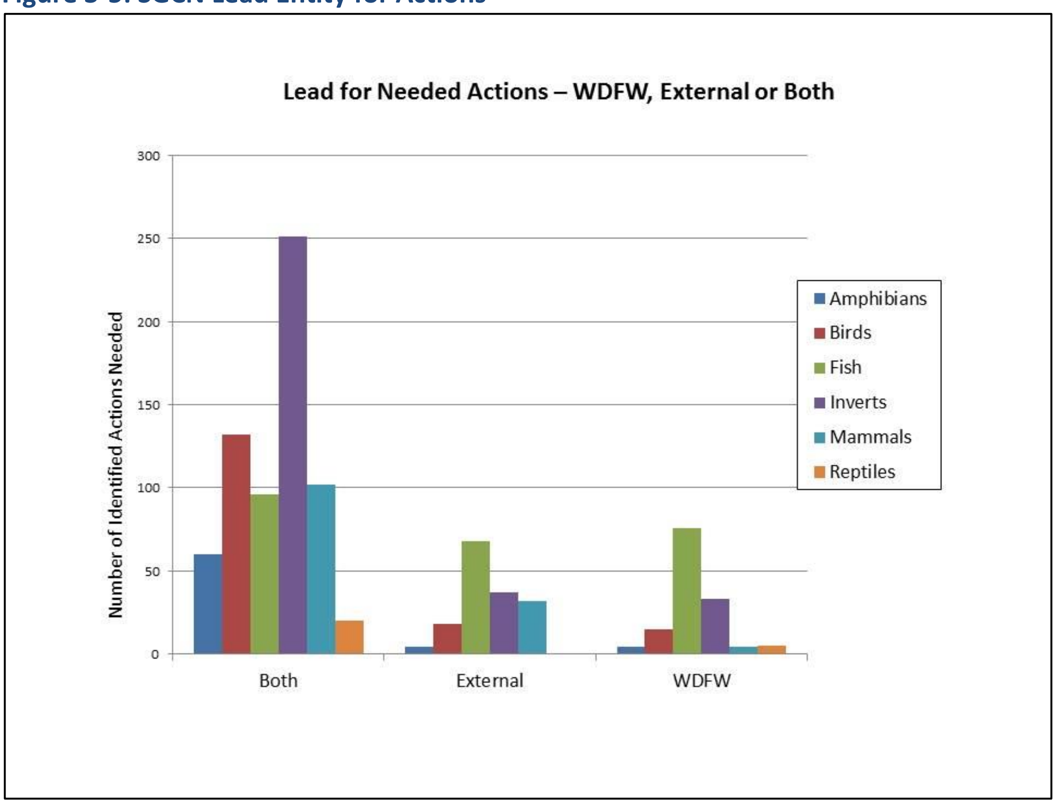

### Figure 3-3: SGCN Needed Actions by Taxa



### Figure 3-4: SGCN Adequacy of Investment




### Figure 3-5: SGCN Lead Entity for Actions



## 3.3 Reference Information

### Explanation of Terms Used in Conservation Status Tables

Federal Status

Refers to legal designations under the Federal ESA (listed as Endangered or Threatened or recognized as a Candidate species for listing), or designated as a Sensitive species.

State Status

The Washington Fish and Wildlife Commission has classified 46 species as Endangered, Threatened or Sensitive, under WAC 232-12-014 and WAC 232-12-011. Species can also be designated Candidate Species for state listing by WDFW policy.

PHS (Priority Habitats and Species Program)

A species listed under the PHS program is considered to be a priority for conservation and management and requires protective measures for survival due to population status, sensitivity to habitat alteration and/or tribal, recreational or commercial importance. Management recommendations have been developed for PHS species and habitats, and can assist landowners, managers and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife.

Climate Vulnerability

The vulnerability assessment method used in this process was comprised of evaluating sensitivity and exposure for each species or habitat, assessing confidence for each sensitivity and exposure evaluation, and scoring overall vulnerability and confidence for a species or habitat. Each evaluation of sensitivity includes assigned rankings as well as short summaries describing key information from the scientific literature (see Appendix C). The aim of the summaries that accompany rankings is to make transparent the rationales and assumptions underlying the rankings and confidences assigned. Each evaluation of exposure includes assigned rankings as well as a bulleted list of the key climate exposure factors for a given species or habitat. This list of exposure factors, along with the spatial location of a resource, was used to guide the literature review for future climate projections in order to assign rankings.

Based on the literature review, one of five rankings (High-5, Moderate-High-4, Moderate-3, Low-Moderate-2, or Low-1) was assigned each to sensitivity and exposure for a given species or habitat. Assigned rankings for sensitivity and exposure were then averaged (mean) to generate an overall vulnerability score for that particular species or habitat:

$$\textbf{Vulnerability} = \frac{\textbf{Climate Exposure + Sensitivity}}{\textbf{2}}$$

Sensitivity and exposure evaluations were also assigned one of three confidence rankings (High-3, Moderate-2, or Low-1); confidence reflects the sureness assessors had in a given sensitivity or exposure ranking. These approximate confidence levels were based on Manomet Center for Conservation Sciences (2012), which collapsed the 5-category scale developed by Moss and Schneider (2000) for the IPCC Third Assessment Report into a 3-category scale to avoid implying a greater level of certainty precision. Confidence rankings for sensitivity and exposure were also averaged (mean) to generate an overall confidence score.

For more on the methodology, please see Chapter 5 – Climate Change.

Rankings

**Global (G) and State (S) Rankings:** Refers to NatureServe status rankings provided by the Natural Heritage Program. These conservation status ranks complement legal status designations and are based on a one to five scale, ranging from critically imperiled (1) to demonstrably secure (5). The global (G) and state (S) geographic scales were used for the SGCN species fact sheets. For more on the methodology used for these assessments, please see: Methodology for Assigning Ranks - NatureServe.

**State Rank:** characterizes the relative rarity or endangerment within the state of Washington.
**S1** = Critically imperiled
**S2** = Imperiled
**S3** = Rare or uncommon in the state – vulnerable
**S4** = Widespread, abundant, and apparently secure i
**S5** = Demonstrably widespread, abundant, and secure in the State
**SA** = Accidental in the state.
**SE** = An exotic species that has become established in the state.
**SH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist in the state.
**SNR** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**SP** = Potential for occurrence of the taxon in the state but no occurrences have been documented.
**SR** = Reported in the state but without persuasive documentation which would provide a basis for either accepting or rejecting the report (e.g., misidentified specimen).
**SRF** = Reported falsely in the state but the error persists in the literature.
**SU**= Unrankable. Possibly in peril in the state, but status is uncertain. More information is need.
**SX** = Believed to be extirpated from the state with little likelihood that it will be rediscovered.
**SZ** = Not of conservation concern in the state.

Qualifiers are sometimes used in conjunction with the State Ranks described above:
**B** - Rank of the breeding population in the state.
**N** - Rank of the non-breeding population in the state.

**Global Rank:** characterizes the relative rarity or endangerment of the element world-wide.
**G1** = Critically imperiled globally
**G2** = Imperiled globally
**G3** = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range - vulnerable
**G4** = Widespread, abundant, and apparently secure globally
**G5** = Demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range
**GH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist somewhere in its former range.
**GNR** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**GU** = Unrankable. Possibly in peril range-wide but status uncertain. More information is needed.
**GX** = Believed to be extinct and there is little likelihood that it will be rediscovered.

Qualifiers are used in conjunction with the Global Ranks described above:
**Tn** Where n is a number or letter similar to those for Gn ranks, above, but indicating subspecies or variety rank. For example, G3TH indicates a species that is ranked G3 with this subspecies ranked as historic.

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# Chapter 4
# Habitats of Greatest Conservation Need

## 4.0 Introduction and Overview

This chapter discusses the habitats and community types essential to the conservation of Species of Greatest Conservation Need (SGCN) in Washington. It summarizes the status and condition of those habitats, lists key stressors and research needs, and highlights actions to ensure their conservation. The information provided in this chapter addresses Elements 2, 3, and 4 of the eight required to be included in the State Wildlife Action Plan (SWAP). In this document, "species" is used to refer to species, subspecies, evolutionarily distinct units (ESU), and distinct population segments (DPS). Habitats of Greatest Conservation Need are defined for the purposes of the SWAP to include imperiled ecological systems (from a conservation perspective) as well as those ecological systems particularly important to SGCN. Ecological Systems and their relationship to fish and wildlife habitat are defined and described further in the discussion of methodology in this chapter.

Two major principles informed and shaped the discussion of habitats in the SWAP – adopting standardized classifications and focusing on spatial priorities.

**Adopting standardized classifications to represent habitat**

The SWAP associates SGCN with two vegetation levels using standard vegetation classification: vegetation formations as described in the National Vegetation Classification System; and ecological systems, as described by NatureServe. These two vegetation levels provide for general (formation level) to more specific (ecological system level) assessment of landscape level associations with multiple SGCN. The ecological systems for marine environments are described using the Coastal and Marine Ecological Classification Standard for nearshore, offshore, and oceanic ecological systems. These systems are subdivided by geographic regions of Puget Sound and the outer coast of Washington. The SWAP also associates SGCN with what are considered cultural or human created habitats (urban environments, agricultural fields, managed timberlands).

The use of these standardized classifications will facilitate cross referencing of conservation needs and objectives across state and international borders, promote collaborative efforts with other organizations, and provide access to enhanced mapping tools and products.

**Focusing on collaborative, on-the-ground conservation action**

Recognizing that conservation frequently entails collaboration and multiple partners, WDFW oriented this work with an eye towards being able to identify spatially explicit habitat conservation priorities, and those that are also shared by other entities. Ultimately, we want to determine the most productive places to achieve on-the-ground conservation.

### Chapter Organization

This chapter begins with a few "at a glance" tables and summaries of the key features of the habitats discussed in the SWAP. Table 4-1 shows the full list of ecological systems found in Washington, and highlights those addressed in this chapter. Table 4-2 shows marine ecological systems in Washington, as defined for the SWAP. Table 4-3 summarizes information about the vegetation formations and Table 4-4 shows the relationship between ecoregions, vegetation formations, and ecological systems of concern. Ecoregions are broad areas that share similar flora and fauna, geology, hydrology, and landforms. Table 4-5 provides a summary of stressors present in the vegetative formations and ecological systems of concern.

The next section includes an overview fact sheet for each of the 16 vegetation formations found in Washington, representing the coarse filter scale – Figure 4-1 shows the distribution of these vegetation formations throughout Washington. These fact sheets provide a description of the vegetation and distribution, the number of SGCN associated with the formation and a list of important habitat needs for the SGCN in this formation. These fact sheets indicate the number of ecological systems of concern, major stressors to the vegetation formations (including climate change, if appropriate), examples of actions needed to provide and maintain habitat for SGCN, and key research and data needs. More detailed information is provided for the most imperiled ecological systems within each vegetation formation and those ecological systems with significant numbers of SGCN closely associated. In many cases, conservation attention will need to be focused at this scale to conserve the ecological values represented through the system.

The information for ecological systems of concern includes conservation rank (see methodology section below), status and trend, a list of species closely and generally associated with the ecological system of concern and, if there is one, the name that refers to this habitat type, generally, in the WDFW Priority Habitats and Species (PHS) Program. Stressors which impact habitat quality and actions to address those stressors are also summarized and discussed.

The final section of the chapter discusses how the conservation needs discussed in this chapter can be applied to on-the-ground conservation through the WDFW Priority Landscapes Initiative. An explanation of terms and abbreviations used in the chapter can be found in Section 4.4.1. References are provided in Sections 4.4.2 and 4.4.3.

### Why use Ecological Systems?

Ecological systems are ecological units useful for standardized mapping and conservation assessments of habitat diversity and landscape conditions. They have been adopted nation-wide by many organizations as a vehicle for considering relationships to fish and wildlife species. Each ecological system type describes complexes of plant communities influenced by similar physical environments and dynamic ecological processes such as fire or flooding (NatureServe [http://www.natureserve.org/conservation-tools/terrestrial-ecological-systems-united-states](http://www.natureserve.org/conservation-tools/terrestrial-ecological-systems-united-states)). Vegetation formations and ecological systems within Washington are mapped and maps are maintained and updated by Washington Department of Fish and Wildlife and Washington Department of Natural Resources. Because ecological systems provide clear descriptions of vegetation structure and type, and can be identified on the ground and mapped, they have tremendous value in assessing and determining the quantity and quality of wildlife habitat.

### Ecoregions

This chapter also references the locations of formations and ecological systems by ecoregion. Ecoregions are based on broad patterns on the landscape and can provide another useful scale and spatial context for conservation planning. Further, several national and state based organizations use ecoregions in various planning initiative, and crosswalks between ecological systems, formations and ecoregions can help to support collaborative efforts. There are 63 ecoregions delineated in North America, and nine of these ecoregions occur partly or completely within Washington (Figure 2.1).

Figure 4-1: Ecoregions in Washington


## Methodology

**Associating species with ecological systems**
Species of Greatest Conservation Need were associated with their use of ecological systems and vegetation formations to determine the relative values of each to wildlife. This step was a central and necessary component of our approach to defining and prioritizing habitats and community types important for species conservation. There is an underlying assumption that conserving ecological systems has direct benefits to wildlife species known (or currently not known) to occur within them. However, in doing so we recognized that using an ecological system based approach for habitat association purposes might not account for specific vegetative conditions (old-growth forest, for example), that can be critical components of habitat suitability. Ecological systems describe vegetation communities but do not account for ecological condition of those systems, or presence of habitat features (such as cavities in snags) that may be critical to wildlife. To address this, we included specific habitat features important to SGCN in each of the species fact sheets (see Appendix A), and included some of the most important habitat needs in the ecological system fact sheets included in this chapter.

Formal efforts to associate wildlife species with ecological systems in Washington began with the Washington Natural Heritage Program, which associated species with ecological systems beginning in 2009. Previously, several efforts were undertaken to associate wildlife species with habitat conditions, broad vegetation types, and cultural systems (Johnson and O'Neil 2001). This work remains a backdrop and major reference for conservation actions outlined in the plan.

For the State Wildlife Action Plan, WDFW set out to use professional judgement of biologists to assess whether species were closely or generally associated with a particular ecological system. In the absence of published literature, we opted to apply the principles of habitat use and preference to determine varying levels of association with a particular system. Incorporating these levels of relative habitat value made the data useful for multiple types of analyses. We associated species and systems with four categories: closely associated, generally associated, unsuitable, and unknown. These associations are defined below.

**1. Closely Associated:** The species demonstrates preference for the ecological system, as indicated by greater occurrence, high densities, greater reproductive output, or other indicators of preference, as compared to other ecological systems. A species that is closely associated with individual ecological systems often relies on one to a few ecological systems for a significant part, or all, of its life history requirements.

**2. Generally Associated:** The species occurs in, but does not prefer, the ecological system, as indicated by relatively low occurrence or densities, or other indicators of a general relationship with the ecological system. A species that is generally associated with individual ecological systems can typically rely on numerous ecological systems to meet its life history requirements.

Note: A species can be closely associated with some ecological systems and generally associated with others, due to differences in occurrence, densities, reproductive output, or other indicators of preference.

**3. Unsuitable:** The species demonstrates no use or only occasional use of an ecological system.

**4. Unknown:** The species' use of the ecological system is unknown. There were questions or uncertainty whether or not a species used an ecological system.

Assessments were based upon our current understanding of information such as distribution, range, abundance, and density. Assessments were often based on an individual's knowledge of occurrence in Washington or nearby states and provinces and reflected best professional judgement given the lack of published biological information on these associations. For situations where ecological systems are currently functioning differently than they have historically, we associated species based on our understanding of the former functionality of the ecological system.

It is important to note that a species can be closely associated with specific habitats within an ecological system in which it is only generally associated. For example, spotted owls are closely associated with a specific habitat within forests with complex structure (e.g. mature and old-growth forest), but are only generally associated with multiple ecological systems within their range. In this case, association with ecological systems does not reflect the specific habitat requirements or needs of the species. In such cases the SWAP recommends actions targeted to the specific habitat within the ecological system.

For recovering species, we made associations with ecological systems based on an anticipated association during or following recovery. For some species, an association with one or more ecological system(s) may dramatically over-represent current distribution, as they may be associated with extremely small areas within the ecological system. For this reason, it must also be understood that the distribution of the ecological system does not imply that the SGCN is present everywhere that the ecological system is found. For certain species, including many slugs and snails, distribution, abundance, species needs, and habitat conditions are not well known, and that lack of knowledge made the determination of their association with ecological systems difficult.

**Identifying and Profiling Ecological Systems of Concern**

We identified Ecological Systems of Concern (ESOC) based on the conservation status rank of each ecological system. Each ESOC is described within the formation overview and specific stressors and actions are highlighted, as well as the SGCN associated with that system.

The Washington Natural Heritage Program assigned conservation status ranks to Washington's ecological systems using NatureServe's Conservation Status Rank calculator. The Conservation Status Rank is a measure of an ecological system's elimination risk. The rank is calculated using a measure of eight core factors relevant to risk assessment of elimination. The factors are organized into three categories: rarity, threats, and trends. Factors are scaled and weighted and subsequently scored according to their impact on risk. WDFW identified systems with S1, S1S2, and S2 ranks as Ecological Systems of Concern.

**Ecological Systems Especially Important to SGCN**

Habitats of Greatest Conservation Need include not only those ecological systems considered imperiled and in need of conservation attention (ecological systems of concern) but also those ecological systems which are especially important to SGCN – defined for this purpose as those with six or more SGCN being closely associated. These ecological systems are highlighted in each of the formation discussions. A list of all the ecological systems in Washington with the number of SGCN associated with them can be found in Table 4-1, as well as at the beginning of each formation discussion.

**Identifying Vulnerability to Climate Change**

Vulnerability to climate change has to date only been assessed for the Ecological Systems of Concerns, and not for the full breadth of ecological systems in Washington. Vulnerability was assessed by evaluating both inherent sensitivity to climatic changes and the degree of change the ecological system is likely to experience. We assigned a rank of low, moderate or high to each of the ecological systems of concern, and incorporated climate change into the discussion of key stressors for each of the vegetation formations and ecological systems, when appropriate. See Chapter 5 for more discussion on the methodology and full results of this ranking.

**References for introduction (complete list at end of chapter)**


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Master, L., D. Faber-Langendoen, R. Bittman, G. A. Hammerson, B. Heidel, J. Nichols, L. Ramsay, and A. Tomaino (2009). NatureServe conservation status assessments: factors for assessing extinction risk. *NatureServe, Arlington, Virginia*.

Rocchio, J. and R. Crawford. 2008. Draft Field Guide to Washington's Ecological Systems. Washington Department of Natural Resources.

## 4.1 Summary of Key Habitat Features

The following tables and figures present summary information regarding distribution, SGCN association and key stressors and actions for SGCN Habitats (defined here as Vegetation Formation and Ecological Systems of Concern):

4.1.1 List of Vegetation Formations and Terrestrial Systems Found in Washington
4.1.2 Distribution of Formations
4.1.3 Marine Ecological Systems
4.1.4 Summary of Formations
4.1.5 Summary Figure of SGCN and ESOC Association with Formations
4.1.6 Table of Key Stressors and Conservation Actions for SGCN Habitats (defined here as Vegetation Formations and Ecological Systems of Concern)

### 4.1.1 Vegetation Formations and Terrestrial Ecological Systems in Washington

All major habitat types occurring in Washington are described and discussed in this chapter, with a focus on the values they provide for wildlife (see Figure 4-1 for a map of the distribution of the vegetation formations throughout Washington). Highlighted ecological systems of concern are discussed in greater detail within each formation because they are imperiled and/or because they are of particularly high conservation value to fish and wildlife.

- (shaded box) Ecologically imperiled (ecological system of concern)
- ** Especially important to the conservation of SGCN
- © High vulnerability to climate change (see Chapter 5 for more information)

**Table 4-1: Washington's Terrestrial Vegetation Formations and Associated Ecological Systems**

| VEGETATION FORMATION | TERRESTRIAL ECOLOGICAL SYSTEM | # SGCN Closely Associated | # SGCN Generally Associated |
|---|---|---|---|
| **Alpine Scrub, Meadow & Grassland** | North Pacific Dry and Mesic Alpine Dwarf-Shrubland, Fell-field and Meadow | 2 | 10 |
| | Rocky Mountain Alpine Dwarf Shrubland | 0 | 1 |
| | Rocky Mountain Alpine Fell-Field | 1 | 2 |
| | Rocky Mountain Alpine Tundra/Fell-field/Dwarf-shrub Map Unit | 1 | 6 |
| | Rocky Mountain Alpine Turf | 0 | 1 |
| **Barren** | North American Alpine Ice Field | 0 | 4 |
| | ** Unconsolidated Shore | 6 | 10 |
| **Bog & Fen** | Boreal Depressional Shrub Bog | 0 | 1 |
| | North Pacific Bog and Fen © | 3 | 8 |
| | Rocky Mountain Subalpine-Montane Fen | 4 | 6 |
| **Cliff, Scree & Rock Vegetation** | ** Inter-Mountain Basins Active and Stabilized Dune | 11 | 5 |
| | ** Inter-Mountain Basins Cliff and Canyon | 5 | 10 |
| | North Pacific Alpine and Subalpine Bedrock and Scree | 1 | 8 |
| | North Pacific Montane Massive Bedrock, Cliff and Talus | 4 | 6 |
| | Rocky Mountain Alpine Bedrock and Scree | 1 | 4 |
| | Rocky Mountain Cliff, Canyon and Massive Bedrock | 2 | 3 |

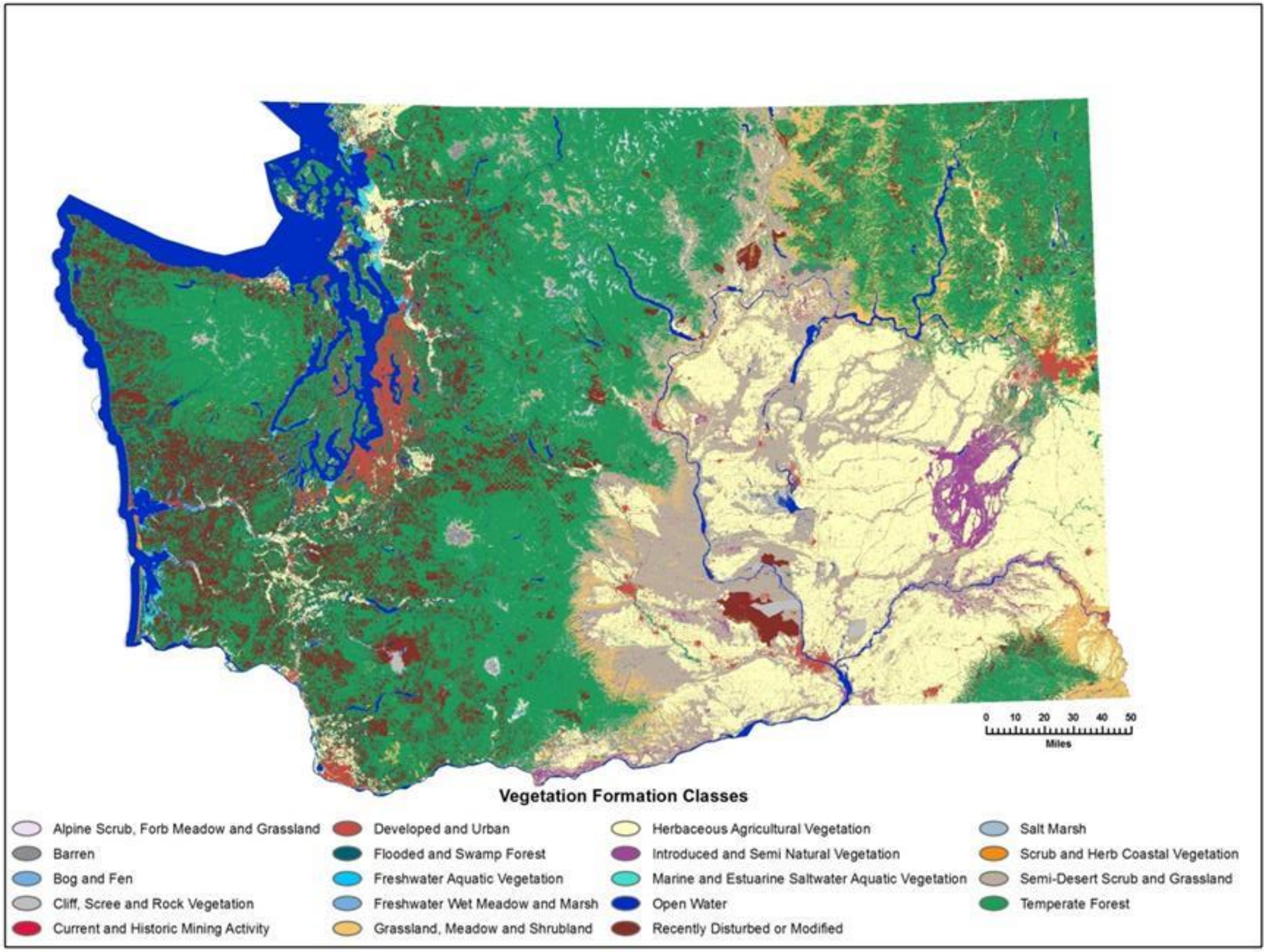
| VEGETATION FORMATION | TERRESTRIAL ECOLOGICAL SYSTEM | # SGCN Closely Associated | # SGCN Generally Associated |
|---|---|---|---|
| **Developed & Urban** | Developed, High Intensity | 1 | 0 |
| | Developed, Low Intensity | 1 | 29 |
| | Developed, Medium Intensity | 0 | 7 |
| | Developed, Open Space | 1 | 26 |
| **Flooded and Swamp Forest** | **Columbia Basin Foothill Riparian Woodland and Shrubland© | 10 | 15 |
| | Great Basin Foothill and Lower Montane Riparian Woodland & Shrubland | 1 | 7 |
| | Inter-Mountain Basins Montane Riparian Systems | 0 | 3 |
| | North Pacific Hardwood-Conifer Swamp | 1 | 14 |
| | **North Pacific Lowland Riparian Forest and Shrubland | 7 | 26 |
| | North Pacific Montane Riparian Woodland and Shrubland | 2 | 22 |
| | North Pacific Shrub Swamp | 1 | 11 |
| | Northern Rocky Mountain Conifer Swamp | 1 | 8 |
| | ** Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland © | 6 | 22 |
| | Rocky Mountain Lower Montane Riparian Woodland and Shrubland | 4 | 16 |
| | Rocky Mountain Subalpine-Montane Riparian Woodland | 3 | 17 |
| **Freshwater Aquatic Vegetation, Wet Meadow, & Marsh** | Avalanche Chute Shrubland | 0 | 1 |
| | Basalt Pothole Pond | 1 | 2 |
| | Coastal Interdunal Wetland | 0 | 1 |
| | Columbia Plateau Silver Sagebrush Seasonally Flooded Shrub Steppe | 0 | 1 |
| | Columbia Plateau Vernal Pool © | 3 | 5 |
| | Modoc Basalt Flow Vernal Pool | 0 | 1 |
| | ** North American Arid West Emergent Marsh | 8 | 12 |
| | North Pacific Avalanche Chute Shrubland | 0 | 9 |
| | North Pacific Coastal Interdunal Wetland | 4 | 0 |
| | North Pacific Hardpan Vernal Pool | 0 | 1 |
| | North Pacific Intertidal Freshwater Wetland | 3 | 7 |
| | Northern Columbia Plateau Basalt Pothole Pond | 1 | 1 |
| | Northern Rocky Mountain Avalanche Chute Shrubland | 0 | 4 |
| | Rocky Mountain Alpine-Montane Wet Meadow | 3 | 9 |
| | Rocky Mountain Subalpine-Montane Riparian Shrubland | 0 | 11 |
| | Subalpine-Montane Wet Meadow | 0 | 1 |
| | **Temperate Pacific Freshwater Aquatic Bed | 17 | 12 |
| | **Temperate Pacific Freshwater Emergent Marsh | 5 | 16 |
| | Temperate Pacific Freshwater Mudflat | 2 | 3 |
| | Temperate Pacific Montane Wet Meadow | 3 | 9 |
| | Temperate Pacific Subalpine-Montane Wet Meadow | 1 | 3 |
| | **Willamette Valley Wet Prairie | 8 | 8 |
| **Grassland, Meadow & Shrubland** | Columbia Basin Foothill and Canyon Dry Grassland | 4 | 26 |

| VEGETATION FORMATION | TERRESTRIAL ECOLOGICAL SYSTEM | # SGCN Closely Associated | # SGCN Generally Associated |
|---|---|---|---|
| | Columbia Basin Palouse Prairie | 3 | 11 |
| | **North Pacific Alpine and Subalpine Dry Grassland | 7 | 7 |
| | **North Pacific Herbaceous Bald and Bluff | 8 | 3 |
| | North Pacific Hypermaritime Shrub and Herbaceous Headland | 2 | 3 |
| | North Pacific Montane Shrubland | 0 | 10 |
| | Northern Rocky Mountain Lower Montane, Foothill and Valley Grassland | 1 | 14 |
| | Northern Rocky Mountain Montane-Foothill Deciduous Shrubland | 3 | 11 |
| | Northern Rocky Mountain Subalpine Deciduous Shrubland | 1 | 7 |
| | Northern Rocky Mountain Subalpine-Upper Montane Grassland | 2 | 6 |
| | Rocky Mountain Subalpine-Montane Mesic Meadow | 2 | 13 |
| | **Willamette Valley Upland Prairie and Savanna | 15 | 8 |
| **Herb. Agricultural Vegetation** | Cultivated Cropland | 5 | 28 |
| | Pasture/Hay | 3 | 29 |
| **Introduced & Semi Natural Vegetation** | Introduced Riparian and Wetland Vegetation | 0 | 12 |
| | Introduced Upland Vegetation - Annual Grassland | 2 | 22 |
| | **Introduced Upland Vegetation - Perennial Grassland and Forbland | 5 | 24 |
| | Introduced Upland Vegetation - Shrub | 1 | 10 |
| | Introduced Upland Vegetation - Treed | 0 | 2 |
| **Open Water** | Open Water (Fresh) | 69 | 20 |
| **Recently Disturbed or Modified** | Disturbed non-specific | 1 | 8 |
| | **Harvested Forest - Grass/Forb Regeneration | 5 | 15 |
| | **Harvested Forest - Northwestern Conifer Regeneration | 6 | 22 |
| | **Harvested Forest-Shrub Regeneration | 5 | 13 |
| | Recently Burned Forest | 2 | 17 |
| | Recently Burned Grassland | 3 | 21 |
| | Recently Burned Shrubland | 2 | 14 |
| **Salt Marsh** | Inter-Mountain Basins Alkaline Closed Depression | 2 | 13 |
| | Inter-Mountain Basins Greasewood Flat | 2 | 9 |
| | Inter-Mountain Basins Playa | 3 | 7 |
| | Temperate Pacific Tidal Salt and Brackish Marsh | 1 | 18 |
| **Scrub and Herb Coastal Vegetation** | North Pacific Coastal Cliff and Bluff | 5 | 3 |
| | North Pacific Maritime Coastal Sand Dune and Strand | 8 | 3 |
| **Semi-Desert Scrub & Grassland** | Columbia Plateau Low Sagebrush Steppe | 2 | 14 |
| | Columbia Plateau Scabland Shrubland | 6 | 19 |
| | **Columbia Plateau Steppe and Grassland | 9 | 23 |
| | **Inter-Mountain Basins Big Sagebrush Shrubland | 15 | 22 |

| VEGETATION FORMATION | TERRESTRIAL ECOLOGICAL SYSTEM | # SGCN Closely Associated | # SGCN Generally Associated |
|---|---|---|---|
| | **Inter-Mountain Basins Big Sagebrush Steppe © | 15 | 26 |
| | Inter-Mountain Basins Mixed Salt Desert Scrub | 3 | 14 |
| | Inter-Mountain Basins Montane Sagebrush Steppe | 2 | 12 |
| | Inter-Mountain Basins Semi-Desert Grassland | 2 | 16 |
| | Inter-Mountain Basins Semi-Desert Shrub Steppe | 3 | 8 |
| **Temperate Forest** | Columbia Plateau Western Juniper Woodland and Savanna | 3 | 11 |
| | East Cascades Mesic Montane Mixed-Conifer Forest and Woodland | 3 | 27 |
| | **East Cascades Oak-Ponderosa Pine Forest and Woodland | 7 | 12 |
| | Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland | 0 | 6 |
| | Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland | 0 | 2 |
| | Middle Rocky Mountain Montane Douglas-fir Forest and Woodland | 1 | 7 |
| | North Pacific Broadleaf Landslide Forest and Shrubland | 1 | 6 |
| | **North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland | 5 | 18 |
| | North Pacific Dry-Mesic Silver Fir-Western Hemlock-Douglas-fir Forest | 4 | 28 |
| | North Pacific Hypermaritime Sitka Spruce Forest | 2 | 21 |
| | North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest | 3 | 22 |
| | Inter-Mountain Basin Curl-leaf Mountain-mahogany Woodland and Shrubland | 0 | 2 |
| | North Pacific Lowland Mixed Hardwood-Conifer Forest and Woodland | 0 | 27 |
| | North Pacific Maritime Dry-Mesic Douglas-fir-Western Hemlock Forest | 4 | 31 |
| | **North Pacific Maritime Mesic Subalpine Parkland | 7 | 16 |
| | **North Pacific Maritime Mesic-Wet Douglas-fir-Western Hemlock Forest | 5 | 30 |
| | North Pacific Mesic Western Hemlock-Silver Fir Forest | 0 | 21 |
| | North Pacific Mountain Hemlock Forest | 1 | 19 |
| | **North Pacific Oak Woodland | 6 | 12 |
| | North Pacific Seasonal Sitka Spruce Forest | 0 | 6 |
| | North Pacific Wooded Volcanic Flowage | 1 | 3 |
| | **Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest | 11 | 26 |
| | Northern Rocky Mountain Foothill Conifer Wooded Steppe | 1 | 3 |
| | Northern Rocky Mountain Mesic Montane Mixed Conifer Forest | 4 | 23 |
| | **Northern Rocky Mountain Ponderosa Pine Woodland and Savanna © | 10 | 20 |
| | Northern Rocky Mountain Subalpine Woodland and Parkland | 2 | 20 |
| | Northern Rocky Mountain Western Larch Savanna | 0 | 12 |
| | Rocky Mountain Aspen Forest and Woodland © | 0 | 12 |
| | Rocky Mountain Lodgepole Pine Forest | 2 | 20 |
| | Rocky Mountain Poor-Site Lodgepole Pine Forest | 1 | 10 |
| | Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland | 3 | 17 |
| | Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland | 4 | 22 |

## 4.1.2 Distribution of Vegetation Formations

**Figure 4-2: Distribution of Vegetation Formations**



### 4.1.3 Marine Ecological Systems

Marine systems were divided into nine separate geographic regions. Two regions comprise the Pacific Ocean marine systems, and were separated for this planning effort at Point Grenville. Puget Sound and the Strait of Juan de Fuca were divided into seven regions; the Strait of Juan De Fuca, San Juan Islands and Georgia Basin, North Central Puget Sound, South Central Puget Sound, Hood Canal, Whidbey Island, and South Puget Sound. The first three marine ecological systems in Table 4-2 were defined and described in the National Vegetation Classification scheme. Comprehensive finer scale ecological systems description and mapping for the estuarine, nearshore, offshore, and oceanic marine ecological systems we used (Table 4-2) have not been developed for Washington waters using standardized methods such as available through the Coastal and Marine Ecological Classification Standard framework (http://coast.noaa.gov/digitalcoast/publications/cmecs).

**Table 4-2: Washington's Seven Marine Ecological Systems**

| MARINE ECOLOGICAL SYSTEM | DESCRIPTION |
|---|---|
| Temperate Pacific Tidal Salt and Brackish Marsh | Emergent vegetation occurring in tidally influenced wetlands associated with estuaries, lagoons and bays, and behind sand spits. |
| Temperate Pacific Intertidal Mudflat | Sparsely vegetated areas within intertidal zones. |
| North Pacific Maritime Eelgrass Bed | Submerged vegetated systems dominated by the eelgrass *Zostera marina.* Found along all coastal areas, but especially abundant in the northern portion of Puget Sound north of Everett. |
| Estuarine | The portion of the estuary with constant water. |
| Nearshore | The area from shoreline to 100 feet (30 meters) deep and may include marine algae communities, such as kelp beds. |
| Offshore | The outer coastal area from 100 feet (30 meters) deep seaward to continental shelf break and may include marine algae communities, such as kelp beds. |
| Oceanic | The outer coastal area seaward of the continental shelf break and may include floating marine algae communities, such as *Sargassum* seaweeds. |

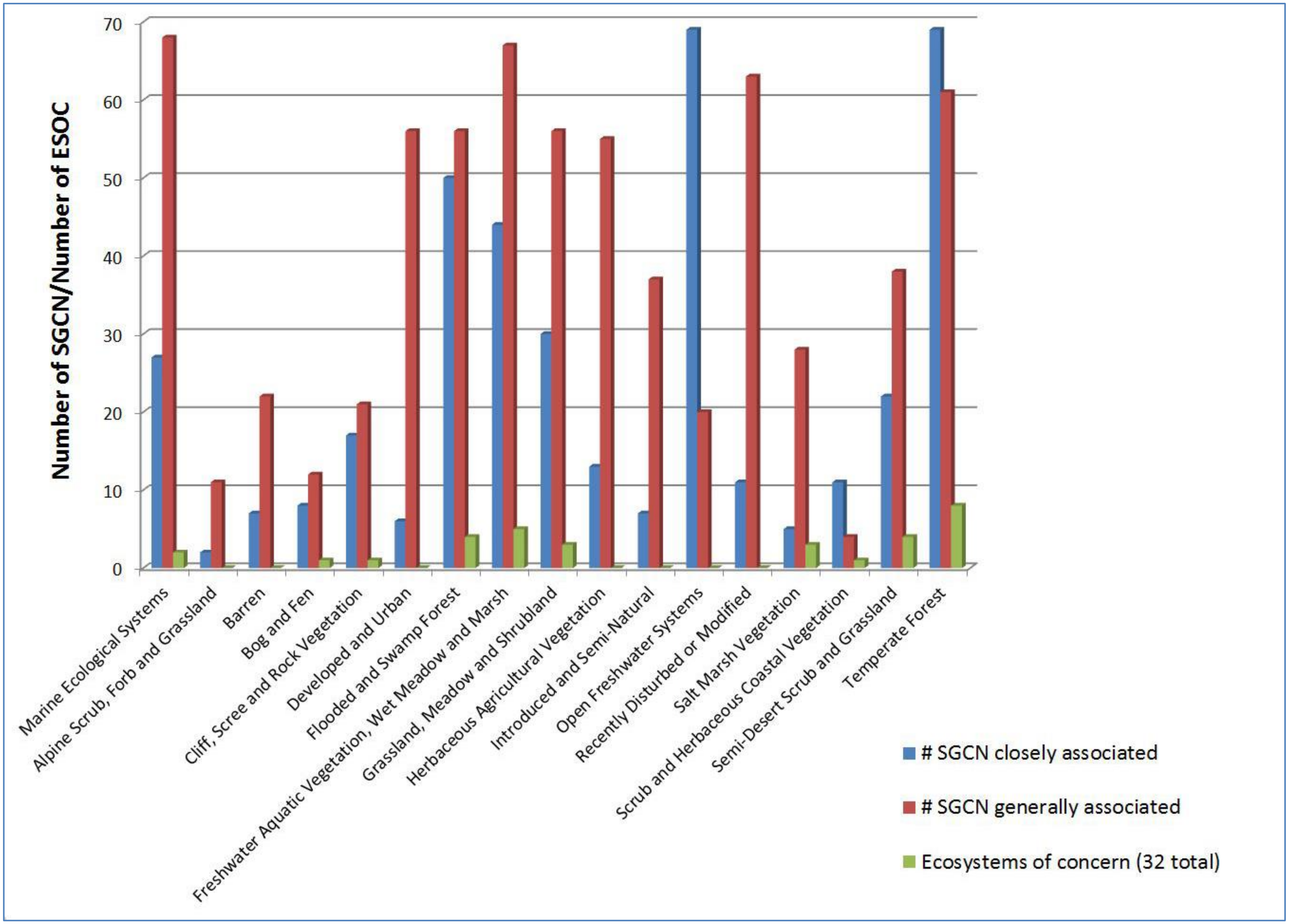
## 4.1.4 Summary of Vegetation Formations

**Table 4-3: Summary of Washington's 16 Terrestrial Vegetation Formations**

| | | | | | ECOREGIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Vegetation Formation (17 total)** | **Distribution (mi²)** | **# SGCN closely associated** | **# SGCN generally associated** | **Ecological systems of concern (37 total)** | Northwest Coast | West Cascades | Puget Trough | North Cascades | Columbia Plateau | Okanogan | **East Cascades** | Canadian Rocky Mtns | Blue Mountains |
| **Alpine Scrub and Grassland** | 251 | 2 | 11 | 0 | x | x | | x | x | x | x | | x |
| **Barren** | 336 | 9 | 19 | 0 | x | x | x | x | | x | x | | |
| **Bog & Fen** | 19 | 7 | 11 | 1 | x | x | x | x | | x | x | x | |
| **Cliff, Scree & Rock Vegetation** | 318 | 14 | 21 | 1 | x | x | x | x | x | x | x | x | x |
| **Developed & Urban** | 2040 | 6 | 57 | 0 | x | x | x | x | x | x | x | x | x |
| **Flooded & Swamp Forest** | 1479 | 49 | 54 | 4 | x | x | x | x | x | x | x | x | x |
| **Freshwater Aquatic Vegetation, Wet Meadow & Marsh** | 559 | 40 | 68 | 9 | x | x | x | x | x | x | x | x | x |
| **Grassland, Meadow & Shrubland** | 3707 | 31 | 20 | 3 | x | x | x | x | x | x | | x | x |
| **Herbaceous Agricultural Vegetation** | 21,491 | 11 | 52 | 0 | x | x | x | x | x | x | x | x | x |
| **Introduced and Semi-Natural** | 1746 | 2 | 38 | 0 | | | x | | x | x | x | x | x |
| **Open Water (freshwater)** | 4400 | 67 | 22 | 0 | x | x | x | x | x | x | x | x | x |
| **Recently Disturbed or Modified** | 6648 | 5 | 63 | 0 | x | x | x | x | x | x | x | x | x |
| **Salt Marsh Vegetation** | 224 | 3 | 25 | 4 | x | | x | | x | x | x | | x |
| **Scrub & Herbaceous Coastal Vegetation** | 28 | 12 | 4 | 1 | x | x | x | | | | | | |
| **Semi-Desert Scrub & Grassland** | 199 | 22 | 44 | 4 | | x | x | x | x | x | x | x | x |
| **Temperate Forest** | 28,818 | 66 | 55 | 10 | x | x | x | x | x | x | x | x | x |

### 4.1.5 Summary of SGCN and ESOC Association with Formations

**Figure 4-3: SGCN Associations by Washington's 16 Terrestrial Vegetation Formations**



## 4.1.6 Key Stressors and Conservation Actions for SGCN Habitats (Formations and ESOCs)

**Table 4-4: Key Stressors and Conservation Actions**

| VEGETATION FORMATION | ECOLOGICAL SYSTEMS OF CONCERN | STRESSORS | | | | | | | | | | | | ACTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Energy Development | Roads & Development | Alteration of Hydrology | Altered Fire Regime | Dams and Diversions | Agricultural side effects | Climate Change | Overharvesting | Invasive Species | Habitat Loss /degradation | Recreation Impacts | Need for Outreach/Ed | Habitat Conservation | Partner/Stakeholder Eng. | Water Management | Fire Management | Invasive Species Control | Create New Habitat | Grazing/Farm Mgmt. | Water Rights | Research or Surveys | Restoration | Land Use Planning | Private Lands Incentives |
| Alpine Scrub, Forb Meadow & Grassland Vegetation | | | | | | | | x | | | x | x | | | | | x | x | | | | | | | |
| Barren | | x | x | | | x | | x | | | x | x | | x | | | | | | | | | | x | |
| Bog & Fen | | | | | | | | x | | | | | | x | | x | | | | | | x | | | |
| | North Pacific Bog & Fen | | x | x | | | x | x | | | | | | x | | x | | | | | | | | x | x |
| Cliff, Scree and Rock Vegetation | | | | | | | | x | | | | | x | x | | | | | | | | | | x | |
| | Inter-Mountain Basins Active and Stabilized Dune | | x | | | x | x | | | x | | | | | x | x | | x | | x | x | | | x | |
| Developed and Urban | | x | x | | x | x | | | x | | x | | | | x | x | | | | | | x | x | x | |
| Flooded & Swamp Forest | | | x | | | x | x | x | x | x | | | | | x | | | | | x | | x | x | x | |
| | Columbia Basin Foothill Riparian Woodland & Shrubland | | x | | | x | x | x | x | x | | | | | x | x | | x | | x | x | x | x | x | |

| VEGETATION FORMATION | ECOLOGICAL SYSTEMS OF CONCERN | STRESSORS | | | | | | | | | | | | ACTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Energy Development | Roads & Development | Alteration of Hydrology | Altered Fire Regime | Dams and Diversions | Agricultural side effects | Climate Change | Overharvesting | Invasive Species | Habitat Loss /degradation | Recreation Impacts | Need for Outreach/Ed | Habitat Conservation | Partner/Stakeholder Eng. | Water Management | Fire Management | Invasive Species Control | Create New Habitat | Grazing/Farm Mgmt. | Water Rights | Research or Surveys | Restoration | Land Use Planning | Private Lands Incentives |
| | North Pacific Hardwood Conifer Swamp | | | x | | | | | x | x | | | | | | | | x | | | | | x | x | |
| | North Pacific Lowland Riparian Forest & Shrubland | | x | | | x | x | x | x | | | | | x | x | x | | | | x | x | x | | | x |
| | Northern Rocky Mountain Lower Montane Riparian Woodland & Shrubland | | | | | | x | x | | x | | | | | | x | | x | | x | | | | x | |
| Freshwater Aquatic Vegetation, Wet Meadow & Marsh | | | x | x | | x | x | x | | x | x | | | | | x | | x | | | | x | x | | |
| | North American Arid West Emergent Marsh | | x | x | | | x | x | | x | | | | | | x | | x | | x | x | x | | x | x |
| | North Pacific Intertidal Freshwater wetland | | x | x | | x | | | | x | x | | | | | x | | x | x | | | | | x | |
| | Temperate Pacific Freshwater Emergent Marsh | | x | | | x | x | | | x | x | | | | | | | x | | | | | | x | |
| | Temperate Pacific Freshwater Mudflat | x | x | | | x | | | | x | x | | | | | x | | x | x | | | | | x | |
| | Willamette Valley Wet Prairie | | | x | x | | x | | | x | x | | | x | | | | | | | | x | x | x | x |
| Grassland, Meadow & Shrubland | | | | | x | | x | x | | x | x | | | | | | x | x | x | x | | x | x | | |

| VEGETATION FORMATION | ECOLOGICAL SYSTEMS OF CONCERN | STRESSORS | | | | | | | | | | | | ACTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Energy Development | Roads & Development | Alteration of Hydrology | Altered Fire Regime | Dams and Diversions | Agricultural side effects | Climate Change | Overharvesting | Invasive Species | Habitat Loss /degradation | Recreation Impacts | Need for Outreach/Ed | Habitat Conservation | Partner/Stakeholder Eng. | Water Management | Fire Management | Invasive Species Control | Create New Habitat | Grazing/Farm Mgmt. | Water Rights | Research or Surveys | Restoration | Land Use Planning | Private Lands Incentives |
| | Columbia Basin Foothill & Canyon Dry Grassland | | | | x | | x | | | x | | | | | | | x | x | x | x | | | x | x | x |
| | Columbia Basin Palouse Prairie | | | | x | | x | | | x | x | | | | | | x | x | | x | | | x | x | |
| | Willamette Valley Upland Prairie & Savanna | | x | | x | | | | | x | | | | x | | | x | | x | | | | x | x | x |
| Herbaceous Agricultural Vegetation | | | | | | | x | | x | | | | x | | x | | | | | | | x | | x | x |
| Introduced and Semi-Natural | | | x | x | | | x | | | | x | | | | | | | | | | | | x | x | x |
| Open Water | | | x | x | | x | | x | | | x | | | | x | x | | | | | | x | x | x | x |
| Recently Disturbed or Modified | | | | | | | | | x | x | x | | | x | | | x | x | | | | | x | | |
| Salt Marsh Vegetation | | | | x | | x | | x | | x | x | | | | | x | x | x | | x | | x | x | | |
| | Inter-mountain Basins Greasewood Flat | | x | x | x | | x | | | x | | | | x | | | | x | | x | | | | x | x |
| | Inter-mountain Basins Playa & Alkaline Closed Depression | | x | x | | x | x | | | x | | | | x | | x | | x | | x | | | | x | x |
| | Temperate Pacific Tidal Salt & Brackish Marsh | | x | x | | | x | | | x | | | | | | x | | x | | | | | x | x | |

| VEGETATION FORMATION | ECOLOGICAL SYSTEMS OF CONCERN | STRESSORS | | | | | | | | | | | | ACTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Energy Development | Roads & Development | Alteration of Hydrology | Altered Fire Regime | Dams and Diversions | Agricultural side effects | Climate Change | Overharvesting | Invasive Species | Habitat Loss /degradation | Recreation Impacts | Need for Outreach/Ed | Habitat Conservation | Partner/Stakeholder Eng. | Water Management | Fire Management | Invasive Species Control | Create New Habitat | Grazing/Farm Mgmt. | Water Rights | Research or Surveys | Restoration | Land Use Planning | Private Lands Incentives |
| Scrub & Herbaceous Coastal Vegetation | | | | | | | | x | | x | x | x | | x | | | | x | | | | x | x | | |
| | North Pacific Maritime Coastal Sand Dune & Strand | | | | | | | | | x | x | | | x | | | | x | | | | | x | x | x |
| Semi-desert Scrub & Grassland | | x | x | | x | | x | x | | x | | | | | | | x | x | | x | | x | x | | |
| | Columbia Plateau Low Sagebrush Steppe | | x | | | | x | | | x | x | | | x | | | | x | | | | | x | x | x |
| | Columbia Plateau Steppe & Grassland | x | x | | x | | x | | | x | x | | | x | | | x | x | | x | | | x | x | x |
| | Inter-Mountain Basins Big Sagebrush Steppe | x | x | | x | | x | | | x | x | | | x | | | x | x | | x | | | x | x | x |
| | Inter-Mountain Basins Semi-desert Shrub Steppe | | x | | x | | x | | | x | x | | | x | | | x | x | | x | | | x | x | x |
| Temperate Forest | | | x | | x | | x | x | x | x | | | | x | | | x | x | | x | | x | x | x | x |
| | East Cascades Oak-Ponderosa Pine Forest & Woodland | | x | | x | | x | | | x | | | | x | | | x | x | | | | | x | x | x |
| | North Pacific Dry Douglas-fir (Madrone) Forest & Woodland | | x | | x | | | | x | x | | | | x | | | x | x | | | | | x | x | x |

| VEGETATION FORMATION | ECOLOGICAL SYSTEMS OF CONCERN | STRESSORS | | | | | | | | | | | | ACTIONS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Energy Development | Roads & Development | Alteration of Hydrology | Altered Fire Regime | Dams and Diversions | Agricultural side effects | Climate Change | Overharvesting | Invasive Species | Habitat Loss /degradation | Recreation Impacts | Need for Outreach/Ed | Habitat Conservation | Partner/Stakeholder Eng. | Water Management | Fire Management | Invasive Species Control | Create New Habitat | Grazing/Farm Mgmt. | Water Rights | Research or Surveys | Restoration | Land Use Planning | Private Lands Incentives |
| | North Pacific Hypermaritime Sitka Spruce Forest | | x | | x | | | | x | x | | | | x | | | x | x | | | | | x | x | x |
| | North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest | | x | | x | | | x | x | x | | | | x | | | | x | | | | | x | x | x |
| | North Pacific Oak Woodland | | x | | x | | | | | x | | | | x | | | x | x | | | | | x | x | x |
| | Northern Rocky Mountain Ponderosa Pine Woodland & Savanna | | x | | x | | x | x | | x | | | | x | | | x | x | | | | | x | x | x |
| | Northern Rocky Mountain Western Larch Savanna | | x | | x | | | x | | x | | | | x | | | x | x | | | | | x | x | x |
| | Rocky Mountain Aspen Forest & Woodland | | x | | x | | | | | x | | | | x | | | x | x | | | | | x | x | x |

## 4.2 DESCRIPTIONS OF VEGETATION FORMATIONS AND ECOLOGICAL SYSTEMS OF CONCERN

Terrestrial habitats (defined here by vegetation formations and ecological systems) are discussed first, followed by marine systems (page 102)

# ALPINE SCRUB, FORB MEADOW AND GRASSLAND VEGETATION

### Overview

Alpine scrub, forb meadow and grassland vegetation formation includes five ecological systems, two of which are closely related: Rocky Mountain Alpine Dwarf Shrubland, Fell-Field and Turf, and North Pacific Dry and Mesic Alpine Dwarf-shrubland, Fell-field and Meadow. These are vegetated areas found above the environmental limit of trees, at the highest elevations of the Olympic and Cascade Mountains. They typically include cold, windblown areas supporting a mosaic of dwarf-shrublands, fell fields, tundra (sedge tufts), and sparsely vegetated snowbed communities. Small patches of krummholz (shrub-form trees) are also part of this system and occur at the lower elevations. These systems differ primarily in geographic distribution and resulting difference in associated flora.

Sites are slopes and depressions where snow lingers, where the soil has become relatively stabilized, and where the water supply is more or less constant. Dwarf shrublands are often found on level or concave glacial topography, with late-lying snow and sub-irrigation from surrounding slopes. Fell fields are found in wind-scoured areas such as ridgetops and exposed saddles. SGCN with close association within these ecological systems are White-tailed Ptarmigan and Olympic Marmot. SGCN with general association are Golden Eagle, American Pika, Cascade Red Fox, Grizzly Bear, Northern Bog Lemming, Wolverine, Cascades Needlefly, Northern Forestfly, two species of mayfly (*Cinygmula gartrelli, Paraleptophlebia falcula*) and one caddisfly (*Allomyia acanthis*). This formation contains no ecological systems of concern.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 156 $mi^2$ | >99% | <1% | 2 | 11 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| North Pacific Dry and Mesic Alpine Dwarf Shrubland | 2 | 10 |
| Rocky Mountain Alpine Dwarf Shrubland | 0 | 1 |
| Rocky Mountain Alpine Tundra | 1 | 6 |
| Rocky Mountain Alpine Turf | 0 | 1 |

### Major stressors

Climate change, which may result in reduced snowpack and encroachment by trees and shrubs, is a major stressor. Trampling and associated recreational impacts are a major source of human disturbance. In recent years, Olympic Marmots have disappeared from some of the driest meadows in the northeast Olympic Mountains.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Prevent encroachment of trees and large shrubs** | Trees and large shrubs are encroaching on habitat in the Olympic Peninsula and the Cascades, providing a potential threat to species like the Olympic Marmot and White-tailed Ptarmigan, both closely associated with these systems. |

### Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire).
- Control of invading species, primarily native trees and shrubs.

### Key research and data needs

- Conducting prescribed fire to enhance habitat and minimize public concerns.

### Specific Ecological System References (complete list at end of chapter)

Edelman, A. J. 2003. *Marmota olympus*. Mammalian Species 736: 1-5.

Schroeder, M. A. 2005. White-tailed ptarmigan. Page 68 in T. R. Wahl, B. Tweit, and S. G. Mlodinow, editors. Birds of Washington. Oregon State University Press, Corvallis, Oregon.

## BARREN

### Overview

Barren vegetation formation includes two ecological systems, Unconsolidated Shore and Alpine Ice Field. Unconsolidated shore is material such as silt, sand, or gravel that is subject to inundation and, most importantly, redistribution due to the action of water in high energy environments (e.g. beaches, rivers). It is characterized by substrates lacking vegetation except for pioneering plants that become established during brief periods when growing conditions are favorable. Erosion and deposition by waves, currents, and seasonal flooding produce a number of landforms representing this class; the most common examples include sand and rock beaches along the outer coast and braided gravel beds associated with rivers and streams. Alpine ice fields include glaciers and perennial snow and ice features.

The ecological system with the most closely and generally associated species in this formation is the Unconsolidated Shore (see below). Seven SGCN have a close association with Unconsolidated Shore: American White Pelican, Dusky Canada Goose, Harlequin Duck, Peregrine Falcon, Rock Sandpiper, Western Snowy Plover and Puget Sound Chinook Salmon ESU. A complete analysis of habitat association has not been done for all SGCN anadromous and freshwater fishes, thus it is possible that other SGCN fishes may be closely associated with the system within this formation. This formation contains no ecological systems of concern.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 209 mi² | 84% | 1% | 7 | 22 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| North American Alpine Ice Field | 0 | 4 |
| Unconsolidated Shore | 6 | 10 |

### Major stressors

Climate change is a significant stressor for the Unconsolidated Shore in coastal areas (rise of sea level, shoreline armoring limits the flow of sediment in shorelines) and Alpine Ice Field ecological system (decline of glaciers and reduction in snowpack). Other major stressors for SGCN include human disturbance on beaches important for Western Snowy Plover nesting, deposition of dredge spoils on Streaked Horned Lark nesting islands, and human modification of river flow processes, which can alter sand and gravel deposits.

### Habitat needs for SGCN associated with unconsolidated shore

| | |
|---|---|
| **Unvegetated condition** | Species use in these systems results from an absence of vegetation and re-setting of succession caused by disturbance and perhaps to some extent to its proximity to open water. This system is used for nesting (e.g. Western Snowy Plover), roosting (e.g. Brown Pelican) and foraging (e.g. Rock Sandpiper). |
| **High invertebrate abundance/ diversity** | Invertebrates are important food for Harlequin Ducks and Rock Sandpipers, among others. |
| **Floodplain gravel beds** | Gravel beds within river floodplains are important for maintaining spawning habitat for salmonids and contributing to instream habitat for other fishes. |

## Actions needed to maintain habitat quality for SGCN

Use of alternative techniques to shoreline and river armoring can protect both development and fresh and salt water shorelines. Restoration of floodplains, such as by dike removal or set-back, can allow gravel beds to develop and increase. Actions to prevent oil spills are needed to avoid significant impacts to wildlife using unconsolidated shore.

## BOG AND FEN

### Overview

Bog and fen vegetation formation includes three ecological systems in Washington: North Pacific Bog and Fen, Rocky Mountain Subalpine–Montane Fen, and Boreal Depressional Shrub Bog. Most bogs and fens are less than 12 acres in size. The North Pacific Bog and Fen ecological system is composed of peatlands that occur as small patches along the Pacific coast from southeastern Alaska to northern California, in and west of the coastal mountain summits including the Puget Sound lowlands. The Rocky Mountain Subalpine-Montane Fen ecological system includes high elevation wetlands with organic soils in eastern Washington. It is confined to specific environments where perennial groundwater discharge occurs, such as low points in the landscape or near slopes where groundwater intercepts the soil surface, or along pond/lake shorelines. Note that the North Pacific Bog and Fen component of this formation is profiled as an ecological system of concern.

Bogs and fens differ from other wetlands in having a substrate composed of organic material, typically in the form of peat and muck. The origin of the peat can be *Sphagnum* moss, 'brown' mosses, sedges, or woody species. Within the North Pacific Bog and Fen ecological system, vegetation is usually a mix of conifer-dominated overstory, shrubs, and open *Sphagnum* or sedge lawns, often with small ponds and pools interspersed. Graminoids, evergreen or deciduous broadleaf shrubs, or evergreen needleleaf trees are commonly dominant. Many plant species are confined to this formation.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 13 $mi^2$ | 43% | 57% | 8 | 12 |

| Ecological systems found in this formation | Number of SGCN closely associated | Number of SGCN generally associated |
|---|---|---|
| Boreal Depressional Shrub Bog | 0 | 1 |
| North Pacific Bog and Fen | 3 | 8 |
| Rocky Mountain Subalpine-Montane Fen | 4 | 6 |

Ecological System of Concern

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **High ecological integrity** | Many of the invertebrates associated with this system are associated with native plants, high ecological integrity, and are sensitive to invasive shrubs and grasses. |
| **Adequate groundwater level** | Fish that use ponds and pools of this system, such as Olympic Mudminnow, require adequate ground water levels to maintain the water bodies. |

### Climate Change

Climate changes such as decreased precipitation, reduced snowpack, or prolonged drought that reduces water availability and recharge may lead to range contraction and/or habitat conversion, increased invasion of dry-adapted species, or tree encroachment in bog and fen habitats.  Shifts from snow to rain that enhances winter/spring flood risk may increase erosion of moist peat and topsoil, reduce opportunities for recharge, and/or lead to drying of habitats.

### Actions needed to maintain habitat quality for SGCN

Site protection; sites with high ecological integrity and corresponding SGCN should be identified and protected.  Groundwater withdrawals should be regulated to preserve groundwater levels needed to maintain aquatic habitat conditions.

### Research and data needs

While some bogs have been surveyed in detail, most have not.  The range of rare species, including several beetles and Makah Copper are not thoroughly documented.

### Ecological systems discussed in greater detail in this section

Of the two ecological systems found in this formation, North Pacific Bog and Fen is discussed in greater detail here.  It is considered an ecological system of concern because of its imperiled conservation status and because of its importance to SGCN.

## North Pacific Bog and Fen (ESOC)

### Description and Distribution

The North Pacific Bog and Fen ecological system is located primarily in the North Pacific Ecoregion, but is sporadically distributed through the west side and eastern slopes of the Cascades.  Elevations are mostly under 1500 feet, and annual precipitation ranges from 35 to 120 inches.  However, fens are also found within the Cascades and Olympic Mountains.  The system is found in primarily in glaciated terrain but also in river valleys, around lakes and marshes, behind coastal sand dunes, or on slopes.  Four SGCN are closely associated with this ecological system:  Olympic Mudminnow, Beller's Ground Beetle, Hatch's Click Beetle, and Makah Copper.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br>Freshwater Wetlands | S2 | Imperiled/ declining<br><br>Declines of 30-50% in last 50 years and from historical condition | **MAMMALS:** Gray Wolf, Western Spotted Skunk, Townsend's Big-eared Bat, Keen's Myotis, Hoary Bat, Silver-haired Bat |
| | | | **BIRDS:** Greater Sandhill Crane |
| | | | **AMPHIBIANS:** Western Toad |
| | | | **FISH:** Olympia Mudminnow* |
| | | | **INVERTEBRATES:** Beller's Ground Beetle*, Hatch's Click Beetle*, Makah Copper* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Historical and contemporary land use practices have impacted hydrologic, geomorphic, and biotic structure and function of peatlands in western Washington.  Conversion of peatlands for agriculture has resulted in significant loss of peatland extent.  These areas are often cultivated for food crops such as blueberries and cranberries.

Reservoirs, water diversions and withdrawals, ditches, roads, and human land uses in the contributing watershed (fens) or surrounding landscape can also have a substantial impact on the hydrological regime. Direct alteration of hydrology (i.e., channeling, draining, damming) or indirect alteration (i.e., roads or removing vegetation on adjacent slopes) results in changes in species composition and wetland extent. Water diversions and ditches can have a substantial impact on the hydrology as well as biological integrity of peatland.

Climate change poses a particular future threat to this system. Bog and fen habitats, particularly those that depend on surface water, are sensitive to drier climate conditions that can lead to habitat conversion or range contraction, increased invasion of dry-adapted species.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Agriculture and aquaculture side effects | Conversion to agriculture eliminates and degrades habitat | • Grazing/farm management<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Protect key sites through acquisition, easement, low intensity land uses, and protection of hydrology<br>Support creation of GMA-based Voluntary Stewardship Plans |
| Roads and development | Development near bogs and fens degrades habitat | • Land acquisition<br>• Land use planning<br>• Environmental review<br>• Private lands agreements | Protect key sites through acquisition, easement, low intensity land uses and protection of hydrology |
| Alteration of hydrology | Alteration of hydrology degrades habitat | • Water management | Maintain or re-configure hydrological sources and routes |
| Climate change | Drier conditions may lead to habitat conversion or range contraction | • Address existing stressors | Build resilience for added stress of climate change by addressing existing stressors |

# CLIFF, SCREE AND ROCK VEGETATION

## Overview

Cliff, scree and rock vegetation include seven systems that generally have little or no vegetation or soil development. Please see Table 4-1 for a complete list of these systems. They include steep cliff faces, narrow canyons, and larger rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Some systems are characterized by the presence of unstable scree and talus that typically occur below cliff faces as well as sand dunes. Small patches of dense vegetation, typically scattered trees or shrubs, can occupy rock fractures and less steep or more stable slopes. Although herbaceous cover tends to be limited in these systems mosses or lichens may be very dense and well-developed, displaying well over 10 percent cover.

The ecological system with the most closely and generally associated species in this system is Inter-Mountain Basins Cliff and Canyon. Species with close association with this system include Ferruginous Hawk, Golden Eagle, Peregrine Falcon, Spotted Bat, and Night Snake. Note that the Inter-Mountain Basins Active and Stabilized Dune component of this formation is an ESOC.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 610 mi$^2$ | 91% | 9% | 17 | 21 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Inter-Mountain Basins Active and Stabilized Dune | 11 | 5 |
| Inter-Mountain Basins Cliff and Canyon | 5 | 10 |
| North Pacific Alpine Bedrock and Scree | 1 | 8 |
| North Pacific Montane Bedrock, Cliff and Talus | 4 | 6 |
| Rocky Mountain Alpine Bedrock and Scree | 1 | 4 |
| Rocky Mountain Cliff, Canyon and Bedrock | 2 | 3 |

Ecological System of Concern

## Major Stressors

- Much of this system occurs in designated wilderness areas and is not exposed to serious threats. This system is generally inaccessible which precludes most human activities.
- Global climate change could alter species composition of this system possibly by allowing more vascular plant species to establish as well as a shift in species composition.
- Invasive plants are mainly a threat within the Inter-Mountain Basins Active and Stabilized Dune ecological system. This is generally not much of a threat to the other ecological systems associated with Cliff, Scree, and Rock vegetation.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Nesting habitat** | Golden Eagle and Peregrine Falcon nest on cliffs and rock faces. |
| **Habitat complexity** | Voids and fissures in rock and talus provide denning habitat for American Pika, Wolverine, and Olympic Marmot. Cliffs are also critical habitat year-round for Spotted Bats. |

### Actions needed to maintain habitat quality for SGCN

- Activities that disturb or displace species that use the system should be discouraged or not allowed during sensitive times. Those activities may include mining or recreation such as rock climbing.
- Activities that remove habitat such as substrate mining should be discouraged.

### Ecological systems discussed in greater detail in this section include:

A. Inter-Mountain Basins Active and Stabilized Dune

## Inter-Mountain Basins Active and Stabilized Dune (ESOC)

### Conservation Status and Concern

Most examples of this system in Washington have either been converted over by various land use activities or have been significantly altered. Sixteen SGCN are associated with Inter-mountain Basins Active and Stabilized Dunes, more than half of which are closely associated with this ecological system. It is an especially important habitat for many of the SGCN amphibian and reptiles of eastern Washington.

### Description and Distribution

Although these dunes are primarily restricted to the Columbia Plateau Ecoregion, a few occur in the Okanogan Ecoregion as far north as the boundary with British Columbia in Okanogan County. Sand dunes are highly dynamic systems and patterns of plant species composition are closely related to sand erosion, deposition and dune migration and stabilization (Chadwick and Dalke 1965). These processes may occur rapidly, leaving legacies from previous vegetation types. While repeating patterns of vegetation are observed and allow the identification of community types, they are often present in a spatially complex, fine-scale mosaic. The boundaries between community types range from distinct to highly blurred (Easterly and Salstrom 1997).

Sand dunes support vegetation if wind stress is not too great (WDFW 2008). Although vegetation tends to be variable, dunes often consist of plants common to shrub-steppe, such as antelope bitterbrush, rabbitbrush and snow buckwheat. However, some plants are more restricted to sand dune, such as, Indian Ricegrass, Lemon Scurfpea, and Veiny Dock. The vegetation cover is related to annual rainfall totals and evapotranspiration rates. The mobility of sand dunes is related to the power of the wind, while a dune's mobility becomes inhibited as vegetation cover increases. Long periods of increased precipitation and persistent presence of vegetation may lead to a sand surface covered by litter and/or mosses and lichens. These same factors also can initiate soil formation, which can cause dune stabilization. Periods of drought are generally unfavorable to vegetation and can reinitiate the mobility of sands (WDFW 2008).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes Inland Dunes | S1 | Critically imperiled/ declining<br><br>Declines of 50-70% in last 50 years and 70-80% from historical condition | **MAMMALS:** Spotted Bat<br>**BIRDS:** Ferruginous Hawk*, Short-eared Owl<br>**REPTILES/AMPHIBIANS:** Northern Leopard Frog*, Western Toad, Woodhouse's Toad*, Desert Nightsnake, Sagebrush Lizard*, Pygmy Short-horned Lizard*, Side-blotched Lizard*, Striped Whipsnake*<br>**INVERTEBRATES:** Three Noctuid Moths*, Columbia River Tiger Beetle*, Morrison's Bumblebee |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Washington inland sand dune systems have declined approximately 76 percent from the early 1970s, primarily as a result of conversion to agricultural, reservoir flooding, and dune stabilization (Hallock et al. 2007). Currently, the major threats to Washington's inland sand dunes are invasive species, agricultural conversion, including the effects of adjacent irrigation, off-road vehicle use, dune stabilization, home development, mining, and livestock grazing (Hallock et al. 2007).

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Invasive and other problematic species | Exotic grasses invading and introduced to actively stabilize dunes are major threat. | • Invasive species control<br>• Partner/stakeholder engagement | Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation. |
| Dams, levees and diversions | The Columbia River Irrigation Project has increased water table creating interdunal wetland and ponds that stabilized dunes. | • Water management<br>• Water rights acquisition<br>• Partner/stakeholder engagement | Remove water retention structures and encourage water conservation in agriculture. |
| Agriculture and aquaculture side effects | Conversion to agriculture eliminates and degrades habitat | • Grazing/farm management<br>• Land use planning | Protect key sites with low intensity land uses. Support creation of GMA-based Voluntary Stewardship Plans |
| Roads and development | Dune stabilization for homes and roads has a cumulative effect on inland dunes. | • Land use planning | Site homes and road to minimize impacts to dunes. |

### Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., R. D. Haugo, and R. Crawford. 2007. Conservation strategy for Washington State inland sand dunes. Natural Heritage Report 2007-05. Prepared for the Bureau of Land Management. Washington Department of Natural Resources. Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp.

# DEVELOPED AND URBAN

## Overview

Developed and urban areas include the range of human affected landscapes from low intensity to high-intensity development. Developed and urban areas are characterized by a high percentage (30% or greater) of constructed materials (asphalt, concrete, buildings, etc...) Impervious surfaces account for 20 to 100 percent of total cover. This includes areas like large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes. It also includes more developed areas including apartment complexes, row houses, and commercial/industrial uses, where people reside or work in high numbers.

Many think that when lands are developed they lose almost all value as fish and wildlife habitat. Although the habitat needs for most SGCN do not exist in developing and urban landscapes, development never eliminates all fish and wildlife habitat. In fact, even though trends in the number of native species decline along a gradient from rural, to suburban, to the urban core, many native species as well as some SGCN are surprisingly resilient and tolerant of the presence of people. Peregrine Falcons nesting on a downtown Seattle skyscraper is an example of how a SGCN can adapt.

Open spaces as well as artificial structures (e.g., bridges, eaves, and feeders) in developed landscapes can also provide suitable nesting, roosting, and foraging opportunities for SGCN and other native species. Although only three terrestrial SGCN, the Peregrine Falcon, Streaked Horned Lark and Sharp-tailed Snake, are generally associated with many of the Developed and Urban ecological systems, other species use these systems as habitat in Washington. Many salmonid SCGN must migrate through rivers that run through developed and highly urbanized areas, thus effects on water quality and condition of riparian areas are of particular concern. Some of their spawning areas are closely associated with developed areas. SGCN salmonids that migrate long distances within the Columbia Basin are exposed to multiple developed areas, resulting in a close association with this habitat form. Problems arise when poorly-placed development or low-density urban sprawl removes and degrades once-important habitat. With population forecasts showing an additional two million Washingtonians by 2040, advising land use managers regarding ways to perpetuate fish and wildlife while accommodating population and economic growth will be one of our most important responsibilities for conserving fish and wildlife habitat across the state.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 2,039 $mi^2$ | 11% | 89% | 6 | 56 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| Developed, High Intensity | 0 | 0 |
| Developed, Low Intensity | 1 | 29 |
| Developed Medium Intensity | 0 | 7 |
| Developed, Open Space | 1 | 26 |

### Major Stressors

- Degraded habitat and connectivity from low-density urban sprawl.
- Degraded habitat structure from fire suppression in and around rural and exurban home sites.
- Increased human-wildlife conflicts (e.g., Cougar encounters, roadkill deer).
- Harassment and predation by people and domestic animals (e.g., house cats and songbirds).
- Water quality degradation from point and non-point source pollution; temperature problems form lack of shading
- Water quantity: high flow problems due to watershed imperviousness, loss of floodplain connectivity and lack of large wood; low flow problems due to water withdrawal and reduced capacity of the watershed to store/infiltrate precipitation.
- Loss and degradation of nearshore and estuarine habitats from industrial and residential development.
- Loss of stream and river habitat and connectivity due to fish passage barriers such as road crossings, culverts, and dams.

### Habitat needs for SGCN associated with this formation

| | |
|---|---|
| **Habitat connectivity/ corridors** | A number of SGCN that use Developed and Urban ecological systems have limited mobility, inhibiting their movement across barriers such as roads and subdivisions. These low mobility SGCN primarily consist of small rodents, reptiles, and amphibians. SGCN anadromous fishes need passage improvements where various types of instream barriers currently block or impede migrations. |
| **Lower development densities** | Most associated SGCN do best where development densities are low (1 home per 10 to 20 acres). However, many of the same species can exist when densities are greater (1 home per 5 acres), so long as development proposals incorporate conservation measures (e.g., cluster development) and do not degrade surface and sub-surface water quality or quantity. |
| **Public education** | A better grasp of the needs of SGCN by the public (and especially urban citizens) will help them become better stewards of landscapes and advocates for conservation. |
| **High water quality standards** | Most SGCN fishes are likely to be adversely affected by poor water quality. Pollution abatement in water run-off from urban and industrial areas often needs improvement. Sewage treatment systems in low to high intensity developed areas may also be pollution sources. Water withdrawals from rivers and aquifers may reduce flows affecting multiple aspects of water and riverscape habitat quality. |

### Actions needed to maintain habitat quality for SGCN

- Assist local jurisdictions with land use (e.g., GMA, SMA) planning and watershed planning using PHS products and tools such as High Resolution Change Detection, Puget Sound Watershed Characterization, NetMap, and NatureServe's Vista.
- Provide feedback to local jurisdictions about the effectiveness of their land use regulations and incentives to conserve ESOCs and Priority Habitats.
- Create database spatial priorities in developing landscapes to protect habitat for SGCN and Priority Species.

- WDFW staff community involvement (e.g., schools and community groups, backyard bird sanctuary enrollments, citizen science projects).
- Management and enforcement of instream flow standards.
- Assist local governments and NGOs prioritize restoration projects (e.g., tree plantings, invasive weed removal, fish passage barrier removal, and retrofitting substandard stormwater facilities).

### Research and Data Needs

- Update PHS management recommendations for specific SGCN which can be used by local governments in their land use ordinances and GMA/SMP updates to protect fish and wildlife and their habitats.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include Priority Habitats and ESOCs statewide.

### Specific Ecological System References (complete list at end of chapter)

Ferguson, H. L., K. Robinette, K. Stenberg. 2001. Wildlife of urban habitats. Pages 317-341 *in* D. H. Johnson and T. A. O'Neil, Managing Directors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Linders, M. J., W. M. Vander Haegen, J. M. Azerrad, R. Dobson, and T. Labbe. 2010. Management Recommendations for Washington's Priority Species: Western Gray Squirrel. Washington Department of Fish and Wildlife, Olympia, Washington.

Washington Department of Fish and Wildlife (WDFW). 2009. Wildlife in a developing landscape. Pages 1-1 to 1-3 *in* Landscape planning for Washington's wildlife: managing for biodiversity in developing areas. J. Azerrad, J. Carleton, J. Davis, T. Quinn, C. Sato, M. Tirhi, S, Tomassi, G. Wilhere, authors. WDFW, Olympia, Washington.

Washington Office of Financial Management. 2014. State of Washington forecast of the state population: November 2014 forecast.

# FLOODED AND SWAMP FOREST

## Overview

Flooded and swamp forests include 11 riparian and swamp systems comprised primarily of facultative and facultative-wetland vegetation. Although some of these systems are found at higher elevations, most are at low-to mid-elevations and are widely distributed throughout Washington. In eastern Washington, lower to mid-elevation systems are dominated by deciduous trees, while conifers tend to dominate higher elevations. Systems in western Washington have a greater mix of conifer and deciduous trees. The riparian flooded and swamp forest systems hold a special significance for Washington's fauna. Most terrestrial species have some association with riparian areas, and all anadromous and freshwater SGCN fish species are closely or generally associated with it. The condition of riparian areas has large influences on habitat conditions vital for all aquatic organisms (e.g., temperature moderation, instream structure and complexity). Note that four components of this formation are profiled as ecological systems of concern. Flooded and swamp forests are generally adapted to high moisture levels, making them vulnerable to projected climate changes in hydrology and fluvial processes resulting from precipitation shifts, reduced snowpack and earlier snowmelt, drought, and altered flow regimes. Declining summer and spring stream flows, particularly when combined with drought, could reduce available water for riparian communities, affecting seedling germination and adult survival and potentially contributing to shifts to more xeric and drought-adapted vegetation. Drought periods may exacerbate fire risk.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution*** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 1,479 mi$^2$ | 33% | 67% | 50 | 56 |

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection by the methods used for this project; the actual extent of this Formation is likely broader than reported.

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| Columbia Basin Foothill Riparian Woodland and Shrubland | 10 | 15 |
| Great Basin Foothill and Lower Montane Riparian Woodland | 1 | 7 |
| Inter-Mountain Basins Montane Riparian Systems | 0 | 3 |
| North Pacific Hardwood Conifer Swamp | 1 | 14 |
| North Pacific Lowland Riparian Forest and Shrubland | 7 | 26 |
| North Pacific Montane Riparian Woodland and Shrubland | 2 | 22 |
| North Pacific Shrub Swamp | 1 | 11 |
| Northern Rocky Mountain Conifer Swamp | 1 | 8 |
| Northern Rocky Mountain Lower Montane Riparian Woodland | 6 | 22 |
| Rocky Mountain Lower Montane Riparian Woodland | 4 | 16 |
| Rocky Mountain Subalpine Montane Riparian Woodland | 3 | 17 |

Ecological System of Concern

## Major Stressors

- Roads
- Urbanization
- Water diversions
- Logging
- Invasive plants
- Excessive grazing
- Agricultural crops
- Channelization and diking
- Climate Change

## Habitat needs for SGCN associated with this formation

| | |
|---|---|
| **Off-channel features** | Many closely associated SGCN require or are closely linked with important off-channel habitats such as springs and seeps (Cascade Torrent Salamander and a number of SGCN invertebrates) as well as stream-associated swamps and wetlands (Oregon Spotted Frog and Columbian White-tailed Deer). |
| **High water quality** | A number of closely associated SGCN, particularly invertebrates and most SGCN fishes, require waters that are cold, clean, and generally free of silt. These water quality characteristics typically are maintained by functions provided by more intact riparian areas. |
| **High ecological integrity** | A number of SGCN prefer older and mature riparian forest conditions with high canopy cover and complex structural characteristics. Closely associated SGCN that require these kinds of conditions include Rocky Mountain Tailed Frog, Cascade Torrent Salamander, Dunn's Salamander, and Puget Oregonian. Large wood contributed to streams by these riparian forests is extremely important for forming and maintaining instream habitat conditions needed for spawning and rearing by all SGCN anadromous and freshwater salmonids. Riparian wood and plant inputs to streams provide important habitat conditions for SGCN freshwater non-salmonid fishes. |

## Actions needed to maintain habitat quality for SGCN

- Multi-stakeholder groups determine how to manage and monitor riparian areas for multiple socioeconomic benefits
- Grazing, agriculture, and farm management (e.g., fencing livestock)
- Forest management (e., g., providing functional Riparian Management Zones)
- Urbanizing land use management: protect and maintain riparian ecosystem integrity protection.
- Habitat restoration (e.g., control invasive plants, restore connectivity, floodplain restoration)

## Research and Data Needs

- Research to identify effective riparian conservation measures in arid landscapes.
- Studies on cumulative effects of land use activities within and across watersheds.
- Research in the Pacific Northwest regarding the influences of land uses beyond forestry (e.g., agriculture, urbanization) to help guide riparian management and conservation.

**Ecological systems discussed in greater detail in this section include:**

A. Columbia Basin Foothill Riparian Woodland and Shrubland
B. North Pacific Hardwood-Conifer Swamp
C. North Pacific Lowland Riparian Forest and Shrubland
D. Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland

**Specific Ecological System References (complete list at end of chapter)**

Knutson, K. L., and V. L. Naef. 1997. Management recommendations for Washington's priority habitats: riparian. Washington Department of Fish and Wildlife, Olympia, Washington.

## Columbia Basin Foothill Riparian Woodland and Shrubland (ESOC)

### Conservation Status and Concern

The Columbia Basin Foothill Riparian Woodland and Shrubland ecological system has been significantly degraded by historical grazing practices. This system has also decreased in extent due to agricultural development, roads, dams and other flood-control activities. Twenty-five terrestrial SGCN are associated with this system, of which 10 are closely associated species. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Middle Columbia Steelhead DPS, Snake River Basin Steelhead DPS, and Snake River Spring/Summer Chinook Salmon ESU.

### Description and Distribution

In the Columbia Plateau Ecoregion, this riparian system occurs along the middle and upper Columbia River and its tributaries. It also is widespread in the lower foothills of the East Cascade, Blue Mountain, and Okanogan Ecoregions. This system is found in low-elevation canyons and draws, on floodplains, in steep-sided canyons, and narrow V-shaped valleys with rocky substrates. Underlying gravels may keep the water table just below the ground surface and are favored substrates for black cottonwood (*Populus balsamifera*). Other trees commonly found in this riparian system are white alder (*Alnus rhombifolia)*, quaking aspen (*Populus tremuloides*), water birch (*Betula occidentalis*), and ponderosa pine (*Pinus ponderosa*).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Riparian | S2 | Imperiled/ declining<br><br>Declines of 50-70% in last 50 years and from historical condition | **MAMMALS:** Hoary Bat, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat |
| | | | **BIRDS:** Bald Eagle, Columbian Sharp-tailed Grouse*, Ferruginous Hawk, Golden Eagle, Lewis' Woodpecker, Loggerhead Shrike, Pygmy Nuthatch |
| | | | **REPTILES/AMPHIBIANS:** Columbia Spotted Frog, Northern Leopard Frog*, Rocky Mountain Tailed Frog*, Western Toad, Ring-necked Snake*, Sharp-tailed Snake* |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Columbia Clubtail*, Columbia Oregonian*, Dry Land Forestsnail, White-belted Ringtail*, Columbia Clubtail*, Mad River Mountainsnail*, Mann's Mollusk-eating Ground Beetle*, Mission Creek Oregonian, Morrison's Bumblebee |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Overharvesting of biological resources | Intentional American Beaver removal has led to loss and degradation of riparian functions. | • Native species restoration | Restore American Beaver to its historical range |
| Climate change and severe weather | Impacting hydrology by altering seasonal inputs of water from rainfall and snowmelt. | • Research, survey or monitoring – habitat<br>• Partner/ stakeholder engagement | Research to identify climate change effects and to identify most vulnerable riparian areas. Re-establishment of riparian trees for shade |
| Agriculture and aquaculture side effects | Grazing practices have impacted structure, composition, and function. Tilling has resulted in drying of seeps and springs. | • Grazing/farm management<br>• Land Use Planning | Encourage fencing livestock away from sensitive riparian areas. Re-establishment of riparian trees and shrubs.<br>Support creation of GMA-based Voluntary Stewardship Plans |
| Dams and diversions | Greatly altering the frequency and intensity of bottomland flooding. | • Dam and barrier removal<br>• Water management<br>• Water rights acquisition | Remove water retention structures and encourage water conservation in agriculture to return bottomland flooding closer to historical levels. Re-establishment of riparian trees for large wood recruitment. |
| Invasive and other problematic species | Invasive plants like reed canary grass (*Phalaris arundinacea*) have degraded many occurrences of this system. | • Invasive species control | Encourage fencing livestock away from sensitive riparian areas, non-native eradication, and restoration of riparian tree by planting. |
| Roads and development | Development practices have directly impacted structure, composition and function | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Growth Management Act), enhance incentives to encourage conservation measures. |

Historical and contemporary land use practices have impacted hydrologic, geomorphic, and biotic structure and function of this riparian system throughout eastern Washington. A comparison of the historical and current extent shows that about 90 percent of the Columbia Basin Foothill Riparian Woodland and Shrubland ecological system in Washington has either been lost or severely degraded. Much of this is the result of widespread land clearing for crops. Land use activities both within riparian areas as well as in adjacent uplands have fragmented many riparian reaches, which has reduced its connectivity with uplands.

Improperly managed grazing is another major influence that has altered the structure, composition, and function of this system. In general, the presence of livestock in arid riparian systems leads to less woody cover and an increase of undesirable plants. The degradation of this system also inhibits its influence on in-stream properties, such as maintaining water quality for the benefit of aquatic organisms. Although grazing and agriculture are the major stressor, this ecosystem has also been lost or degraded to the construction of roads, dams and other flood-control structures. While the widespread removal of American Beaver has harmed riparian ecosystem processes, American Beaver recolonization in the interior Columbia River Basin has led to the rapid improvement in riparian processes, structures, and quality of instream salmon habitat along incised streams. Climate change is also a concern because of this system’s reliance on seasonal rainfall. Thus, increased drought frequency and duration are a concern.

### Specific Ecological System References. (complete list at end of chapter)


Kauffman, J. B., A. S. Thorpe, and E. N. J. Brookshire. 2004. Livestock exclusion and belowground ecosystem responses in riparian meadows of Eastern Oregon. Ecological Applications 14: 1671-1679.

Pollock, M. M., T. J. Beechie, and C. E. Jordan. 2007. Geomorphic changes upstream of beaver dams in Bridge Creek, an incised stream channel in the interior Columbia River basin, eastern Oregon. Earth Surface Processes and Landforms 32: 1174-1185.

Sarr, D. A. 2002. Riparian livestock exclosure research in the western United States: a critique and some recommendations. Environmental Management 30: 516-526.

Trimble, S. W., and A. C. Mendel. 1995. The cow as a geomorphic agent: a critical review. Geomorphology 13: 233-253.


## North Pacific Hardwood-Conifer Swamp (ESOC)

### Conservation Status and Concern

Widespread logging has altered the structure and composition of most of these forested wetlands. To a lesser degree, other land uses have also impacted this system. Only a fraction of what remains has characteristics consistent with high ecological integrity. Fifteen terrestrial SGCN are associated with this system, of which only the Oregon Spotted Frog is a closely associated species.

### Description and Distribution

Most occurrences of North Pacific hardwood-conifer swamps in Washington are concentrated in the Pacific Northwest Coast Ecoregion, though patches are found sporadically in the West and North Cascades Ecoregions as well as in Puget Trough. The sizes of patches are mostly small and sporadically distributed in glacial depressions, river valleys, at the edges of lakes and marshes, and on slopes where there are seeps. Examples of this system mainly occur on flat to gently sloping lowlands below 1500 feet elevation, though they are found in higher elevation forests when shallow soils occur over bedrock. This system is dominated by any one or a number of coniferous or hardwood species. Overstory canopy can be dense to relatively open (i.e. less than 50 percent). Shrub cover can also vary from dense to less than 50 percent. Soils are poorly drained while surface waters either move slowly or occur as stagnant pools. Groundwater or streams which do not experience significant overbank flooding are major contributors of water.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes (Riparian; Freshwater Wetlands - Fresh Deepwater) | S2 | Imperiled/ declining<br><br>Declines of 30-50 % within last 50 years.<br><br>Declines of 70-80% from historic. | **MAMMALS:** Columbian White-tailed Deer, Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk<br>**BIRDS:** Bald Eagle, Barrow's Goldeneye, Harlequin Duck, Marbled Murrelet, Western Screech Owl<br>**AMPHIBIANS:** Oregon Spotted Frog*, Western Toad<br>**FISH:** To be determined- research needed |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Forestry has greatly influenced the structure, composition, and function of hardwood-conifer swamps in Washington. Most stands previously comprised of older and mature forest are now younger second-growth stands. Logging has led to establishment of younger red alder (*Alnus rubra*) dominated forest where stands once consisted of various hardwood and conifer species capable of growth in saturated or seasonally flooded soils. Similar to the effects on tree composition, logging can change the composition of understory shrubs. With logging, diverse understories have given way to a much less varied shrub layer, often dominated by salmonberry (*Rubus spectabilis*). As a secondary effect of logging, hardwood-conifer swamps have been degraded by the loss of large downed wood and snags. Logging has also negatively impacted forested swamps by altering water quality (e.g., increased nutrients and sediments), hydrology, and water temperatures, as well as microclimate. This in turn has harmed aquatic and semiaquatic species, especially those that require clean, cool water.

Beyond forestry, other land use activities have impacted the ecological integrity of this system. Agricultural development and roads have decreased the extent of this system. Because of the hydrological connections to adjacent systems, nearby land use activities can alter the ecological integrity of hardwood-conifer swamp systems. Consequently, watershed scale conservation planning as well as the use of buffers and other on-site conservation actions are important to maintaining system integrity. Exotic species, such as reed canary grass, has also threatened the ecological integrity of hardwood-conifer swamps in Washington.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Forestry impacts | Forestry has led to widespread alteration of forest composition and structure. Salmonberry responds similarly to alder and tends to dominate the understory after logging. | • Land use planning<br>• Vegetation management | Monitor and improve implementation of land use regulations (e.g., Forest Practices Act) and expand use of incentives to ensure adequate riparian buffers.<br><br>Control invasive plants and reestablish native species to restore ecological function. |

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Alteration of hydrology | Degraded water quality and altered hydrology resulting from land use negatively influence aquatic and semi-aquatic species. | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and expand use of incentives to ensure adequate riparian buffers. |
| Invasive and other problematic species | Invasive species such as reed canary grass and Himalayan blackberry can take over, especially at lower elevations. | • Invasive species control | Control invasive plants and reestablish native species to restore ecological function. |

### Specific Ecological System References (complete list at end of chapter)

Chappell, C. B., and J. Kagan. 2001. Westside riparian-wetlands. Pages 94-96 *in* D. H. Johnson, and T. A. O'Neil, editors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR.

## North Pacific Lowland Riparian Forest and Shrubland (ESOC)

### Conservation Status and Concern

By greatly influencing bottomland flooding, flood-control has altered the structure and composition of this lowland ecological system. Other land uses as well as ongoing threats from invasive species have also aided in the loss and degradation of this system. Thirty-three terrestrial SGCN are associated with this system, of which seven are closely associated species. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Puget Sound Chinook Salmon ESU, Lower Columbia Chinook Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, and Columbia River Chum Salmon ESU.

### Description and Distribution

North Pacific Lowland Riparian Forest and Shrublands is a linear system that occurs on low-elevation, alluvial floodplains that are confined by valleys and inlets or lower terraces of rivers and streams. This ecological system is widely distributed across lowland western Washington in the Puget Trough, Pacific Northwest Coast, and West Cascade Ecoregions. Scattered occurrences also occur in the North and East Cascades and the Columbia Plateau Ecoregions. Riverine flooding and the succession that occurs after large flood events are the major drivers of this system. Consequently, this system does not develop under stagnant hydrological regimes. North Pacific Lowland Riparian Forest and Shrubland is primarily dominated by broadleaf species such as bigleaf maple (*Acer macrophyllum*), black cottonwood, and red alder, though in the absence of major disturbances conifers tend to increase.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes Riparian | S2 | Imperiled/ declining<br><br>Declines of 30-50% within last 50 years and from historical condition | **MAMMALS :** Columbian White-tailed Deer*, Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population), Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk |
| | | | **BIRDS:** Bald Eagle, Marbled Murrelet, Peregrine Falcon, Slender-billed White-breasted Nuthatch, Western Bluebird |
| | | | **AMPHIBIANS:** Cascade Torrent Salamander*, Cope's Giant Salamander, Dunn's Salamander*, Larch Mountain Salamander, Olympic Torrent Salamander, Oregon Spotted Frog*, Van Dyke's Salamander, Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** California Floater, Puget Oregonian*, Barren Juga, Brown Juga*, Three-band Juga*, Dalles Sideband, Hoko Vertigo, Dalles Hesperian, Taylor's Checkerspot, Valley Silverspot |

* SGCN is closely associated with this ecological system

## Stressors and Actions Needed

Historical and contemporary land use practices have significantly altered the hydrology and biotic structure and function of this riparian system. Roughly half of the historical extent of this system has been lost, while much of what remains is degraded. Land uses activities both within riparian areas as well as in adjacent uplands have fragmented the riparian corridor along most reaches of stream where this system occurs. Forestry, conversion to croplands, and urbanization are primary contributors to loss of North Pacific Lowland Riparian Forest and Shrublands in Washington. Reservoirs, water diversions, levees and other water control structures also have impacted hydrologic regimes important to maintaining this system. In particular, major flood control dams have greatly altered the frequency and intensity of bottomland flooding. This in turn has permanently inundated some areas while altering the vegetative structure and composition of others. The spread of exotic and invasive plants such as reed canary grass and blackberry have also contributed to the system's degradation. All these disturbances have compromised the habitat function of North Pacific Lowland Riparian Forest and Shrublands for terrestrial species and compromise the system's contributions to aquatic habitats and species (e.g., input of large wood to rivers and streams).

These forests and shrublands, adapted to high moisture levels and local flooding regimes driven by snowmelt and rainfall hydrology are likely to be affected by changes in hydrology and fluvial processes resulting from climate change (precipitation shifts, reduced snowpack, earlier snowmelt, drought and altered streamflow regimes).

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Dams, levees and diversions | Greatly altering the frequency and intensity of bottomland flooding. | • Dam and barrier removal<br>• Water management<br>• Water rights acquisition | Remove water retention structures and purchase water rights to return bottomland flooding closer to historical levels. |

| | | | |
|---|---|---|---|
| Forestry impacts | Logging riparian forests results in the loss of terrestrial habitat, while indirectly impacting in-stream habitat conditions. | • Environmental review<br>• Land acquisition<br>• Private lands agreements | Monitor and improve implementation of land use regulations (e.g., Forest Practices Act) and expand use of incentives to ensure adequate riparian management areas. Outreach to landowners to find mutual benefits. |
| Roads and development | Impacts hydrological regime (e.g., runoff) associated with increased impervious surfaces. Confinement of alluvial floodplains. | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and expand use of incentives to ensure adequate riparian management areas. |
| Climate change and severe weather | Impacting hydrology by altering seasonal inputs of water from rainfall and snowmelt. | • Research, survey or monitoring – habitat<br>• Partner/stakeholder engagement | Research to identify climate change effects and to identify most vulnerable riparian areas. |
| Agriculture and aquaculture side effects | Conversion to agriculture eliminates and degrades habitat | • Grazing/farm management | Support creation of GMA-based Voluntary Stewardship Plans |

## Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland (ESOC)

### Conservation Status and Concern

The integrity of this system has been compromised across much of its range by land use activities that modify annual flooding and alter vegetative structure and composition. Twenty-eight terrestrial SGCN are associated with this system, of which six are closely associated. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Snake River Spring/Summer Chinook Salmon ESU, and Snake River Basin Steelhead DPS.

### Description and Distribution

The Northern Rocky Mountain Lower Montane Riparian Woodland and Shrubland ecological system consists of deciduous, coniferous, and mixed conifer-deciduous woodlands. In Washington, this system occurs mainly on public lands along streams and in floodplains within the lower montane and foothill zones of the Canadian Rocky Mountain, Blue Mountain, and Okanogan Ecoregions. It also is found sporadically along the lower slopes in the East Cascade Ecoregion. This system is maintained by annual flooding and wet soils and can take the form of woodlands, shrublands, wet meadows, and marshes. American Beaver (*Castor canadensis*) activity is an important driver of hydrological change. Black cottonwood is the key indicator species, while several other species, including quaking aspen, paper birch (*Betula papyrifera*), and water birch can also be mixed among the canopy. Shrubs, ferns, and forbs associated with mesic conditions are also common.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes (Riparian) | S2 | Imperiled/ declining<br><br>Decline of 10-39% within last 50 years<br><br>Declines of 30-50% from historical condition | **MAMMALS:** Fisher, Gray Wolf, Grizzly Bear, Hoary Bat, Preble's Shrew*, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk |
| | | | **BIRDS:** Bald Eagle, Barrow's Goldeneye, Flammulated Owl, Golden Eagle, Harlequin Duck, Lewis' Woodpecker, Mountain Quail*, Peregrine Falcon, Columbian Sharp-tailed Grouse* |
| | | | **AMPHIBIANS:** Columbia Spotted Frog, Northern Leopard Frog*, Rocky Mountain Tailed Frog*, Tiger Salamander, Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Mardon Skipper, Meadow Fritillary*, Morrison's Bumblebee, Mission Creek Oregonian, Idaho Vertigo |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Almost all productive floodplain riparian areas in central and eastern Washington have been put into agriculture use. Because this system occurs at low to mid-elevations, it is accessible to livestock and is highly attractive to congregating cattle. Pressure from livestock has caused both biotic and hydrologic changes to this system. These include severe changes to ecosystem composition, such as when prolonged grazing eliminates shrubs in favor of annuals such as Kentucky bluegrass. Other non-native and invasive species are brought about by grazing and by the pressures of other land uses. At stream edges, the combination of root loss and trampling from heavy grazing weakens and collapses banks. This can cause a stream to downcut, which can lower water tables and severely alter the hydrology of these riparian systems. That in turn can further change and degrade the composition and structure of the riparian vegetation.

Although not as pervasive as grazing, croplands encroachment and logging have also led to the loss and degradation of this ecological system. Changes in hydrological regime caused by dams and water diversions, tillage, and American Beaver removal have influenced the spatial extent of the system and have altered peak and based flows. These changes can have substantial effect on both riparian plants and aquatic biota.

Climate change influences riparian ecosystems due to the reliance of these systems on water. River hydrology, especially in the arid west, responds to climate change through timing changes of spring snow melt, altered flood magnitudes, and reduced summer and base flows. This can shift riparian plant communities by favoring drought-tolerant species over drought-intolerant cottonwoods that are closely associated with Northern Rocky Mountain Lower Montane Riparian Woodland and Shrublands.

Land use activities both within riparian areas as well as in adjacent uplands have fragmented many riparian reaches, which has reduced riparian-upland connectivity. Degraded riparian areas are also less able to beneficially influence adjacent streams (e.g., provide shade and large wood; uptake pollutants and excess nutrients). Consequently, watershed scale conservation planning as well as site-scale conservation measures are important to maintaining connectivity and system integrity.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Agriculture and aquaculture side effects | Grazing practices incompatible with habitat conservation has impacted habitat structure and function. | • Grazing/ farm management<br>• Land use planning | Encourage fencing livestock away from sensitive riparian areas; restore riparian woody vegetation. Support creation of GMA-based Voluntary Stewardship Plans |
| Invasive and other problematic species | Invasive species become problematic when substrates are disturbed by grazing practices incompatible with habitat conservation. | • Invasive species control | Encourage fencing livestock away from sensitive riparian areas and control invasive plants and reestablish native species to restore ecological function. |
| Climate change and severe weather | Alteration of seasonal and annual flooding regimes will likely have adverse effects. | • Address existing stressors | Addressing existing stressors can help build resilience to climate change impacts. |

**Specific Ecological System References**. **(complete list at end of chapter)**


Hultine, K. R., S. E. Bush, and J. R. Ehleringer. 2010. Ecophysiology of riparian cottonwood and willow before, during, and after two years of soil water removal. Ecological Applications 20:347-361.

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Kovalchik, B. L., and R. R. Clausnitzer. 2004. Classification and management of aquatic, riparian, and wetland sites on the national forests of eastern Washington: series description. USDA Forest Service General Technical Report PNW-GTR-593. Portland, Oregon.

Perry, L. G., D. C. Andersen, L. V. Reynolds, S. M. Nelson, and P. B. Shafroth. 2012. Vulnerability of riparian ecosystems to elevated CO2 and climate change in arid and semiarid western North America. Global Change Biology 18: 821-842.

Poff, B. K., A. Karen, D. G. Neary, and V. Henderson. 2011. Threats to Riparian Ecosystems in Western North America: An Analysis of Existing Literature. Journal of the American Water Resources Association 47:1241-1254.

Wissmar, R. C. 2004. Riparian corridors of eastern Oregon and Washington: functions and sustainability along lowland-arid to mountain gradients. Aquatic Sciences 66: 373-387

# FRESHWATER AQUATIC VEGETATION, WET MEADOW, AND MARSH

## Overview

The freshwater aquatic vegetation, wet meadow, and marsh vegetation formation includes 22 ecological systems comprised mainly of native herbaceous vegetation. Associated ecological systems occur at a broad range of elevations, climate conditions, and are widely distributed throughout Washington. They mostly occur in small patches, found primarily where there are hydric soils. Many of these systems are made up of diverse plant communities and are used by a wide range of Washington's SGGN. The wet meadow and marsh systems that occur in arid parts of the state are particularly important as refuge for native fauna during dry summer periods. Washington has lost an estimated 31 percent of its 1.35 million acres of wetlands. Although many wetlands that remain are of high ecological quality, others occur in a degraded state. Note that five components of this formation are profiled as ecological systems of concern.
Climate changes such as drought, increasing temperatures, and changes in precipitation type, timing, and amount that alter hydrologic regimes and rates of evaporation and recharge may have significant impacts in wetland habitats. For example, these climate changes could lead to wetland drying, shifts in species assemblages (native and non-native), habitat conversion, and/or decreased quality and quantity of habitat available for aquatic biota. Changes in winter precipitation type and timing, as well as earlier runoff, could positively (e.g., create side channels or additional habitat) or negatively (e.g., reduced opportunities for water storage and recharge, increased erosion) impact these habitats.

The ecological system with the largest number of associated species in this formation is Temperate Pacific Freshwater Aquatic Bed. Specifically, a large group in this association are aquatic invertebrates, including snails, flies, stoneflies, and mussels. They form one of the largest assemblages of closely associated species within a single ecological system in Washington. There are nine ecological systems of concern in this formation, five of which are discussed in greater detail below:

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution*** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 559 $mi^2$ | 11% | 89% | 44 | 67 |

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection; the actual extent of this Formation is likely broader than reported.

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| Columbia Plateau Vernal Pool | 3 | 5 |
| Modoc Basalt Flow Vernal Pool | 0 | 1 |
| North American Arid West Emergent Marsh | 8 | 12 |
| North Pacific Avalanche Chute Shrubland | 0 | 9 |
| North Pacific Coastal Interdunal Wetland | 4 | 0 |
| North Pacific Intertidal Freshwater Wetland | 3 | 7 |
| Northern Columbia Plateau Basalt Pothole Pond | 1 | 1 |
| Northern Rocky Mountain Avalanche Chute Shrubland | 0 | 4 |
| Rocky Mountain Alpine Montane Wet Meadow | 3 | 9 |
| Rocky Mountain Subalpine Montane Riparian Shrubland | 0 | 11 |
| Temperate Pacific Freshwater Aquatic Bed | 17 | 12 |

| | | |
|---|---|---|
| Temperate Pacific Freshwater Emergent Marsh | 5 | 16 |
| Temperate Pacific Freshwater Mudflat | 2 | 3 |
| Temperate Pacific Montane Wet Meadow | 3 | 9 |
| Willamette Valley Wet Prairie | 8 | 8 |

Ecological System of Concern

### Major Stressors

- Dams and water management/use
- Invasive plants
- Pollution and degraded water quality
- Change in water quantity, timing due to changes in uplands (e.g., urbanization)
- Excess pressure from agriculture and grazing
- Loss of connectivity with uplands
- Climate Change
- Over-pumping of groundwater

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Open habitat** | Several amphibians (Oregon Spotted Frog, Western Pond Turtle, and Northern Leopard Frog) closely associated with some Freshwater Wet Meadow and Marsh ecological systems require open habitats with understory vegetation of low stature so eggs and egg masses will be exposed to sufficient sunlight. |
| **High ecological integrity** | The same amphibians that need open habitat are negatively affected by predators such as warm water fishes or American Bullfrogs (*Lithobates catesbeiana*) and when wetlands are invaded by aggressive plants such as reed canary grass or plants such as the native broadleaf cattail (*Typha latifolia*) that may become aggressive when alterations to hydrology, nutrient and sediment regime produce an environment conducive to forming monotypic stands. Olympic Mudminnow and Tui Chub are likely closely associated with this system and require its ecological integrity throughout their life cycles. |
| **High habitat connectivity** | A number of closely associated SGCN have low mobility. Because many of these same species also require different types of habitats in close proximity to one another, wetlands with few barriers to adjacent uplands are preferred. |

### Actions needed to maintain habitat quality for SGCN

- Invasive plant and animal control.
- Habitat restoration and native plant restoration.
- Maintenance and/or restoration of a close approximation of system's natural hydrology.

### Research and Data Needs

- Information on the effects of agricultural practices on wetland functions in the Pacific Northwest, especially in eastern Washington, is limited.
- Studies have examined whether projects using compensatory wetland mitigation met performance standards. However, few studies explore why performance standards are not met.
- Research on cumulative impacts to wetlands is mainly addressed from the perspective of direct wetland losses, and less from the perspective of degraded wetlands.
- Research on the effectiveness of wetland regulations and wetland rating systems for conserving species and important wetland functions and processes.

- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

### Ecological systems and other habitats discussed in greater detail in this section include:

A. Temperate Pacific Freshwater Mudflat
B. North Pacific Intertidal Freshwater Wetland
C. North American Arid West Emergent Marsh
D. Willamette Valley Wet Prairie
E. Temperate Pacific Freshwater Emergent Marsh

### Specific Ecological System References (complete list at end of chapter)

Dahl, T. E. 1990. Wetland losses in the United States 1780's to 1980's. U. S. Fish and Wildlife Service, Washington, DC, USA.

## North American Arid West Emergent Marsh (ESOC)

### Conservation Status and Concern

North American Arid West Emergent Marshes provide important habitat for many migratory water birds as well other species that require shallow waters. They are also a particularly valuable source of moist habitat for fauna during dry summer periods in arid landscapes. Although a widespread system, almost all occurrences are degraded ecologically from their historical condition. Twenty terrestrial SGCN are associated with this system, eight of which are closely associated species. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

North American Arid West Emergent Marshes are widespread below the lower tree-line throughout the Columbia Plateau, and along the lower portions of the Canadian Rocky Mountain, and Okanogan Ecoregions. Typically represented as small wetland patches surrounded by savanna, shrub-steppe, or meadow-steppe vegetation, occurrences are sporadically distributed, mostly within depressions (e.g., ponds), along lake fringes, and near slow-flowing rivers and streams. Water chemistry can be highly variable, even within the same wetland complex, and soils have hydric characteristics. Marshes are frequently inundated to water depths of up to six feet. For most of the growing season water can be found at or above the surface, although soils can become exposed by late summer. Plants adapted to waterlogged substrates dominate these wetlands and common emergent and floating vegetation include species of sedge, bulrush, rushes, pondweed, and pond-lily.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes (Freshwater Wetlands - Fresh Deepwater) | S2 | Imperiled/ declining<br><br>Declines of 30-50% within last 50 years and from historical condition | **MAMMALS:** Hoary Bat, Kincaid Meadow Vole*, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat |
| | | | **BIRDS:** American White Pelican, Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Common Loon, Marbled Godwit, Peregrine Falcon*, Red-necked Grebe, Short-eared Owl, Upland Sandpiper* |
| | | | **AMPHIBIANS:** Columbia Spotted Frog, Northern Leopard Frog*, Tiger Salamander*, Woodhouse's Toad* |

| | | | |
|---|---|---|---|
| | | | **FISH**: To be determined- research needed |
| | | | **INVERTEBRATES:** Silver-bordered Fritillary* |

* SGCN is closely associated with this ecological system

**Stressors and Actions Needed**

A variety of land use activities and stressors have negatively impacted this system. They range from development, grazing and agriculture, roads, invasive species, as well as the availability and quality of water. Grazing, invasive species, especially reed canary grass, and altered hydrology have degraded almost every occurrence of this system in the Columbia Basin. Grazing practices that are incompatible with habitat conservation is a likely reason for the decreased abundance of native sedges and grasses, and an increase of invasive plants. Land use disturbance in contributing watersheds can contribute excess nutrients to marshes, which can also aid in the spread of invasive plants. Land use activities both within marshes as well as in adjacent uplands have likely reduced connectivity between wetland and upland habitats. American Bullfrogs are common to the Columbia Basin Ecoregion and likely occur in this marsh system. As severe droughts and air temperatures increase as a result of climate change, this will likely put further stress on this ecological system (e.g., wetlands drying out).

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Agriculture and aquaculture side effects | Spread of invasive plant species, particularly through grazing practices that are incompatible with habitat conservation. | • Invasive species control<br>• Grazing/farm management<br>• Private lands agreements<br>• Land use planning | Control invasive plants to maintain native species and restore ecological functions. Work with landowners to exclude livestock from marshes. Support creation of GMA-based Voluntary Stewardship Plans. |
| Alteration of hydrology | Hydrological alterations have reduced habitat quantity, quality, and availability. | • Water management<br>• Water rights acquisition<br>• Grazing/farm management<br>• Private lands agreements | Remove water retention structures and possible purchase of water rights to minimize loss of groundwater. |
| Climate Change and severe weather | Sensitive to increasing temperatures and changes in precipitation type, timing, and amount. | • Research, survey or monitoring - habitat | Activities to restore ecological function. |
| Roads and development | Development practices have directly impacted structure, composition and function. | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures. |

### Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., and K. R. McAllister. 2009. American Bullfrog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

## North Pacific Intertidal Freshwater Wetland (ESOC)

### Conservation Status and Concern

Hydrological modifications, especially those which alter tidal exchange, have negatively affected the ecological processes and species associated with this system. This and other disturbances such as the spread of invasive plants have contributed to significant declines in spatial extent and ecological integrity of North Pacific Intertidal Freshwater Wetlands in Washington. Ten terrestrial SGCN are associated with this system, of which the Columbian White-tailed Deer, Peregrine Falcon and Taylor's Checkerspot are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

North Pacific Intertidal Freshwater Wetland is a small-patch, tidally influenced freshwater ecological system that forms as narrow strips as well as more extensive patches of habitat. It occurs primarily in the Puget Trough and Pacific Northwest Coast Ecoregions. More specifically occurrences are found in bays and inlets of Washington's southern outer coast, at outlets of large rivers that discharge into Puget Sound (e.g., Skagit River Delta), and along the Columbia River and its tributaries downstream of Bonneville Dam. Although little detailed vegetation data has been collected for this system, plants communities are complex and can include patches dominated by trees, shrubs or herbaceous species.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes (Freshwater Wetlands - Fresh Deepwater) | S1 | Critically imperiled/ declining<br><br>Decline of 50-70% within last 50 years and from historical condition | **MAMMALS :** Columbian White-tailed Deer*, Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat |
| | | | **BIRDS:** Peregrine Falcon*, Bald Eagle, Barrow's Goldeneye, Red–necked Grebe, Greater Sandhill Crane |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Oregon Silverspot, Taylor's Checkerspot* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

An estimated 90 percent of Puget Sound freshwater tidal wetlands have been lost, while lesser but still significant losses are documented in the Columbia River System. Hydrological modifications, especially those that alter tidal exchange (e.g., jetties, dikes, and dams) have contributed to these losses. Direct alterations of hydrology (i.e., channeling, draining, damming) as well as indirect alterations (e.g., roads on adjacent slopes) have likely also changed the locations of these types of wetlands. Water control structures have degraded the ecological processes and species composition linked to this system by substantially altering the processes that maintain this system. Where there have been long term changes in flow, these wetlands have sometimes reestablished to reflect the new hydrology (e.g., broadleaf cattail can be an aggressive invader).

Although urbanization adjacent to and harvesting timber in wetlands is now regulated, many occurrences were historically filled during urbanization or logged. Urbanization, logging, filling, and other activities within wetlands as well as in adjacent uplands have likely also reduced wetland connectivity with upland habitat. Most remaining occurrences of North Pacific Intertidal Freshwater Wetlands are degraded to some extent by invasive weeds, such as reed canary grass, giant knotweed (*Polygonum sachalinense*), and purple loosestrife (*Lythrum salicaria*).

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Dams, levees and diversions | Hydrological alterations (especially those which alter tidal exchange) | • Dam and barrier removal<br>• Hazard removal<br>• Instream modification | Restore hydrological processes by removing or modifying in-stream and near shore barriers inhibiting historical hydrological regime |
| Fish and wildlife habitat loss or degradation | Reduced connectivity with uplands | • Dam and barrier removal<br>• Create new habitat or natural processes<br>• Land use planning | Remove barriers inhibiting habitat connectivity to restore ecological function. Retain, re-establish low intensity land uses adjacent to wetlands. |
| Invasive and other problematic species | Invasive plants | • Invasive species control | Control invasive plants and reestablish native species to restore ecological function. |
| Roads and development | Direct loss (filling) of habitat; degradation of ecosystem processes | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act) and stormwater regulations, enhance incentives to encourage Low Impact Development techniques and other conservation measures. |

### Specific Ecological System References (complete list at end of chapter)

Fresh K., M. Dethier, C. Simenstad, M. Logsdon, H. Shipman, C. Tanner, T. Leschine, T. Mumford, G. Gelfenbaum, R. Shuman, and J. Newton. 2011. Implications of Observed Anthropogenic Changes to the Nearshore Ecosystems in Puget Sound. Prepared for the Puget Sound Nearshore Ecosystem Restoration Project. Technical Report 2011-03.

Marcoe, K., and S. Pilson. 2012. Land cover change in the Lower Columbia River Estuary, 1880 – 2011. Poster presented at The Columbia River Estuary Conference. May 15 to 17, 2012, Astoria, Oregon.

## Temperate Pacific Freshwater Emergent Marsh (ESOC)

### Conservation Status and Concern

Although Temperate Pacific Freshwater Emergent Marshes remain widespread on the landscape, much, if not most of it is in a degraded condition. The system has also likely experience significant decline in its extent in Washington. Twenty-one terrestrial SGCN are associated with this system, five of which are closely associated species. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

Dominated by herbaceous vegetation, this system occurs as small patches mainly in lowlands. In Washington, Temperate Pacific Freshwater Emergent Marshes are most abundant in the Puget Trough Ecoregion, though it occurs throughout the Pacific Northwest Coast and North Cascades Ecoregions and in sporadic locations across the foothills of the East and West Cascades. This freshwater system ranges from seasonally to permanently flooded wetlands found in depressions, along streams, and shorelines. A consistent freshwater source is essential to the function of this system. Therefore, waters generally remain at or above the surface, though water levels can radically fluctuate and by late summer bare soil can become exposed. Waters are nutrient rich, which favor aggressive species and low plant species diversity. Vegetation is frequently made up of graminoids (e.g., grasses, sedges, rushes), though forbs can be present. Trees, shrubs and non-vascular plants are typically absent or sparse.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Freshwater Wetlands, Freshwater Deepwater | S2 | Imperiled/ declining<br><br>Decline of 10 to 30% within last 50 years and from historical condition | **MAMMALS:** Columbian White-tailed Deer, Hoary Bat, Keen's Myotis, Shaw Island Vole, Silver-haired Bat, Townsend's Big-eared Bat |
| | | | **BIRDS:** Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Dusky Canada Goose, Harlequin Duck, Peregrine Falcon*, Purple Martin, Greater Sandhill Crane, Short-eared Owl |
| | | | **REPTILES/AMPHIBIANS:** Columbia Spotted Frog, Oregon Spotted Frog*, Tiger Salamander*, Western Toad, Western Pond Turtle* |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** A caddisfly species (*Limnephilus flavastellus*) |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Although most wetlands now receive regulatory protections, historical filling and draining certainly led to the direct loss of these wetlands. In addition to direct losses, alterations to this system have occurred from activities like diking, urban development, and agricultural. Given that a high concentration of these wetlands are in populous regions of the state, urban development pressures have certainly taken a toll on this ecological system. Such influences include altered hydrology associated with runoff over impervious surfaces. It also includes the flush of nutrients and toxic contaminants into wetlands from roads and development.

Development has also fragmented these wetlands from other nearby wetlands as well as from adjacent uplands. Similar to other types of wetlands, many Temperate Pacific Freshwater Emergent Marshes are degraded by invasive plants. Broadleaf cattail is a native species that can become a particularly problematic invader when ecological conditions have been altered. With the spread of American Bullfrogs throughout the lowlands of Washington, especially in the Puget Sound Region, this non-native predator is now common to marsh systems in this region. Conversely, the widespread trapping of American Beaver has diminished the positive role that this species used to play in creating and maintaining wetlands throughout the state.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
| --- | --- | --- | --- |
| Invasive and other problematic species | Invasive plants | • Invasive species control | Control invasive plants and reestablish native species to restore ecological function. |
| Invasive and other problematic species | American Bullfrog use of wetland. | • Invasive species control | Control American Bullfrogs, especially where they coexist with vulnerable SGCN. |
| Roads and development | Impacts hydrological regime (e.g., runoff) associated with increased impervious surfaces. Confinement of alluvial floodplains. | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Growth Management Act) and stormwater regulations, enhance incentives to encourage Low Impact Development techniques and other conservation measures. |

### Specific Ecological System References (complete list at end of chapter)

Hallock, L. A., and K. R. McAllister. 2009. American Bullfrog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

MacKenzie, W. H., and J. R. Moran. 2004. Wetlands of British Columbia: a guide to identification. Research Branch, B.C. Ministry of Forestry, Victoria, British Columbia.

## Temperate Pacific Freshwater Mudflat (ESOC)

### Conservation Status and Concern

Temperate Pacific Freshwater Mudflat ecological systems provide important habitat, especially as a migratory stopover for shorebirds to rest and feed. This ecological system has decreased from its historical extent in Washington, primarily because of a significantly altered flooding regime. Five terrestrial SGCN are associated with this system, of which only the Cinnamon Teal and Columbia River Tiger Beetle are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This small patch system ranges from sparsely vegetated to extensive sods of herbaceous vegetation. The system occurs in seasonally flooded shallow floodplain mudflats, especially along the estuarine waters of the lower Columbia River in the Pacific Northwest Coast Ecoregion. Plants supported by these mudflats typically are annuals of low stature.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes (Freshwater Wetlands - Fresh Deepwater) | S1 | Critically imperiled.<br><br>Decline of 50-70% in last 50 years and from historical condition | **BIRDS:** Bald Eagle, Cinnamon Teal*, Dusky Canada Goose, Peregrine Falcon<br>**FISH**: To be determined- research needed<br>**INVERTEBRATES:** Columbia River Tiger Beetle* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Hydrological alterations in the upper Columbia River drainage (e.g., large mainstem river dams) have likely decreased the extent of this system due to reduced sediment loads carried downstream and because of changes in flooding regime. River bottom dredging has also likely removed the sediment source required to maintain mudflats, while non-native species has also impacted the system.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Energy development and distribution | Hydropower alters frequency and intensity of bottomland flooding and sediment inputs. | • Water management | Negotiations with dam operators during relicensing to influence ecosystem. |
| Invasive and other problematic species | Excess nutrients lead to establishment of non-native or invasive plants. | • Invasive species control<br>• Planting/seeding | Removing invasive flora. |

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Fish and wildlife habitat loss or degradation | Dredging activities can result in removal of sediments needed for mudflat development and maintenance. | • Create new habitat or natural processes<br>• Living shorelines | Work with Corps of Engineers on mudflat restoration (e.g., creating new mudflats with dredging spoils). |
| Roads and development | Alteration of sediment regime has indirectly impacted structure, composition and function | • Land use planning | Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures. |

## Willamette Valley Wet Prairie (ESOC)

### Conservation Status and Concern

The Willamette Valley Wet Prairie ecological system has been nearly extirpated in Washington. Sixteen terrestrial SGCN are associated with this system; eight species are closely associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This system is mainly restricted to oak/prairie landscapes of South Puget Sound as well as parts of Lewis, Cowlitz, and Clark Counties (hereafter referred to as Willamette Valley). Wet prairie is dominated by a highly diverse community of grasses and sedges and to a lesser degree by forbs or shrubs. In fire-maintained prairie landscapes, wet prairies occur in areas with seasonally high water tables. Although likely extirpated, South Puget Sound wet prairie occurred in low-lying sites with open topography and few barriers to isolate them from historically frequent fires. In the permeable, glacial outwash substrates of the region, wet prairies were most likely limited to swales and along low-gradient riparian areas where aquafers were perched close to the surface. The wet prairies of South Puget Sound contrast with Willamette Valley wet prairies, in that the latter generally occurs on fairly impermeable, clay-rich soils. Although Willamette Valley wet prairie once covered a large area, it now is likely restricted to scattered small patches of habitat.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Westside Prairie | S1 | Critically imperiled/ declining<br><br>Declines of >90% in last 50 years and from historical condition | **MAMMALS:** Brush Prairie Pocket Gopher, Silver-haired Bat, Townsend's Big-eared Bat, Mazama Pocket Gopher |
| | | | **BIRDS:** Bald Eagle, Cinnamon Teal, Oregon Vesper Sparrow, Short-eared Owl, Streaked Horned Lark*, Western Bluebird* |
| | | | **FISH**: To be determined- research needed |
| | | | **INVERTEBRATES:** Taylor’s Checkerspot*, Oregon Branded Skipper*, Mardon Skipper*, Sonora Skipper*, Puget Sound Fritillary*, Valley Silverspot* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

In the wet prairie swales of the South Puget Sound, relatively high site productivity resulted in their rapid conversion to agricultural use, intense grazing pressure from livestock, and rapid invasion by dense, woody vegetation in the absence of regular fires. In addition, the hydrology of many sites has been altered by draining, agriculture, roads, recession of the ground water table (due to wells), and lack of fire. As a result, native prairie vegetation in wet prairie swale habitat has been extirpated in South Puget Sound and may be close to meeting the same fate in southwest Washington.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Fish and wildlife habitat loss or degradation | Habitat is nearly extirpated from Washington | • Private lands agreements<br>• Conservation area designation<br>• Land acquisition<br>• Habitat restoration<br>• Land use planning | Apply regulatory (e.g., low intensity land uses) and non-regulatory (e.g., conservation easements) tools to protect known extant wet prairie locations. |
| Resource information collection needs | Insufficient knowledge of the location of remaining wet prairie habitat, especially on private lands, where access is limited. | • Research, survey or monitoring - habitat | Identify extent of remaining wet prairie by gaining access to sites with likelihood of locating habitat. |

### Specific Ecological System References (complete list at end of chapter)

Altman, B., M. Hayes, S. Janes, and R. Forbes. 2001. Wildlife of westside grassland and chaparral habitats. Pages 261-291 *in* D. H. Johnson and T. A. O'Neil, Managing Directors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, Oregon.

Caplow, F., and J. Miller. 2004. Southwestern Washington prairies: using GIS to find rare plant habitat in historic prairies. Washington Department of Natural Resources, Olympia, Washington.

Chappell, C. B., E. A. Alverson, and W. R. Erickson. 2004. Ecologic and geographic variation in species composition of prairies, herbaceous balds, and oak woodlands of the Willamette Valley-Puget Trough-Georgia Basin Ecoregion. Abstract: Ecological Society of America, August 1 - 6, 2004, Portland Convention Center, Oregon.

Easterly, R. T., D. L. Salstrom, and C. B. Chappell. 2005. Wet prairie swales of the South Puget Sound, Washington. Report prepared for The Nature Conservancy, South Sound Office, Olympia, Washington.

# GRASSLAND, MEADOW, AND SHRUBLAND

## Overview

Grasslands, meadows, and shrublands include 12 ecological systems comprised of native upland vegetation throughout a broad elevational and climactic range in Washington. They vary from dry subalpine grasslands to prairies to western Washington balds and bluffs, to deciduous shrublands and subalpine meadows to dry canyon grasslands and prairies of eastern Washington. They do not include ecological systems associated with deserts, wetlands, alpine, disturbed, urban, coastal dune and tidal vegetation. Note that three components of this formation are profiled as ecological systems of concern.

The ecological system with the greatest number of associated SGCN in this formation is Willamette Valley Upland Prairie and Savanna, with 17 closely associated species (see below), followed by North Pacific Herbaceous Bald and Bluff. A number of SGCN butterflies are closely associated with North Pacific Herbaceous Bald and Bluff, including the Great Arctic, Hoary Elfin, Propertius Duskywing, Oregon branded Skipper, Puget Sound Fritillary, Sonora Skipper, Taylor's Checkerspot and Valley Silverspot.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 3,713 mi$^2$ | 46% | 54% | 30 | 56 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| Columbia Basin Foothill and Canyon Dry Grassland | 4 | 26 |
| Columbia Basin Palouse Prairie | 3 | 11 |
| North Pacific Alpine and Subalpine Dry Grassland | 7 | 7 |
| North Pacific Herbaceous Bald and Bluff | 8 | 3 |
| North Pacific Hypermaritime Shrub and Herbaceous Headland | 2 | 3 |
| North Pacific Montane Shrubland | 0 | 10 |
| Northern Rocky Mountain Lower Montane Foothill and Valley | 1 | 14 |
| Northern Rocky Mountain Montane Foothill Deciduous Shrubland | 3 | 11 |
| Northern Rocky Mountain Subalpine Deciduous Shrubland | 1 | 7 |
| Northern Rocky Mountain Subalpine Upper Montane Grassland | 2 | 6 |
| Rocky Mountain Subalpine Montane Mesic Meadow | 2 | 13 |
| Willamette Valley Upland Prairie and Savanna | 15 | 8 |

Ecological System of Concern

## Major stressors

Wildlife habitat loss and degradation, invasive plants and animals (including invading native species), fire suppression and climate change.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Deep soils** | Several species (Mazama Pocket Gopher, Olympic Marmot, American Badger, Western Pond Turtle) require soils that are relatively deep and suitable for burrowing. These species also provide natural disturbance in grassland habitats. Deep soil habitats are more suitable for agriculture and are sensitive to accelerated succession due to fire suppression and climate change. |
| **High micro-climate diversity** | Many of the butterflies use habitat of high microclimate diversity with few invasive plants and high diversity of native plants. |
| **High ecological integrity** | Some of the birds (Streaked Horned Lark, Oregon Vesper Sparrow) and butterflies (Taylor's Checkerspot, Mardon Skipper, Oregon Branded Skipper, Sonora Skipper) require short-stature vegetation provided by native species, and are sensitive to invasive shrubs and grasses. Ecological integrity of this habitat's riparian areas is important for SGCN interior Columbia Basin anadromous salmonids and freshwater fishes. |

### Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire)
- Grazing, agriculture, and farm management
- Invasive species control
- Habitat restoration, research, and native species restoration)
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

### Ecological systems discussed in greater detail in this section

Of the 12 ecological systems found in this formation, the following three are ecological systems of concern, and discussed in greater detail.

A. Columbia Basin Foothill and Canyon Dry Grassland
B. Columbia Basin Palouse Prairie
C. Willamette Valley Upland Prairie and Savanna

## Columbia Basin Foothill and Canyon Dry Grassland (ESOC)

### Conservation Status and Concern

Columbia Basin Foothill and Canyon Dry Grasslands occur over 1,450 square miles in eastern Washington. Degradation in condition is the major cause of conservation need. Cheatgrass (*Bromus tectorum*) and other annual bromes are widespread on south aspects. Exotic weeds also commonly invade this system on the north aspects.

### Description and Distribution

Columbia Basin Foothill and Canyon Dry Grassland ecological systems occur on steep open slopes, from 300 to 5000 feet elevation in the canyons and valleys of the Columbia Plateau Ecoregion, particularly along the Snake River canyon and large tributaries. It typically occurs at and well below lower treeline. It is floristically similar to the Columbia Basin Palouse Prairie but is distinguished by landform, soil, and process characteristics. Perennial bunchgrasses and forbs (usually over 25 percent cover) dominate these grasslands. Annual precipitation is low (5 to 10 inches) and occurs mostly in the winter, primarily as rain.

Fire frequency is presumed to be less than 20 years; the return interval may have been as low as 5 to 10 years. Elk, deer and bighorn sheep are native large grazers in the canyon who used particularly in winter and spring.

There are four terrestrial SGCN that are considered closely associated with this ecological system, three birds and one reptile. An additional 25 terrestrial species are generally associated with this system. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Snake River Basin Steelhead DPS, and Snake River Spring/Summer Chinook Salmon ESU.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Eastside Steppe | S1-S2 | Imperiled/ declining<br><br>Decline of 30 – 50% in last 50 years<br><br>Decline of >90% from historical conditions | **MAMMALS:** American Badger, White-tailed Jackrabbit, Washington Ground Squirrel, Townsend's Big-eared Bat, Spotted Bat, Silver-haired Bat, Merriam's Shrew, Hoary Bat |
| | | | **BIRDS:** Bald Eagle, Mountain Quail, Loggerhead Shrike, Short-eared Owl, Peregrine Falcon, Columbian Sharp-tailed Grouse*, Ferruginous Hawk*, Burrowing Owl, Golden Eagle* |
| | | | **REPTILES/AMPHIBIANS:** Columbia Spotted Frog, Desert Nightsnake, Ring-necked Snake*, Side-blotched Lizard**,** Tiger Salamander, Western Toad |
| | | | **FISH**: To be determined- research needed |
| | | | **INVERTEBRATES:** Morrison's Bumblebee, Poplar Oregonian, Hoder's Mountainsnail, Ranne's Mountainsnail, Limestone Point Mountainsnail, a mayfly species (*Paraleptophlebia jenseni*) |

*SGCN closely associated with this ecosystem.

### Stressors and Actions Needed

Two important attributes not mentioned above are the relative cover of native bunchgrass and condition of the biological soil crust. The primary land uses that alter the natural processes of this system are associated with livestock practices, annual exotic species invasion, fire regime alteration, direct soil surface disturbance, and fragmentation. Excessive grazing stresses the system through soil disturbance, diminishing or eliminating the biological soil crust, altering the composition of perennial species, and increases the establishment of annual grasses, particularly cheatgrass and other exotic annual bromes. Increasing habitat quality is the primary action needed to restore ecological integrity.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in shrub encroachment, loss of habitat diversity | • Fire management<br>• Vegetation management | Integrated Habitat Restoration using prescribed fire, weed control and seeding with natives |
| Invasive/other problematic species | Invasive forbs and shrubs are degrading native grassland | • Invasive species control | Mechanical and herbicide control of exotics |

| | | | |
|---|---|---|---|
| Agriculture and aquaculture side effects | Excessive grazing and accelerating weed invasions | • Grazing/farm management<br>• Invasive species control<br>• Planting/seeding<br>• Private lands agreements<br>• Land use planning | Conservation easements, landowner agreements, and restoration. Integrated habitat restoration using prescribed fire, weed control and seeding with natives Support creation of GMA-based Voluntary Stewardship Plans |

### Specific Ecological System References (complete list at end of chapter)

Tisdale, E.W. 1986. Canyon grasslands and associated shrublands of west-central Idaho and adjacent areas. Bulletin 40. Forestry, Wildlife and Range Experiment Station, University of Idaho, Moscow.

## Columbia Basin Palouse Prairie (ESOC)

#### Conservation Status and Concern

This once extensive grassland is now limited to small patches, as over 90 percent of the original prairie was converted to agricultural uses. The remaining patches remain subject to weed and native shrub invasion.

#### Description and Distribution

The Columbia Basin Palouse Prairie ecological system was once an extensive grassland system within the Columbia Plateau Ecoregion in southeast Washington and adjacent Idaho and Oregon. It was characterized by dense bunchgrass cover on a dune-like topography composed of loess hills and plains over basalt informally called the Palouse loess. Remnant prairies are now typically associated with small, steep and rocky sites or small, isolated sites within an agricultural landscape. The associated climate of the Palouse Prairie is generally warm to hot, dry summers and cool, wet winters. Annual precipitation is high, (15 to 30 inches) and the soils were typically deep, well-developed, and old.

There are three terrestrial SGCN that are considered closely associated with this ecological system. They are all birds (see table below). An additional 11 terrestrial species are generally associated with this system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Eastside Steppe | S1 | Critically imperiled/ declining<br><br>Decline of 10-30% within the last 50 years.<br><br>Decline of >90% from historical condition | **MAMMALS:** Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat, White-tailed Jackrabbit, American Badger, Washington Ground Squirrel |
| | | | **BIRDS:** Columbian Sharp-tailed Grouse*, Ferruginous Hawk*, Golden Eagle*, Short-eared Owl, Peregrine Falcon, Burrowing Owl, Cinnamon Teal |
| | | | **AMPHIBIANS:** Tiger Salamander |
| | | | **FISH**: To be determined- research needed |
| | | | **INVERTEBRATES**: Giant Palouse Earthworm* |

* SGCN is closely associated with this ecological system

### Key Stressors and Actions Needed

The primary land uses that alter the natural processes of the Columbia Plateau Palouse Prairie system are associated with agricultural and livestock practices, exotic species, fire regime alteration, direct soil surface disturbance, and fragmentation. Fire further stresses livestock-altered vegetation by increasing exposure of bare ground and consequent increases in exotic annuals and decrease in perennial bunchgrass. Fire suppression leads to deciduous shrubs, such as snowberry (*Symphoricarpos* spp.), ninebark (*Physocarpus malvaceus*), oceanspray (*Holodiscus discolor*), and currant (*Ribes* spp.) and in some areas ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*).

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Agriculture and aquaculture side effects | Conversion to agriculture eliminates and degrades habitat | • Land use planning<br>• Grazing/farm management | Support creation of GMA-based Voluntary Stewardship Plans |
| Altered disturbance regimes | Fire exclusion has resulted in shrub encroachment, loss of habitat diversity | • Fire management<br>• Invasive species control | Integrated Habitat Restoration using prescribed fire, weed control and seeding with natives |
| Invasive and other problematic species | Invasive forbs and shrubs are degrading native grassland | • Fire management<br>• Invasive species control | Mechanical and herbicide control of exotics |

## Willamette Valley Upland Prairie and Savanna (ESOC)

### Conservation Status and Concern

Due to historical losses in habitat, and ongoing threats from invasive species and development, conservation action is critical for conservation of this ecological system and associated SGCN. There are 15 terrestrial SGCN considered as closely associated with this ecological system (see table below). There are an additional eight terrestrial species that are considered generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

The Willamette Valley Upland Prairie and Savanna is a grassland and savanna system endemic to the Willamette Valley Ecoregion and Puget Lowlands. In Washington, it is most expansive in the south Puget Sound (e.g., Pierce and Thurston Counties) and is also found in the San Juan Islands and in southwestern Washington. Most sites experience extreme soil drought in the summer. In the South Puget Sound, this system occurs as large patches, usually associated with deep, gravelly/sandy glacial outwash that is excessively well drained within more forested landscapes. Landforms are usually flat, rolling, or gently sloping, and often part of extensive plains.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes Westside Prairie | S1 | Critically imperiled, declining | **MAMMALS:** Mazama Pocket Gopher*, Western Gray Squirrel, Townsends Big-eared Bat, Silver-haired Bat, Hoary Bat, Brush Prairie Pocket Gopher |

| | | | |
|---|---|---|---|
| | | Decline of 30% within the last 50 years.<br><br>Decline of > 90% from historical condition | **BIRDS:** Streaked Horned Lark*, Oregon Vesper Sparrow*, Western Bluebird*, Short-eared Owl, Bald Eagle |
| | | | **REPTILES/AMPHIBIANS:** Western Pond Turtle*, Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Taylor's Checkerspot*, Mardon Skipper*, Puget Blue*, Valley Silverspot*, Puget Sound Fritillary*, Sonora Skipper*, Island Marble*, Oregon Branded Skipper*, Propertius' Duskywing*, Hoary Elfin* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

The exclusion of fire from most of this system over the last 100-plus years has resulted in the loss of oak savanna from the landscape and the encroachment of Douglas-fir, except perhaps on the very driest sites. This encroachment leads to the conversion of prairies and savannas to forests. Fire exclusion has also resulted in increases in shrub cover and the conversion of some prairies to shrublands. Non-native species generally increase after ground-disturbing activities. The dominant native grass, Roemer's Fescue (*Festuca roemeri*), and many herbaceous species are threatened by the uncontrolled spread of Scot's broom (*Cytisus scoparius*). Prescribed fire and other management tools have been used recently in some areas to control Scot's broom and Douglas-fir encroachment, and to attempt to mimic historical conditions.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment, loss of habitat diversity | • Fire management<br>• Vegetation management | Integrated habitat restoration using prescribed fire, weed control and seeding with natives |
| Invasive and other problematic species | Invasive forbs and shrubs are degrading native prairie | • Fire management<br>• Invasive species control | Mechanical and herbicide control of exotics |
| Roads and development | Habitat has been fragmented and lost to housing and subdivisions | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisition, conservation easements, landowner agreements, and restoration |

# HERBACEOUS AGRICULTURAL VEGETATION

## Overview

Herbaceous Agricultural Vegetation includes both cultivated croplands and pastures and hay. Cultivated croplands can be defined as areas used for the production of annual crops, as well as perennial woody crops such as orchards and vineyards. It includes all lands that are actively tilled. Pastures are defined as areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically as a perennial planting (for example, fields). Conservation Reserve Program fields are cultivated croplands that provide perennial grasslands used by a suite of grassland birds and are an important part of the landscape for Greater Sage-grouse.

CRP fields include both native and non-native vegetation, depending upon the site and species. They are included here because they are agricultural lands, with temporary habitat enhancement. They exhibit a wide range of herbaceous conditions. CRP fields can express habitat conditions of a variety of ecological systems, depending upon what is specifically planted in each field.

Each of these types of habitat can, under certain conditions, support a relatively large number of Species of Greatest Conservation Need (see table below). This may be, in part, due to the high diversity of agricultural lands, including diversity in elevation, highly productive soils, locations in valley bottoms and/or near rivers and streams, and distribution throughout the state. The annual or frequent disturbance associated with agricultural lands makes them valuable seasonally to many wildlife species. Ephemeral or farmed wetlands can be valuable places for overwintering waterfowl, breeding sites for amphibians, and food for many species during certain times of the year. Other features of the agricultural environment, including water developments, buildings and farm structures, roadsides, field borders, fence rows, and windbreaks can provide valuable habitat for wildlife .

Six terrestrial SGCN are considered to have close association with herbaceous agricultural vegetation, five of them (all but Oregon spotted frog) are associated with cultivated cropland. These are the Oregon Spotted Frog, Woodhouse's Toad, Burrowing Owl, Dusky Canada Goose, Greater Sage-grouse, and Gray-tailed Vole. For these species, agricultural lands are considered essential for their continued conservation. A significant number (22) of SGCN are generally associated with cultivated cropland.

For other species with general association, agricultural lands may provide important habitats, by providing important food, for example, and may be as important as habitat found in ecological systems of the natural landscape. Agricultural lands border many rivers and streams, especially in the interior Columbia Basin, and thus are associated with many anadromous and freshwater SGCN fishes. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Upper Columbia Spring Chinook Salmon ESU, and likely Bull trout-Mid-Columbia Recovery Unit.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 13,354 mi$^2$ | 7% | 93% | 13 | 55 |

| | | |
|---|---|---|
| **Cliff, Scree & Rock Vegetation** | **Inter-Mountain Basins Cliff and Canyon** | **5** |
| **Cliff, Scree & Rock Vegetation** | **North Pacific Alpine and Subalpine Bedrock and Scree** | **1** |
| **Cliff, Scree & Rock Vegetation** | **North Pacific Montane Massive Bedrock, Cliff and Talus** | **4** |
| **Cliff, Scree & Rock Vegetation** | **Rocky Mountain Alpine Bedrock and Scree** | **1** |
| **Cliff, Scree & Rock Vegetation** | **Rocky Mountain Cliff, Canyon and Massive Bedrock** | **2** |
| **Developed & Urban** | **Developed, High Intensity** | **1** |

| **Ecological systems found in this formation** | **Number of SGCN** | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Cultivated Cropland | 5 | 28 |
| Pasure/Hay | 3 | 29 |

### Major Stressors

- Annual disturbance – timing is key to understanding impacts to wildlife. Changes in disturbance regimes and areas disturbed also may significantly impact wildlife.
- Agricultural chemicals, including pesticides and fertilizers – choice of chemical, timing of exposure, and number of chemicals applied and rate of application are key to understanding impacts to wildlife and fishes.
- Increased predation by various predators, including corvids, gulls, canids, raccoons, opossums, skunks and rodents.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Reduce pesticide impacts** | Reduce pesticide impacts through chemical selection, timing, amount of chemical applied and adoption of integrated pest management strategies. |
| **Enhance fencerows, borders, windbreaks, and roadsides** | Selection of appropriate species for planting in these areas, timing of disturbances like mowing to reduce impacts, maintenance of uncultivated and undisturbed strips of vegetation, and protection of these habitats from disturbances such as excessive grazing, vehicle traffic, etc.. |
| **Maintain riparian buffer native vegetation** | Adequately functioning riparian areas are needed for anadromous and freshwater SGCN fishes |

### Actions needed to maintain habitat quality for SGCN

- Continue programs that help agricultural lands provide wildlife habitat, principally Natural Resources Conservation Service and Farm Services Agency programs like the Wetland Reserve Program, Conservation Reserve Program, Environmental Quality Incentives Program, and the Resource Conservation and Development Program.
- Identify important connectivity areas in developing landscapes to help jurisdictions plan future growth.

- Continued support for programs that help educate landowners on ways to manage agricultural lands to help benefit wildlife and fishes.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.

### Research and Data Needs

- Understanding how agricultural production affects wildlife at the landscape scale
- Investigating the optimum patch size and landscape context for farmland set-aside programs to benefit grassland and shrub steppe wildlife
- Continued work on benefits of integrated pest management to wildlife,
- Specific habitat enhancements for Species of Greatest Conservation Need.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

### Specific Ecological System References (complete list at end of chapter)

Edge, W. D. 2001. Wildlife of Agriculture, Pastures, and Mixed Environs. Pages 342-360 *in* D. H. Johnson, and T. A. O'Neil, editors. Wildlife-habitat relationships in Oregon and Washington. Oregon State University Press, Corvallis, OR.

Schroeder, M. A. and W. M. Vander Haegen. 2011. Response of greater sage-grouse to the Conservation Reserve Program in Washington State. Studies in Avian Biology 38:517-529.

Vander Haegen, W. M., M. A. Schroeder, W. Y. Chang, and S. M. Knapp. 2015. Avian abundance and reproductive success in the intermountain west: Local-scale response to the conservation reserve program. Wildlife Society Bulletin (In Press).

# INTRODUCED AND SEMI-NATURAL

## Overview

Introduced and Semi-Natural Vegetation includes 5 systems that are considered human influenced or made: 1) introduced riparian and wetland vegetation and introduced upland vegetation, 2) annual grasslands, 3) perennial grasslands, 4) shrublands, and 5) treed. These are considered spontaneous, self-perpetuating, and not (immediately) the result of planting, cultivation, or human maintenance. Land occupied by introduced vegetation is generally permanently altered (converted) unless restoration efforts are undertaken. Natural vegetation types are usually no longer recognizable. Land cover is significantly altered/disturbed by introduced wetland, grassland, shrubland, and tree species. Examples of these include: reed canary grass invasions in wetland systems, Scot's broom invasions into upland grassland systems, cheatgrass invasions into shrub-steppe systems, and Russian olive along riparian systems in eastern Washington.

Wildlife use of these habitats include, for example, Burrowing Owl use of disturbed vegetation in deep soils along irrigation canals in eastern Washington, Washington Ground Squirrel use of old grazed fields invaded by bulbous bluegrass (*Poa bulbosa*), Streaked Horned Lark use of disturbed vegetation in western Washington airports, and American Badger use of cheatgrass dominated communities of eastern Washington. Six terrestrial SGCN identified as closely associated with this formation are the Streaked Horned Lark, Burrowing Owl, Columbian Sharp-tailed Grouse, Greater Sage-grouse, Valley Silverspot, and the Island Marble, a butterfly that inhabits the San Juan Islands associated with several introduced species that have spread in disturbed habitats, including field mustard (*Brassica campestris*), tall tumble mustard (*Sisymbrium altissimum*), and tall peppergrass (*Lepidium virginicum*). All of these six species are closely associated with introduced perennial grassland, the system with the largest number of closely associated SGCN.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 1,085 mi$^2$ | 20% | 80% | 7 | 37 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Introduced Riparian and Wetland Vegetation | 0 | 12 |
| Introduced Upland Vegetation – Annual Grassland | 2 | 22 |
| Introduced Upland Vegetation – Perennial Grassland | 5 | 24 |
| Introduced Upland Vegetation –Shrub | 1 | 10 |
| Introduced Upland Vegetation –Treed | 0 | 2 |

## Major Stressors

Human disturbance is the key stressors for these systems, including changes in disturbance patterns and conversion to agricultural production.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Short-stature exotic grasses and forbs** | A number of SGCN that use Introduced and Semi-natural Vegetation are associated with short stature exotic grasses and forbs, essentially providing structural similarities to native habitats. These include Streaked Horned Lark, Burrowing Owl, Oregon Vesper Sparrow, and Columbian Sharp-tailed Grouse. Oregon Spotted Frogs only use reed canary grass habitat to a significant degree when it is mowed annually. |
| **Large unfragmented blocks of habitat** | Many SGCN are area sensitive, meaning they have a minimum size threshold for habitat to be functional for uses such as for breeding. Bald Eagle, Peregrine Falcon, Oregon Vesper Sparrow, and Columbian Sharp-tailed Grouse are known to require larger contiguous patches of undeveloped land. |

### Actions needed to maintain habitat quality for SGCN

- Habitat Management – several SGCN that use Introduced and Semi-natural Vegetation are associated with a particular condition that may be subject to change over time, or a disturbance regime. Streaked Horned Lark, for example, is associated with short-stature vegetation at various airports in south Puget Sound. Airport habitat is actively mowed during the growing season to maintain the short-stature vegetation. Other disturbances like herbicide application, irrigation canal maintenance, and road maintenance have the potential to disrupt, disturb, or eliminate these species.
- Habitat Restoration – restoring native species to these environments can greatly increase their value to wildlife. Adding sagebrush to areas dominated by introduced grasses and forbs can provide a significant benefit to Greater Sage-grouse and Columbian Sharp-tailed Grouse, for example.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.

# OPEN FRESHWATER SYSTEMS

## Overview

Open freshwater systems take on a variety of forms, from streams and rivers, potholes and small American Beaver ponds, to large lakes and reservoirs. They are found in every corner of the state, in all climates, at almost all elevations, and are just as common in wilderness areas as they are in major urban centers. Interestingly, Washington has more streams than any state except Alaska. It should be noted that freshwater wetlands and some other standing shallow waters are not classified as Open Water (see Freshwater and Wet Meadow and Marsh).

Open water stands out from all terrestrial and other freshwater systems in that they have significantly greater numbers of closely associated SGCN. That in part is because all freshwater and anadromous fish as well as other aquatic species rely on open water for at least part of their life history. However, a large number of terrestrial and semi-aquatic SGCN also have a close affinity to open waters. These include many amphibians, waterfowl, and invertebrates, as well as species of bats that use open waters to forage on insects. Because open water systems support so many sensitive species, the influence that disturbances pose on SGCN is a serious one to the state's overall biodiversity. In fact, the consequences of numerous disturbances to open water systems are being felt right now. Those are reflected in the large number of aquatic species in Washington that are Federally Threatened and Endangered, such as the 16 Pacific salmon, steelhead and bull trout species units included as SGCN.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution*** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 4,402 mi$^2$ | 87% | 13% | 69 | 20 |

| | | |
|---|---|---|
| **Cliff, Scree & Rock Vegetation** | **Inter-Mountain Basins Cliff and Canyon** | **5** |
| **Cliff, Scree & Rock Vegetation** | **North Pacific Alpine and Subalpine Bedrock and Scree** | **1** |
| **Cliff, Scree & Rock Vegetation** | **North Pacific Montane Massive Bedrock, Cliff and Talus** | **4** |
| **Cliff, Scree & Rock Vegetation** | **Rocky Mountain Alpine Bedrock and Scree** | **1** |
| **Cliff, Scree & Rock Vegetation** | **Rocky Mountain Cliff, Canyon and Massive Bedrock** | **2** |
| **Developed & Urban** | **Developed, High Intensity** | **1** |

## Major Stressors

- Reduced glacial and snowpack runoff to replenish open water systems from climate change.
- More frequent and intense droughts lasting longer durations from climate change.
- Physical barriers to instream movement and migration.
- Altered water quality from (e.g., increased temperature, sediment, nutrients, and toxicants) from loss of riparian filtering, as well as urban and agricultural runoff.
- Physical alterations, like dredging, channelizing, damming, and confinement of migrating channels.
- Artificial modifications to hydrology from activities such as damming and irrigation.
- Loss of aquatic habitat complexity.
- Altered natural disturbance processes (e.g., seasonal flooding) and regimes.

### Habitat needs for SGCN associated with this formation

| | |
|---|---|
| **Good water quality** | Many aquatic and semi-aquatic SGCN require waters that are clean and cold for their survival and fitness. These include many anadromous salmonids, freshwater fishes, amphibians and invertebrates. |
| **Habitat complexity** | A large number of SGCN require various types of aquatic habitat and diverse habitat structure. This includes areas with clean spawning gravels, large instream wood, deep pools, off-channel habitats (e.g., oxbows) and locations where species can find cool water refuge during periods of high stream temperatures. |
| **Habitat connectivity** | Connectivity is especially important to migratory anadromous fish where their life histories require being able to reach their particular spawning grounds. Lateral connectivity is also important between a stream's main stem and off-channel and floodplain habitats. |

### Actions needed to maintain habitat quality for SGCN

- Removal of artificial barriers, especially ones that can open up new habitat for SGCN.
- Research to assess influences of climate change and to identify mitigation measures.
- Maintaining functions/processes associated with intact riparian ecosystems.
- Maintenance and enhancements of in-stream structure (e.g., large wood) and complexity.
- Improve water quality (e.g., maintain or decommission roads causing siltation and erosion).
- Reintroduction and protection of American Beaver and conservation of American Beaver ponds.
- Multi-stakeholder groups determine how to manage and monitor riparian areas for multiple socioeconomic benefits.
- Support creation of GMA-based Voluntary Stewardship Plans for agricultural areas.
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.
- Provide feedback to local jurisdictions about the effectiveness of their land use regulations and incentives to conserve ESOCs and Priority Habitats.

# RECENTLY DISTURBED OR MODIFIED

## Overview

There are seven Recently Disturbed or Modified ecological systems in Washington. They can be generally categorized as 1) previously harvested (primarily commercial logging) and 2) recently burned. Either of these two groups can includes places where the disturbance is the result of something other than human intervention, such as a stand of windblown timber. But in many cases the disturbance is human-caused (e.g., a catastrophic wildfire caused by a built-up fuels from fire suppression). In general, these areas are altered from their historical condition, especially when the disturbance is directly caused by humans. Consequently they have lower ecological integrity when compared to their undisturbed counterparts and their value to native species has usually been reduced.

Although these lands may be less valuable, it is important not to undervalue or ignore them. One reason for this is that they comprise a large area, 10 percent of the state's land area in total. Because of this they are prominent across Washington's landscape, and thus the possibility of improving their suitability as SGCN habitat must be addressed This includes their potential for habitat restoration as well as their potential to provide other benefits (e.g., as connections between important habitat areas

Many recently disturbed or modified areas provide habitat to SGCN. In fact, 74 SGCN are associated with these systems, many of which are habitat generalists, though some have a particular affinity to the disturbed nature of these systems. Eleven SGCN are closely associated with these modified systems. The systems with the largest number of closely associated species are the coniferous regeneration systems, especially the grass/forb and shrub stages. Four of the closely associated SGCN with the grass/forb stages are butterflies, where logging creates or re-creates suitable habitat in certain situations through the establishment of small meadows. Other species like Mountain Quail and Peregrine Falcon are closely associated with these stages.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 6,649 $mi^2$ | 38% | 62% | 11 | 63 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Disturbed non-specific | 1 | 8 |
| Harvested Forest – Grass/Forb Regeneration | 5 | 15 |
| Harvested Forest – Northwestern Conifer Regeneration | 6 | 22 |
| Harvested Forest – Shrub Regeneration | 5 | 13 |
| Recently Burned Forest | 2 | 17 |
| Recently Burned Grassland | 3 | 21 |
| Recently Burned Shrubland | 2 | 14 |

### Major Stressors

- Altered natural disturbance regimes and processes.
- Loss of structural diversity and habitat complexity.
- Loss of older forests because of short harvest rotation cycles.
- Spread of invasive plants.
- Habitat fragmentation and loss of connectivity.

### Habitat needs for SGCN associated with this formation

| | |
|---|---|
| **Complex habitat structure** | Many SGCN associated with disturbed habitats prefer the presence of more complex habitat feature such as snags and downed wood, and multiple canopy layers. The SGCN that have an affinity for more complex conditions are Barrow's Goldeneye, Great Gray Owl, Lewis' Woodpecker, Northern Spotted Owl, Western Bluebird, Keen's Myotis, and Silver-haired Bat. |
| **Protect key habitats within area of disturbance** | Within disturbed areas some types of habitats deserve special attention because of their value to many SGCN. These include systems such wetlands and riparian areas. |
| **Climax condition** | Several species prefer more mature habitat conditions or habitats that have at least some characteristics of climax conditions, like large trees. The SGCN that have an affinity for these conditions are Cascade Torrent Salamander, Bald Eagle, Barrow's Goldeneye, Great Gray Owl, Northern Spotted Owl, Keen's Myotis, and Western Gray Squirrel. |
| **Open habitat** | Some SGCN prefer open habitat over those with closed understories. These are Loggerhead Shrike, Short-eared Owl, Streaked Horned Lark, White-headed Woodpecker, and American Badger. |

### Actions needed to maintain habitat quality for SGCN

- Controlling the spread and removal of invasive plants.
- Controlled burns and forest thinning to reduce the possibility of large wildfire.
- Habitat restoration.
- Prioritization of disturbed and modified sites and landscapes for conservation and protection.

# SALT MARSH VEGETATION

## Overview

Salt Marsh vegetation includes three ecological systems; Inter-Mountain Basins Alkaline Closed Depression, Inter-Mountain Basins Greasewood Flat, Inter-Mountain Basins Playa, and Temperate Pacific Tidal Salt/Brackish Marsh. The Alkaline Closed Depression ecological systems are sparsely to densely vegetated found on seasonally flooded sites over saline soils in closed depressions or terminal basins. The Greasewood Flat ecological system includes open to moderately dense shrublands dominated or co-dominated by Greasewood (*Sarcobatus vermiculatus*) and also with saline soils. Inter-Mountain Basins Playa and Alkaline Closed Depression and Inter-Mountain Basins Greasewood Flat ecological systems are found in central to southern eastern Washington. The Tidal/Brackish Marsh ecological system is associated with tidally influenced coastal wetlands of estuaries, lagoons, and bays, and behind sand spits. All four of these ecological systems are ecological systems of concern.

Climate changes that lead to changes in water levels may impact inter-mountain basins playa, alkaline closed depressions and greasewood flats. Changes in precipitation may lead to fluctuations in salinity levels, which could lead to shifts in vegetation composition. Increases in runoff that increase nutrient levels in basin playas and alkaline closed depressions could also threaten vegetation. Projected sea level rise represents a key climate stressor for tidal salt and brackish marshes, as it could lead to submergence of habitats and declines in vegetation unless they are able to migrate inwards through sediment accretion.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution*** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 91 $mi^2$ | 61% | 39% | 5 | 28 |

*This Vegetation Formation is typically a narrow linear feature or small patch; such shapes are not well-suited for detection by the methods used for this project; the actual extent of this Formation is likely broader than reported.

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | closely associated | generally associated |
| Inter Mountain Basins Alkaline Closed Depression | 2 | 13 |
| Inter Mountain Basins Greasewood Flat | 2 | 9 |
| Inter Mountain Basins Playa | 3 | 7 |
| Temperate Pacific Tidal Salt and Brackish Marsh | 1 | 18 |

Ecological System of Concern

## Major Stressors

Habitat degradation and exotic plant invasions, development (dredging, filling, channeling), hydrological alteration and climate change.

## Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **High invertebrate diversity/abundance** | Invertebrates serve as food for many of these species, including Marbled Godwit, Harlequin Duck, Red-necked Grebe |

### Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes and prescribed fire)
- Grazing, Agriculture, and farm management
- Invasive species control
- Habitat restoration, research, and native species restoration, including hydrological restoration

### Ecological systems discussed in greater detail in this section

Of the 12 ecological systems found in this formation, the following 3 are discussed in greater detail here. These are considered ecological systems of concern, either because of their imperiled conservation status, because of their importance to SGCN, or both.

A. Inter-Mountain basins Greasewood Flat
B. Inter-Mountain Basins Playa and Alkaline Closed Depression
C. Temperate Pacific Tidal Salt/Brackish Marsh

## Inter-Mountain Basins Greasewood Flat (ESOC)

### Conservation Status and Concern

This is a geographically limited ecological system with small sites. The primary conservation concern is degradation of the system.

### Description and Distribution

Greasewood flats are limited to the Columbia Basin, especially the northern and central portions of the basin. They often co-occur with playas and alkaline depressions. They are more common in Benton, Grant, Franklin, Klickitat, and Walla Walla counties.

Soils are typically saline and bare ground is a common feature. The water table remains high enough to maintain vegetation, despite salt accumulations. Wetland vegetation may concentrate near seeps/springs or in drainages where standing water is perennial. Saline soils and dominance by greasewood distinguish this type from other ecological systems. The primary ecological process maintaining greasewood flat systems is an elevated groundwater table.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| None | S1 | Critically imperiled/ declining | **MAMMALS:** American Badger, Black-tailed Jackrabbit, Hoary Bat, Silver-haired Bat, Spotted Bat, |
| | | Decline of 30-50% within the last 50 years and from historical conditions | **BIRDS:** Burrowing Owl*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Peregrine Falcon, Short-eared Owl |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

The primary stressors are alteration of hydrology, livestock practices, annual exotic species invasion, fire regime alteration, and fragmentation. Activities resulting in hydrological alterations, sedimentation, nutrient inputs, and/or physical disturbance may negatively shift species composition and allow for non-native species establishment. Declining water tables create perennially dry soils, stop surface salt accumulation, and allow salts to leach deeper that create a drier, less saline soil resulting in a change in vegetation composition and pattern. The tall perennial Pepperwood (*Lepidium latifolium*), a non-native invasive species decreases the abundance of shorter native grasses and forbs. The introduction of cheatgrass into these communities has altered fuel loads and fuel distribution. Fire alters the community composition because salt-desert shrubs are not adapted to periodic fire.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Alteration of hydrology | Hydrological alterations, agriculture, roads, and development | • Land acquisition<br>• Private lands agreements | Identify and protect sites with good ecological integrity. |
| Invasive and other problematic species | Invasive species increase with excessive grazing, trampling | • Grazing/farm management<br>• Invasive species control<br>• Land use planning | Mechanical and herbicide control of exotics, planning Support creation of GMA-based Voluntary Stewardship Plans |

## Inter-Mountain Basins Playa and Alkaline Closed Depression (ESOC)

### Conservation Status and Concern

A significant amount of this system has been lost due to alterations of hydrology. Degradation has occurred across its range and in most locations. There are three SGCN that are considered closely associated with this ecological system and 12 that are considered generally associated with this ecological system (see table below).

### Description and Distribution

The Inter-Mountain Basins Playa and the Inter-Mountain Basins Alkali Closed Depression ecological systems occur throughout much of the cool arid and semi-arid regions of the Columbia Plateau and Great Basin. They almost always appear within a shrub steppe or semi-desert landscape. They are differentiated by 1) vegetation cover (playa is typically sparse to patchily vegetated, generally less than 10 percent plant cover while alkali closed depression is moderately to densely covered by herbaceous plants), 2) soil chemistry (playas are considered more saline than alkaline closed depressions), and 3) hydrological regime (playas are more intermittently flooded; closed depressions are more seasonally to semi-permanently flooded).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes Freshwater Wetlands | S1 | Critically Imperiled/ declining<br><br>Declines of 30-50% within the last 50 years and from historical conditions | **MAMMALS:** Hoary Bat, Kincaid Meadow Vole, Silver-haired Bat, Spotted Bat, Townsends Big-eared Bat<br>**BIRDS:** American White Pelican, Bald Eagle, Barrow's Goldeneye, Cinnamon Teal*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Marbled Godwit, Peregrine Falcon*, Short-eared Owl |

* SGCN is closely associated with this ecological system

### Key Stressors and Actions Needed

Historical and current land use practices have impacted hydrologic, geomorphic, and biotic structure and function of playas on the Columbia Basin. Reservoirs, water diversions, ditches, roads, and human land uses in the contributing watershed can also have a substantial impact on the hydrological regime. Direct alteration of hydrology (i.e., channeling, draining, damming) or indirect alteration (i.e., roads or removing vegetation on adjacent slopes) results in changes in the amount and pattern of herbaceous wetland habitat. Excessive livestock grazing leads to a shift in plant species composition.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Alteration of hydrology | Hydrological alterations associated with agriculture, roads, and development | • Land acquisition<br>• Private lands agreements<br>• Water management | Identify and protect sites with good ecological integrity. |
| Invasive and other problematic species | Invasive species increase with excessive grazing, trampling | • Grazing/farm management<br>• Invasive species control | Mechanical and herbicide control of exotics, planning |
| Agriculture and aquaculture side effects | Conversion to agriculture eliminates and degrades habitat | • Land use planning<br>• Grazing/farm management | Support creation of GMA-based Voluntary Stewardship Plans |

## Temperate Pacific Tidal Salt and Brackish Marsh (ESOC)

### Conservation Status and Concern

A significant amount of this system has been lost. Habitat degradation has occurred across its range and in most locations. There is one terrestrial SGCN that is considered closely associated with this ecological system, and 18 terrestrial species considered generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN fishes.

### Description and Distribution

Temperate Pacific Tidal Salt and Brackish Marsh ecological systems are found along the Pacific Coast, from south-central Alaska to the central California coast. In Washington, it occurs in large bays on the outer coast and around the waters of Puget Sound. Occurrences are confined primarily to inter-tidal portions of estuaries, coastal lagoons and bays, and behind sand spits or other locations protected from wave action. Their associated specific environments are defined by ranges of salinity, tidal inundation regime, and soil texture. This system is characterized as being dominated by emergent vegetation whose composition is influence by tidal fluctuations and varying degree of salinity (saline to brackish). Marine salt water circulation through a marsh is most important factor in marsh plant species distribution.

Characteristic plant species include seashore salt grass (*Distichlis spicata*), sea milkwort (*Glaux maritima*), jaumea (*Jaumea carnosa*), pickleweed (*Salicornia* spp.), sea blight (*Suaeda* spp.), and arrow grass (*Triglochin* spp.).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br><br>Nearshore – coastal<br><br>Nearshore – Puget Sound | S2 | Imperiled/ declining<br><br>Declines of 50-70% within the last 50 years and from historical conditions | **MAMMALS:** Shaw Island Vole |
| | | | **BIRDS:** Bald Eagle, Barrow's Goldeneye, , Brown Pelican, Common Loon, Dusky Canada Goose, Harlequin Duck, Marbled Godwit, Peregrine Falcon, Purple Martin, Red-necked Grebe, Western High Arctic Brant |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Island Marble*, Oregon Silverspot, Taylor's Checkerspot, Valley Silverspot |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

A number of stressors related to development, transportation and agriculture contribute threats to this ecological system.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Alteration of hydrology | Hydrological alterations, agriculture, roads, and development | • Planting/seeding<br>• Vegetation management<br>• Water management<br>• Land use planning | Salt marsh restoration, including restoration of native species<br>Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act) |
| Invasive and other problematic species | Invasive species such as Spartina | • Invasive species control | Mechanical and herbicide control of exotics |

# SCRUB AND HERBACEOUS COASTAL VEGETATION

## Overview

Scrub and herbaceous coastal vegetation includes two ecological systems, North Pacific Coastal Cliff and Bluff, and North Pacific Maritime Coastal Sand Dune and Strand. The North Pacific Coastal Cliff and Bluff includes un-vegetated or sparsely vegetated rock cliffs and very steep bluffs along Washington's coastline and associated marine and estuarine inlets. Sand dunes are isolated and scattered in Puget Sound, and most abundant along the southern Washington coastline.

Of the two ecological systems, North Pacific Maritime Coastal Sand Dune and Strand has the larger number of closely associated SGCN, and is discussed in greater detail below. Species that are closely associated with the North Pacific Coastal Cliff and Bluff ecological system include the Stellar Sea Lion, Peregrine Falcon, Rock Sandpiper, Island Marble, and Taylor's Checkerspot.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 28 mi$^2$ | 49% | 51% | 11 | 4 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| North Pacific Coastal Cliff and Bluff | 5 | 3 |
| North Pacific Maritime Coastal Sand Dune and Strand | 8 | 3 |

Ecological System of Concern

## Major Stressors

1. Invasive species
2. Habitat degradation
3. Recreation
4. Climate Change

Currently, the major threats to Scrub and Herbaceous Coastal Vegetation is the continued spread and subsequent stabilization of sand dunes by invasive species, off road vehicle use, road construction, intentional dune stabilization, and conversion to residential lots. The exotic European beachgrass (*Ammophila arenaria*) has been extensively planted for stabilization purposes and has also spread widely on its own for over 125 years and the eastern North American native American beachgrass (*A. breviligulata*) has been planted and spreading on the Long Beach peninsula. Once these plant species became established, the physical form and natural processes of dunes were altered, leading to rapid acceleration of successional processes, which then altered the native species composition.

Sea level rise, increased coastal erosion, and increased storminess and wave action represent significant climate stressors for this formation. Projected sea level rise could cause erosion and/or landward shift of dunes and cliffs. Similarly, greater wave and wind action from storms could cause increased disturbance and erosion of cliffs, dunes, and dune vegetation. Climate induced-changes or declines in dune vegetation that help stabilize and protect dunes could make dune habitat more vulnerable to disturbances from increased erosion, waves, and winds.

### Habitat needs for SGCN associated with coastal sand dune and strand

| | |
|---|---|
| **High ecological integrity** | Some of the birds (Streaked Horned Lark, Western Snowy Plover) and invertebrates (Taylor's Checkerspot, Sand Verbena Moth, Oregon Silverspot, Acmon Blue) require either an open dune composition without exotic beachgrasses, or short-stature vegetation provided by native species, and are sensitive to invasive weeds including dunegrasses. |

### Actions needed to maintain habitat quality for SGCN

- Habitat restoration, research, and native species restoration**.**
- Invasive species control,
- Manage public recreation, including off road vehicle use.

### Ecological systems discussed in greater detail in this section

Of the two ecological systems found in this formation, North Pacific Coastal Sand Dune and Strand is discussed in greater detail here. It is considered an ecological system of concern because of its imperiled conservation status and because of its importance to SGCN.

## North Pacific Maritime Coastal Sand Dune and Strand (ESOC)

### Conservation Status and Concern

This ecological system is located in active or stabilized dunes along the coast. Exotic species like American beachgrass have greatly reduced or eliminated active dune processes, helping to accelerate successional process, greatly increasing vegetative cover, and restricting habitat for species associated with this ecological system. There are 11 Species of Greatest Conservation Need in this ecological system; eight of those are closely associated.

### Description and Distribution

Sand dunes are distributed along the Pacific coast from south-central Alaska to central Oregon. In Washington dunes are found locally in Puget Sound, coastlines along the Straits of Juan de Fuca, and the western Olympic Peninsula. The most extensive areas of sand dunes are in the southern portion of the Washington coast between the mouths of the Copalis and Columbia Rivers. Coastal dunes include beach strand (not the beach itself but sparsely or densely vegetated areas behind the beach), foredunes, sand spits, and active to stable backdunes and sandsheets. Coastal dunes often front portions of inlets and tidal marshes. Significant plant species include native grasses such as dunegrass (*Leymus mollis*) and red fescue (*Festuca rubra*).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br><br>Nearshore – coastal<br><br>Nearshore – Open Water<br><br>Nearshore – Puget Sound | S1 | Imperiled/ declining<br><br>Decline of 50-70% within the last 50 years<br><br>Decline of 70-80% from historical conditions | **MAMMALS:** Shaw Island Vole<br>**BIRDS:** Streaked Horned Lark*, Western Snowy Plover*, Bald Eagle, Peregrine Falcon<br>**INVERTEBRATES:** Sand Verbena Moth*, Oregon Silverspot*, Taylor's Checkerspot*, Acmon Blue*, Island Marble*, Siuslaw Sand Tiger Beetle* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Fish and wildlife habitat loss or degradation | Dune stabilization has resulted in accelerated succession, invasion of exotic trees, shrubs and grasses, and reduction or loss of function of critical habitat | • Vegetation management<br>• Land use planning | Integrated habitat restoration using weed control and seeding with natives Monitor and improve implementation of land use regulations (e.g., Shoreline Management Act), enhance incentives to encourage conservation measures. |
| Invasive and other problematic species | Invasive forbs and shrubs are degrading native vegetation | • Invasive species control | Mechanical and herbicide control of exotics |
| Recreation | Off-road vehicle use has resulted in the loss of native communities | • Land acquisition<br>• Private lands agreements | Identification and protection of areas with high ecological integrity |

# SEMI-DESERT SCRUB AND GRASSLAND

## Overview

Semi-Desert Scrub and Grasslands includes 10 verified ecological systems in Washington. Comprised of native upland vegetation, these systems occur throughout most of eastern Washington. The underlying soils are variable across the spectrum, although some systems are strongly linked to a particular soil characteristic (e.g., deep soil systems). All Semi-Desert Scrub and Grassland systems in Washington have an understory layer typically made up of native bunchgrasses that are almost always accompanied by other perennial grasses and/or forbs. Although not all the systems have a shrub layer, most have some cover of shrubs. Dominant shrubs include big sagebrush (*Artemisia tridentata*), antelope bitterbrush (*Purshia tridentata*), rabbitbrush (*Chrysothamnus* spp.), and dwarf sagebrush (*Artemesia arbuscula*). At the soil surface, diverse communities of moss and lichen can also be found, especially if soils are relatively intact or undisturbed.

The ecological systems with the most closely associated SGCN include the Inter-Mountain Basin Big Sagebrush Shrubland and Steppe, each with fifteen closely associated SGCN. Columbia Plateau Steppe and Grassland is next with nine closely associated SGCN, followed by Columbia Plateau Scabland Shrubland, with six closely associated SGCN. Four ecological systems are Ecological Systems of Concern, and are discussed in more detail below. SGCN closely associated with the Columbia Plateau Scabland Shrubland include Sage Grouse, Sharp-tailed Grouse, Sage Thrasher, Ferruginous Hawk, Short-horned Lizard, and Striped Whipsnake.

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 7,729 mi$^2$ | 46% | 54% | 22 | 38 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Columbia Plateau Low Sagebrush Steppe | 2 | 14 |
| Columbia Plateau Scabland Shrubland | 6 | 19 |
| Columbia Plateau Steppe and Grassland | 9 | 23 |
| Inter Mountain Basins Big Sagebrush Shrubland | 15 | 22 |
| Inter Mountain Basins Big Sagebrush Steppe | 15 | 26 |
| Inter Mountain Basins Mixed Salt Desert Scrub | 3 | 14 |
| Inter Mountain Basins Montane Sagebrush Steppe | 2 | 12 |
| Inter Mountain Basins Semi-Desert Grasslands | 2 | 16 |
| Inter Mountain Basins Semi-Desert Shrub Steppe | 3 | 8 |

Ecological System of Concern

### Major Stressors

- Agriculture conversion
- Wind power and residential development
- Soil disturbance
- Invasive annual plants.
- Fire and fire frequency
- Excessive grazing
- Roads and transmission lines

Climate changes including shifts in precipitation, drought, and altered fire regimes may affect plant composition, density, and distribution in semi-desert scrub and grassland habitats. Precipitation likely influences plant composition, growth, and recruitment, and drought negatively affects seedling survival in sagebrush systems, reduces shrub cover, and elevates herbaceous diversity and cover. Increasing fire frequencies and/or intensities will likely negatively affect sagebrush and shrub habitats, and may favor grassland expansion. However, fire also favors cheatgrass and other non-native annual establishment, which can alter ecosystem function.

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Deep Soils** | Several species: American Badger, Pygmy Rabbit, Washington Ground Squirrel, and Burrowing Owl require relatively deep soils suitable for burrowing. The burrowing actions of some of these species also function to provide natural disturbance in grassland habitats. |
| **Minimal habitat fragmentation** | Greater Sage-grouse, Sage Thrasher, and Sagebrush Sparrow require large intact blocks of shrub-steppe habitat. |
| **High ecological integrity** | Many SGCN that use ecological systems associated with Semi-Desert Scrub and Grassland do best where native perennial plants such as bunchgrasses are dominant and where the fire return interval is low. Some SGCN also have highly specific preferences in terms of habitat structure. Ecological integrity of this habitat's riparian areas is important for SGCN interior Columbia Basin anadromous salmonids and freshwater fishes. |

### Actions needed to maintain habitat quality for SGCN

- Management to maintain infrequent intervals of fire
- Grazing management
- Invasive species control (cheatgrass in particular)
- Habitat and native species restoration

### Research and Data Needs

- Research to help improve techniques for restoring degraded habitat.
- Studies to help develop science-based compensatory mitigation ratios.
- Expand the High Resolution Change Detection analysis to include ESOCs and Priority Habitats statewide.

**Ecological systems and other habitats discussed in greater detail in this section**

A. Columbia Plateau Low Sagebrush Steppe
B. Inter-Mountain Basins Big Sagebrush Steppe
C. Inter-Mountain Basins Semi-Desert Shrub Steppe
D. Columbia Plateau Steppe and Grassland

## Columbia Plateau Low Sagebrush Steppe (ESOC)

### Conservation Status and Concern

This ecological system is very rare, occupying less than one percent of Washington's land area. The ecological integrity of the system is in decline, primarily due to disturbances from intense grazing and invasive plants. Sixteen terrestrial SGCN are associated with this system and two of those are closely associated.

### Description and Distribution

This large patch system occurs on isolated ridges at or above the lower treeline (approximately 3300 to 4500 feet) within the East Cascade, Blue Mountain, and Columbia Plateau Ecoregions. The system often lies adjacent to Douglas-fir and ponderosa pine forests. While the overstory canopy is dominated by dwarf sagebrush understory vegetation is made up of bunchgrasses and/or native forbs. Although bunchgrasses typically dominate, forbs can be dominant, especially at higher elevations. The space between vascular plants may support a crust of mosses and lichens, especially where soils are relatively undisturbed and intact. Substrates are shallow, fine-textured soils or poorly drained clays, and are almost always very stony.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes Shrub-steppe | S2 | Imperiled/ declining<br><br>>30% decline within the last 50 years.<br><br>Decline from historical conditions is unknown. | **MAMMALS:** American Badger, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, White-tailed Jackrabbit |
| | | | **BIRDS:** Burrowing Owl, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Mountain Quail, Short-eared Owl |
| | | | **REPTILES:** Pygmy Short-horned Lizard* |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Morrison's Bumblebee |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Disturbance from grazing and from the spread of invasive plants seem to be the chief threats to this system. On some sites cheatgrass has replaced native perennials. This is especially true on sites that are intensely grazed. Intense grazing also reduces the cover of moss and lichens and increases patches of bare ground. Areas of bare ground are highly susceptible to cheatgrass invasion.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Invasive and other problematic species | Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat. In other places the problem is an overabundant cover of native shrubs. | • Invasive species control | Mechanical and herbicide control of invasive species. |
| Fish and wildlife habitat loss or degradation | Habitat has been lost to agriculture, and development to a lesser degree. | • Environmental Review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Support creation of GMA-based Voluntary Stewardship Plans |

## Columbia Plateau Steppe and Grassland (ESOC)

### Conservation Status and Concern

Historically this system was more expansive across eastern Washington. Much of that expanse has been converted, especially to croplands. What is left is mostly degraded by grazing, an altered fire regime, invasive plants, and various other disturbances. Thirty-two terrestrial SGCN are associated with this system and nine of those are closely associated.

### Description and Distribution

This extensive grassland system is dominated by perennial bunchgrasses and forbs (greater than 25 percent cover) and sometimes a sparse canopy of shrubs (less than 10 percent cover). Soils are variable, ranging from relatively deep to stony volcanic-derived clays, to alluvial sands. A characteristic of the soils is that often they lack areas of exposed or bare soil. Instead they typically are carpeted by a crust of mosses and lichens, especially where soils are intact and relatively undisturbed. In contrast to closely related ecological systems, historical fire frequency is higher, which is a factor for its low cover of fire intolerant shrubs. In Washington this large patch system is widespread throughout the Columbia Plateau Ecoregion, though it also occurs in small segments of the Blue Mountain, Okanogan, and East Cascade Ecoregions.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Eastside Steppe | S2 | Imperiled/ declining | **MAMMALS:** American Badger*, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Townsend's Ground Squirrel, Washington Ground Squirrel, White-tailed Jackrabbit |
| | | | **BIRDS:** Burrowing Owl, Cinnamon Teal, Ferruginous Hawk*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Mountain Quail, Sage Thrasher*, Sagebrush Sparrow, Columbian Sharp-tailed Grouse*, Short-eared Owl |

| | | | |
|---|---|---|---|
| | | | **REPTILES/AMPHIBIANS:** Columbia Spotted Frog, Northern Leopard Frog*, Tiger Salamander, Woodhouse's Toad*, Desert Nightsnake, Ring-necked Snake*, Pygmy Short-horned Lizard*, Side-blotched Lizard |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Morrison's Bumblebee, Hoder's Mountainsnail, Ranne's Mountainsnail |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

The ecological integrity of this system has been diminished by persistent grazing, cropland conversion, invasive plants, altered fire regime, soil disturbance, and habitat fragmentation. Most deep soils steppe and grasslands has been converted to croplands. Thus most of what remains is on shallow, rocky soils. Although cropland conversion rates are not nearly what they were at their peak, conversions to agriculture still take place, especially in the wine-producing southern Columbia Valley. Residential and wind farm development is another source of direct loss of this habitat. And much of what has not already been converted is degraded. Fire suppression throughout much of the range has degraded the system by increasing shrub cover. These shrubs have displaced bunchgrasses and forbs by outcompeting with them for space and light. Grazing practices incompatible with habitat conservation have also degraded a considerable amount of this habitat. Where grazing is heavy and persistent the system responds in various ways depending on the type of grazing and season. In general, overgrazing has spread invasive plants, decreased native perennial cover, compacted soils, eliminated soil crusts of mosses and lichens, and has increased shrub cover. Across much of this landscape grazing and other land uses have increased bare ground and have replaced native perennials with cheatgrass. Fire on livestock-altered vegetation has further promoted the spread of annuals.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | An altered fire regime and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrub and bunchgrass communities. | • Fire management<br>• Vegetation management<br>• Grazing/farm management<br>• Invasive species control | Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation. |
| Fish and wildlife habitat loss or degradation | Habitat has been lost to agriculture and the development of homes and wind farms. | • Environmental Review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Support creation of GMA-based Voluntary Stewardship Plans |

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Invasive and other problematic species | Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat. | • Invasive species control | Mechanical and herbicide control of invasive species. |

## Inter-Mountain Basins Big Sagebrush Steppe (ESOC)

### Conservation Status and Concern

Historically this system was more expansive across eastern Washington. Much of that expanse has been converted, especially to croplands. What is left is mostly degraded by grazing, an altered fire regime, invasive plants, and various other disturbances. Forty-one terrestrial SGCN are associated with this system and 15 of those are closely associated.

### Description and Distribution

This large patch system occurs throughout a large portion of the Columbia Plateau and Okanogan Ecoregions, as well as the lower foothills of the East Cascade Ecoregion. When found in less disturbed conditions it takes the character of a grassland with a conspicuous, but discontinuous, layer of shrubs. The natural fire regime of this ecological system historically maintained this patchy distribution of shrubs. The characteristic shrubs, typically sagebrush (*Artemisia* spp.) and/or antelope bitterbrush, form an open to moderately dense shrub layer (5 to 40 percent cover). Ground cover typically is made up of moderate to dense layer (more than 25 percent cover) of perennial bunchgrasses, although native forbs are also common to the herbaceous layer of this system. Soils are typically deep and non-saline, and typically are encrusted on the surface by mosses and lichens that bind the soil surface (biological soil crust),especially when soils are undisturbed. This system differs from the similar Inter-Mountain Basins Montane Sagebrush Steppe in that it occurs at lower elevations, mainly below 3000 feet.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Shrub-steppe | S2 | Imperiled/ declining<br><br>Decline of 30-50% within the last 50 years and from historical conditions | **MAMMALS:** American Badger*, Black-tailed Jackrabbit, Hoary Bat, Merriam's Shrew, Pygmy Rabbit*, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Townsend's Ground Squirrel, Washington Ground Squirrel, White-tailed Jackrabbit |
| | | | **BIRDS:** Burrowing Owl*, Cinnamon Teal, Ferruginous Hawk*, Golden Eagle, Greater Sage-Grouse*, Loggerhead Shrike, Mountain Quail, Peregrine Falcon, Sage Thrasher*, Sagebrush Sparrow*, Columbian Sharp-tailed Grouse*, Short-eared Owl |
| | | | **REPTILES/AMPHIBIANS:** Northern Leopard Frog*, Tiger Salamander, Western Toad, Woodhouse's Toad*, Desert Nightsnake, Ring-necked Snake*, Sagebrush Lizard*, Sharptail Snake*, Pygmy Short-horned Lizard*, Side-Blotched Lizard, Striped Whipsnake* |
| | | | **FISH:** To be determined- research needed |

| | | | |
|---|---|---|---|
| | | | **INVERTEBRATES:** Morrison's Bumblebee, Columbia Oregonian, Poplar Oregonian, Hoder's Mountainsnail, Ranne's Mountainsnail, Limestone Point Mountainsnail, a mayfly species (*Paraleptophlebia falcula*) |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Because this system lies on deep, fertile soils, it has been targeted for its suitability as cropland. Consequently, much of this system has been converted to crops, especially in the Columbia Basin Reclamation area. Cropland conversions have made deep soil Big Sagebrush Steppe rare. Although rates of cropland conversion are not nearly what they were at their peak, agriculture conversions still occur like in the wine-producing southern Columbia Valley. Residential and wind farm development is another source of direct loss of this habitat. Grazing is another ongoing disturbance, especially when grazing practices are incompatible with habitat conservation. Where grazing is heavy and persistent the system responds in various ways depending on the type of grazing and season. In general, overgrazing spreads invasive plants, compacts soils, eliminates important soil crusts of mosses and lichens, and can lead to a dense shrub cover. Dense shrub cover can in turn compete with native bunchgrasses for very limited water, reducing their cover. Shrubs also increase following fire suppression. Frequent intense fires, on the other hand, can eliminate entire stands of sagebrush. Recovery to pre-fire shrub cover can then take decades, especially in low rainfall areas.. After wildfire, conditions become favorable for the spread of annuals, such as cheatgrass, which make sites more susceptible to subsequent wildfire. All these changes in shrub-steppe composition and structure ultimately reduce the habitat conditions required for many SGCN to persist.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrub and bunchgrass communities. | • Fire management<br>• Vegetation management<br>• Grazing /farm management | Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation. |
| Fish and wildlife habitat loss or degradation | Habitat has been lost to agriculture and the development of homes and wind farms. | • Environmental Review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Support creation of GMA-based Voluntary Stewardship Plans. |
| Invasive and other problematic species | Invasive annual grasses (cheatgrass) have degraded habitat – other problems include an overabundant cover of native shrubs. | • Invasive species control | Mechanical and herbicide control of invasive species. |

## Inter-Mountain Basins Semi-Desert Shrub Steppe (ESOC)

### Conservation Status and Concern

This is the rarest of all Semi-Desert Scrub and Grassland ecological systems in Washington, occupying roughly a tenth of one percent of Washington's land area. Being in the driest region of Washington, this shrub-steppe ecosystem is particularly vulnerable to the spread of invasive plants that often are facilitated by fire and grazing. Eleven terrestrial SGCN are associated with this system, and three bird species are closely associated: Burrowing Owl, Ferruginous Hawk, and Greater Sage-grouse.

### Description and Distribution

Inter-Mountain Basins Semi-Desert Shrub Steppe occurs in the hottest and driest parts of southeastern Washington's Columbia Plateau, where annual rainfall is less than 8 inches. Although some occurrences are on public lands, most is in private ownership. Patch sizes of this ecological system range from small to large. Though the canopy often consists of an open to moderately dense mix of shrubs and dwarf shrubs, some occurrences are dominated by a single species of shrub. Dominant shrubs include spiny hopsage (*Grayia spinosa*), winterfat (*Krascheninnikovia lanata*), and rubber rabbitbrush (*Ericameria nauseosa*). Native herbaceous cover in the understory typically exceeds 25 percent and principally is made up of bunchgrasses with few or no forbs. The natural fire regime is important to maintaining a patchy distribution of shrubs, which is a characteristic of this system. The result is that the general look tends to resemble grassland rather than shrubland.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Shrub-steppe | S1 | Imperiled/ declining<br><br>50-70% decline within the last 50 years and from historical conditions | **MAMMALS:** Pygmy Rabbit, Townsend's Big-eared Bat, Washington Ground Squirrel |
| | | | **BIRDS:** Burrowing Owl*, Ferruginous Hawk*, Golden Eagle, Greater Sage-grouse*, Loggerhead Shrike, Short-eared Owl, Cinnamon Teal |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Morrison's Bumble Bee |
| | | | |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

This system's ecological integrity has been altered by persistent grazing, invasive plants, wildfire, soil disturbances, and habitat fragmentation. Grazing practices incompatible with habitat conservation have stressed the system by disturbing the delicate soils and by exposing bare ground. It also disturbs the layer of moss and lichens that lock in scarce amounts of soil moisture. Grazing has brought about a shift in this system's plant composition by creating dense stands of big sagebrush and by shifting the dominant grasses from native perennials to annuals, particularly cheatgrass. Because cheatgrass produces abundant fine fuels, its spread increases fire risk. Because fire also enhances the spread of cheatgrass, the system has become highly vulnerable to a persistent cycle of wildfire and cheatgrass expansion.

Fire has also drastically altered shrub species composition given the indigenous shrubs generally are intolerant of frequent fires. Although not as big a problem as grazing, wildfire, or invasive plants, cropland expansion (especially where the soils are deeper) and development have fragmented some of this shrub-steppe.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire and ground disturbance has degraded the habitat and has led to a loss of habitat diversity. Fire has a particularly strong impact to indigenous shrubs. | • Fire management<br>• Vegetation management<br>• Grazing/farm management | Integrated habitat restoration using prescribed fire, weed control, and seeding with native vegetation. |
| Fish and wildlife habitat loss or degradation | Habitat has been lost to agriculture, and development to a lesser degree. | • Environmental Review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Support creation of GMA-based Voluntary Stewardship Plans |
| Invasive and other problematic species | Invasive annual grasses (cheatgrass) and exotic weeds have degraded habitat and increase with fire. | • Invasive species control | Mechanical and herbicide control of invasive vegetation. |

# TEMPERATE FOREST

## Overview

Temperate Forest includes 31 ecological systems comprised of native upland vegetation throughout a broad elevation range and wide distribution in Washington. Forests in this category vary from the dry forest types of the eastern Cascade Range to the rain forests along the Washington coast. Temperate Forests support numerous SCGN including the following species: 22 birds, 11 amphibians, 35 invertebrates, 25 mammals, six reptiles, and 31 anadromous or freshwater fishes.

The ecological system with the most closely associated SGCN is the Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest. This widespread eastern Washington system includes a number of closely associated SGCN birds (pygmy nuthatch, white-headed woodpecker, Mountain Quail, Great Gray Owl, Golden Eagle, and Flammulated Owl), Mammals (Lynx, Western Gray Squirrel) and Reptiles (California Mountain Kingsnake, Sharp-tailed Snake). Old growth forest structure, snags and downed wood are key habitat features for species closely associated with this system.

Ten ecological systems within this formation are profiled as ecological systems of concern, and eight are discussed in greater detail below. Two other ecological systems (North Pacific Maritime Mesic Subalpine Parkland and North Pacific Maritime Mesic-Wet Douglas-fir – Western Hemlock) are of special interest due to significant numbers of closely associated species. Within the Subalpine Parkland system, two SGCN mammals are closely associated, Olympic Marmot and Mazama Pocket Gopher. Other SGCN closely associated with this system include five invertebrates (Mardon skipper, Puget Blue, Puget Sound Fritillary, Valley Silverspot, and Western Bumblebee). Closely associated SGCN species within the Maritime Mesic-Wet Douglas-fir ecological system include two amphibians (Cascades Torrent Salamander, Dunn's Salamander) one reptile (Ringneck Snake), and two invertebrates (Johnson Hairstreak and Bluegray taildropper).

| Formation Summary | | | | |
|---|---|---|---|---|
| **Distribution** | **Public Land** | **Private Land** | **SGCN with close association (#)** | **SGCN with general association (#)** |
| 28,929 mi$^2$ | 70% | 30% | 69 | 61 |

| Ecological systems found in this formation | Number of SGCN | |
|---|---|---|
| | **closely associated** | **generally associated** |
| Columbia Plateau Western Juniper Woodland and Savanna | 3 | 11 |
| East Cascades Mesic Montane Mixed Conifer Forest | 3 | 27 |
| East Cascades Oak-Ponderosa Pine Forest and Woodland | 7 | 12 |
| Inter Mountain Basins Aspen-Mixed Conifer Forest | 0 | 6 |
| Inter Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland | 0 | 2 |
| Middle rocky Mountain Montane Douglas-fir Forest | 1 | 7 |
| North Pacific Broadleaf Landslide Forest and Shrubland | 1 | 6 |
| North Pacific Dry Douglas-fir (Madrone) Forest | 5 | 18 |
| North Pacific Dry-Mesic Sliver Fir Western Hemlock Douglas Fir Fores | 4 | 28 |
| North Pacific Hypermaritime Sitka Spruce Forest | 2 | 21 |

| | | |
|---|---|---|
| North Pacific Hypermaritime Western Red-Cedar Western Hemlock Forest | 3 | 22 |
| North Pacific Lowland Mixed Hardwood-Conifer Forest | 0 | 27 |
| North Pacific Maritime Dry-Mesic Douglas fir Western Hemlock Forest | 4 | 31 |
| North Pacific Maritime Mesic Subalpine Parkland | 7 | 16 |
| North Pacific Maritime Mesic-Wet Douglas –fir-Western Hemlock Forest | 5 | 30 |
| North Pacific Mesic Western Hemlock Silver Fir Forest | 0 | 21 |
| North Pacific Mountain Hemlock Forest | 1 | 19 |
| North Pacific Oak Woodland | 6 | 12 |
| North Pacific Wooded Volcanic Flowage | 1 | 3 |
| North Pacific Seasonal Sitka Spruce Forest | 0 | 6 |
| Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest | 11 | 26 |
| Northern Rocky Mountain Mesic Montane Mixed Conifer Forest | 4 | 23 |
| Northern Rocky Mountain Ponderosa Pine Woodland and Savanna | 10 | 20 |
| Northern Rocky Mountain Subalpine Woodland and Parkland | 2 | 20 |
| Northern Rocky Mountain Western Larch Savanna | 0 | 12 |
| Rocky Mountain Aspen Forest and Woodland | 0 | 12 |
| Rocky Mountain Lodgepole Pine Forest | 2 | 20 |
| Rocky Mountain Poor-site Lodgepole Pine Forest | 1 | 10 |
| Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland | 3 | 17 |
| Rocky Mountain Subalpine Mesic Spruce Fir Forest and Woodland | 4 | 22 |

Ecological System of Concern

### Major stressors

1. Agricultural conversion in lower elevation areas
2. Conversion for development purposes
3. Intensive plantation forestry primarily in lower- and mid-elevation areas
4. Altered fire behavior in dry forest landscapes
5. Excessive grazing
6. Weed invasions
7. Climate change

### Habitat needs for SGCN associated with this vegetation formation

| | |
|---|---|
| **Old-growth Forest - High Ecological Integrity** | Old growth forest comprised of trees of a wide range of age, height and diameter distributions of living and dead trees which results in complex structure important to numerous species. Examples: Northern Spotted Owl nesting, roosting, and foraging habitat; Bald Eagle nesting and roosting habitat. Golden Eagle nesting in large ponderosa pines, White-headed Woodpecker foraging and nesting in ponderosa pine forests. |
| **High microclimate diversity** | Many of the butterflies use habitat of high microclimate diversity with few invasive plants and high diversity of native plants. |
| **Snags and downed wood** | Vertical structure and structure on the forest floor provide area for foraging wildlife such as woodpeckers and habitat for Northern Flying Squirrels, an important prey species for Northern Spotted Owl. |

### Actions needed to maintain habitat quality for SGCN

- Fire management (establishment of natural fire regimes)
- Establish longer forestry rotations
- Grazing management
- Invasive species control
- Habitat restoration, research, and native species restoration.
- Landowner agreements/incentives; acquisition/easements

### Role of Climate Change

Increasing temperatures, decreased moisture availability, and altered fire regimes represent the most significant climate stressors to temperate forests. Altered fire regimes appear to be the greatest threat, particularly given fire suppression practices of the past century that have led to the invasion of shade-tolerant and fire-intolerant species and/or altered forest structure and composition (i.e., increased stand density, smaller diameter trees. Warmer temperatures and decreased moisture availability may increase insect outbreaks in some temperate forests. In general, North Pacific temperate forests likely exhibit less vulnerability to climate change than temperate forests of the East Cascades and Rocky Mountains.

### Research and Data Needs

- Assess effectiveness of various restoration methods
- Assess ecological consequences of using silvicultural versus prescribed fire methods to restore and/or retain habitats (e.g. ponderosa pine forest and woodland).
- What is the range of ecological value (e.g. wildlife species occurrence) that might be expected to occur in these ecological systems depending on varying levels of anticipated or hypothesized protection or ecological restoration?
- Are there minimum patch sizes or levels of isolation that make patches usable or unusable for the SGCN that are closely associated?
- Continue biennial updates to the High Resolution Change Detection dataset for the Puget Sound basin; expand the analysis to include ESOCs and Priority Habitats statewide.

### Ecological systems and other habitats discussed in greater detail in this section

A. East Cascades Oak-Ponderosa Pine Forest and Woodland
B. North Pacific Dry Douglas-fir-(Madrone) Forest and Woodland
C. North Pacific Hypermaritime Sitka Spruce Forest
D. North Pacific Hypermaritime Western Red-cedar-Western Hemlock Forest
E. North Pacific Oak Woodland
F. Northern Rocky Mountain Ponderosa Pine Woodland and Savanna.
G. Northern Rocky Mountain Western Larch Savanna
H. Rocky Mountain Aspen Forest and Woodland

## East Cascades Oak-Ponderosa Pine Forest and Woodland (ESOC)

### Conservation Status and Concern

Fire suppression combined with grazing creates conditions that support cloning of oak and invasion by conifers resulting in denser stands. Seven terrestrial SGCN are closely associated with this ecological system and 12 are generally associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This narrowly restricted ecological system appears at or near lower treeline in foothills of the eastern Cascade Range. Most occurrences of this system are dominated by a mix of Oregon white oak (*Quercus garryana)* and ponderosa pine or Douglas-fir. Scattered ponderosa pine or Douglas-fir comprise the upper canopy over Oregon white oak trees. Clonal Oregon white oak can create dense patches across a grassy landscape or can dominate open woodlands or savannas. Shrub-steppe vegetation may be prominent in some stands and create a distinct tree/shrub/sparse grassland habitat, including bitterbrush, big sagebrush and yellow rabbitbrush (*Chrysothamnus viscidiflorus*). The understory is generally dominated by herbaceous species, especially graminoids (grasses, sedges, and rushes). Mesic sites have an open- to-closed sodgrass understory dominated by pinegrass (*Calamagrostis rubescens*), Geyer's sedge (*Carex geyeri),* Ross' sedge (*Carex rossii*), or blue wildrye (*Elymus glaucus*). Drier savanna and woodland understories typically contain bunchgrass steppe species such as Idaho fescue (*Festuca idahoensis*) or bluebunch wheatgrass (*Pseudoroegneria spicata*). Common exotic grasses that often appear in high abundance are cheatgrass and bulbous bluegrass.

In the Columbia River Gorge, Oregon white oak can be found in dense patches often associated with grassland or shrubland balds within a closed Douglas-fir overstory forest landscape. The understory is often shrubby and composed of deerbrush (*Ceanothus integerrimus),* oceanspray, common snowberry (*Symphoricarpos albus*), and Pacific poison oak (*Toxicodendron diversilobum*). These woodlands occur at the lower treeline/ecotone between sagebrush (*Artemisia* spp.) or bitterbrush steppe or shrubland and ponderosa pine and/or *Douglas-fir* forests or woodlands. The matrix system occurs in the eastern Cascades in Washington and Oregon within 40 miles of the Columbia River Gorge. Elevations range from 1500 to 6300 feet. The Washington map was based on LANDFIRE data.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes, if Snags or Logs, or Old Growth/ Mature Forest Conditions are present | S1/S2 | Imperiled/ declining | **MAMMALS:** American Badger, Gray Wolf, Hoary Bat, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel* |
| | | | **BIRDS:** Bald Eagle, Golden Eagle, Lewis' Woodpecker*, Pygmy Nuthatch*, White-headed Woodpecker |
| | | | **REPTILES/AMPHIBIANS:** Larch Mountain Salamander, Western Toad, California Mountain Kingsnake*, Ring-necked Snake*, Sharp-tailed Snake*, Western Pond Turtle* |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Mardon Skipper, a mayfly species (Paraleptophlebia jenseni) |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Fire suppression may support cloning of oak and invasion by conifers resulting in denser stands. This may be exacerbated by excessive grazing. Establishment of a natural fire regime is a key conservation action.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment. | • Fire management<br>• Vegetation management<br>• Invasive species control | Integrated habitat restoration using prescribed fire, weed control and seeding with natives. |
| Roads and development | Habitat has been lost to housing and subdivisions. | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Monitor and improve implementation of land use regulations (e.g., Growth Management Act). |
| Invasive and other problematic species | Invasive trees, forbs and shrubs are degrading habitat. | • Invasive species control | Mechanical and herbicide control of invasive species. |

## North Pacific Dry Douglas-Fir (Madrone) Forest and Woodland (ESOC)

### Conservation Status and Concern

Clearcut or similar logging reduces canopy structural complexity and abundance of large woody debris. Fire suppression and climate change are significant threats to habitat for at least one SGCN species. There are five closely associated and 18 generally associated terrestrial SCGN that use this system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

Large and small patch system most common in the Puget Trough - Willamette Valley but found throughout western Washington and much of western Oregon. The Washington map was based on the recent modification of Washington's GAP map for Zone 1 (i.e. west side and east slope of the Cascades). Found in dry soils within relatively dry to mesic climates in the western Cascades, it can occur up to about 4000 feet elevation. With fire exclusion, stands have probably increased in tree density and grassy understories have been replaced by deciduous shrubs. Moderate to heavy grazing or other significant ground disturbance leads to increases in non-native invasive species, many of which are now abundant in stands with grassy or formerly grassy understories. Exotic herbaceous invaders include colonial bentgrass (*Agrostis capillaris*), common velvetgrass (*Holcus lanatus*), Kentucky bluegrass (*Poa pratensis)*, tall oatgrass (*Arrhenatherum elatius*), ripgut brome (*Bromus rigidus*), orchardgrass (*Dactylis glomerata*), bristly dogstail grass (*Cynosurus echinatus*), tall fescue (*Schedonorus arundinaceus*), and common St. John's wort (*Hypericum perforatum*).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br>If Snags or Logs, or Old Growth/ Mature Forest Conditions are present | S2 | Imperiled/ declining<br><br>Declines of 30-50% within the last 50 years.<br><br>Declines of 70-80% from historical conditions | **MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Shaw Island Vole, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel, Western Spotted Skunk |
| | | | **BIRDS:** Bald Eagle, Marbled Murrelet, Peregrine Falcon, Slender-billed White-breasted Nuthatch, Western Bluebird, Western Screech Owl |
| | | | **AMPHIBIANS:** Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Great Arctic*, Hoary Elfin*, Oregon Megomphix, Pacific Vertigo, Puget Sound Fritillary*, Taylor's Checkerspot*, Valley Silverspot* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Maintenance of a natural fire regime is a key indicator of health

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment | • Fire management<br>• Vegetation management | Integrated habitat restoration using prescribed fire, weed control and seeding with natives |
| Roads and development | Habitat has been lost to housing and subdivisions | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration<br>Monitor and improve implementation of land use regulations (e.g., Growth Management Act). |
| Invasive and other problematic species | Invasive trees, forbs and shrubs are degrading habitat | • Invasive species control | Mechanical and herbicide control of invasive species |
| Forestry impacts | Clearcut or similar logging reduces canopy structural complexity and abundance of large woody debris. | • Environmental review<br>• Land acquisition<br>• Private lands agreements | Protect key sites through acquisition, easement, and planning. |

## North Pacific Hypermaritime Sitka Spruce Forest (ESOC)

### Conservation Status and Concern

Historically this system was more extensive, but has been reduced by conversion to commercial forest and shorter harvest rotation. There are two closely associated and 21 generally associated terrestrial SCGN that use this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This system is characterized by forests found in the outermost coastal fringe where salt spray is prominent and on riparian terraces and valley bottoms near the coast where there is abundant fog. Large patch system are restricted to the hypermaritime climatic areas near the Pacific Coast, along a fog belt from Point Arena, California, north to the Kenai Peninsula, Alaska. It is found below 1000 feet elevation and within 15 miles of the outer coast, and does not include swamp areas. Mild, wet climate with abundant summer fog are characteristic and annual precipitation ranges from 26 to 217 inches, with the majority falling as rain, which can be heavy. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e., west side and east slope of the Cascades).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br>If Snags or Logs, or Old Growth/ Mature Forest Conditions are present | S2 | Imperiled/ declining<br><br>Decline of 70-80% within last 50 years and from historical condition | **MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population)*, Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk |
| | | | **BIRDS:** Bald Eagle, Golden Eagle, Harlequin Duck, Marbled Murrelet, Northern Spotted Owl, Peregrine Falcon, Western Bluebird, Western Screech Owl |
| | | | **AMPHIBIANS:** Cope's Giant Salamander, Dunn's Salamander*, Olympic Torrent Salamander, Van Dyke's Salamander, Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Crowned Tightcoil, Oregon Silverspot |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Many historical occurrences of this system have become conifer plantations and logging of remaining intact stands remains a threat. Clearcut logging and plantation forestry have resulted in less diverse tree canopies, and have focused mainly on Douglas-fir, with reductions in coarse woody debris, a shortened stand initiation phase, and succession truncated well before late-seral characteristics are expressed. Non-native species are also a potential threat to the persistence and ecological integrity of this ecological system. Developing longer stand rotations in managed lands, habitat restoration, and protection through a variety of methods are key conservation actions.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Roads and development | Habitat has been lost to housing and subdivisions. | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Monitor and improve implementation of land use regulations (e.g., Growth Management Act). |
| Forestry impacts | Intensive forestry that emphasizes shorter rotations and different species. | • Vegetation management | Integrated Habitat Restoration with native species. |
| Invasive/other problematic species | Invasive trees, forbs and shrubs are degrading habitat. | • Invasive species control | Mechanical and herbicide control of invasive species. |

## North Pacific Hypermaritime Western Red-cedar Western Hemlock Forest (ESOC)

### Conservation Status and Concern

Fire suppression and climate change are significant threats to habitat for this ecological system. There are three closely associated and 22 generally associated terrestrial SCGN with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This is a coastal forest occurring in areas of low, gentle relief within 15 miles of the coast. Where these forests are best developed they occur in a mosaic with forested wetlands, bogs, and Sitka spruce forests (the latter in riparian areas and on steep, more productive soils). The matrix system occupies the outer coastal portions of British Columbia, southeastern Alaska, and Washington. Its center of distribution is the northern coast of British Columbia, as western redcedar (*Thuja plicata*) approaches its northernmost limit in the southern half of southeastern Alaska.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br>If Snags or Logs, or Old Growth/ Mature Forest Conditions are present | S2 | Imperiled/ declining<br><br>Declines of 70-80% within last 50 years<br><br>Declines of 50-70% from historical | **MAMMALS:** Fisher, Gray Wolf, Hoary Bat, Keen's Myotis, Pacific Marten (coastal population), Silver-haired Bat, Townsend's Big-eared Bat, Western Spotted Skunk |
| | | | **BIRDS:** Bald Eagle, Golden Eagle, Harlequin Duck, Marbled Murrelet, Northern Spotted Owl, Peregrine Falcon, Western Bluebird, Western Screech Owl |
| | | | **AMPHIBIANS:** Dunn's Salamander*, Cope's Giant Salamander, Olympic Torrent Salamander, Van Dyke's Salamander, Western Toad |
| | | | **FISH:** To be determined- research needed |

| | | | |
|---|---|---|---|
| | | | **INVERTEBRATES:** Bluegray Taildropper*, Johnson's Hairstreak*, Oregon Silverspot, Puget Oregonian |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

These forests very rarely burn and are more influenced by gap disturbance processes and intense windstorms than by fire. Many historical occurrences of this system have become conifer plantations and logging of remaining intact stands remains a threat. Clear-cut logging and plantation forestry have resulted in less diverse tree canopies, and have focused mainly on Douglas-fir, with reductions in coarse woody debris, a shortened stand initiation phase, and succession truncated well before late-seral characteristics are expressed. Non-native species are also a potential threat to the persistence and ecological integrity of this ecological system.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Forestry impacts | Intensive forestry that emphasizes shorter rotations and different species. | Vegetation management | Integrated habitat restoration with native species. |
| Roads and development | Habitat has been lost to housing and subdivisions. | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Monitor and improve implementation of land use regulations (e.g., Growth Management Act). |

## North Pacific Oak Woodland (ESOC)

### Conservation Status and Concern

Due to historical loss of habitat, and ongoing threats from invasive species and development, conservation action is critical for conservation of this ecological system and associated SGCN. There are seven terrestrial SGCN species that are closely associated with this ecological system and 12 that are generally associated. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This oak woodland is most prevalent on gravelly outwash plains in Thurston and Pierce counties but is found on dry sites that experienced frequent pre-settlement fires in other part of the Puget Trough including parts of Jefferson, Clallam, Island and San Juan Counties. This system occurs as either large or small patches. The sporadic distribution and often small patch size of component parts of this system often limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. The presence of Oregon white oak either as single species patches or where mixed with conifers characterizes these woodlands. East of the Cascade Crest is a different system dominated by Oregon white oak (i.e., East Cascades Oak-Ponderosa Pine Forest and Woodland).

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes<br>Oregon White Oak Woodlands | S1 | Critically imperiled/ declining.<br>Rate of decline unknown. | **MAMMALS:** Hoary Bat, Keen's Myotis, Mazama Pocket Gopher, Silver-haired Bat, Townsend's Big-eared Bat, Western Gray Squirrel* |
| | | | **BIRDS:** Bald Eagle, Slender-billed White-breasted Nuthatch*, Western Bluebird, Western Screech Owl |
| | | | **REPTILES/AMPHIBIANS:** Oregon Spotted Frog, Western Toad**,** Western Pond Turtle* |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Mardon Skipper, Propertius' Duskywing*, Puget Sound Fritillary*, Taylor's Checkerspot*, Valley Silverspot* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

This ecological system is relatively limited in area and is currently declining in extent and condition. With the cessation of regular fires, many oak woodlands have been invaded by a greater density of trees that alters the structure and function of woodlands and interferes with successional dynamics such as recruitment. Some areas have been lost to urban or agriculture development. Ongoing threats include residential development, increase and spread of exotic species, and fire suppression effects. Selective logging of Douglas-fir in oak woodlands can prevent long-term loss of oak dominance. Moderate to heavy grazing can lead to an increase in non-native plant species, many of which are now abundant. Maintenance of a natural fire regime is a key conservation action.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment | • Fire management<br>• Vegetation management<br>• Invasive species control | Integrated habitat restoration using prescribed fire, weed control and seeding with native species |
| Roads and development | Habitat has been lost to housing and subdivisions | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration<br>Monitor and improve implementation of land use regulations (e.g., Growth Management Act). |
| Invasive and other problematic species | Invasive trees, forbs and shrubs are degrading habitat | • Invasive species control | Mechanical and herbicide control of invasive species |

## Northern Rocky Mountain Ponderosa Pine Woodland and Savanna (ESOC)

### Conservation Status and Concern

Fire suppression and climate change are significant threats to this ecological system. Housing and development is increasingly moving into this habitat. There are 10 terrestrial SGCN that are closely associated with this ecological system and 20 SGCN that are generally associated. Although a complete analysis has not been done for all SGCN anadromous and freshwater fishes, several appear closely associated with this system, e.g., Upper Columbia Steelhead DPS, and Upper Columbia Spring Chinook Salmon ESU.

### Description and Distribution

These woodlands and savannas are, or at least historically were, fire-maintained and occur at the lower treeline/ecotone between grasslands or shrublands at lower elevations and more mesic coniferous forests at higher elevations. This is the predominant ponderosa pine system of eastern Washington. This system occurs in the foothills of the northern Rocky Mountains in the Columbia Plateau region and west along the foothills of the Modoc Plateau and eastern Cascades into southern interior British Columbia.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes If Snags or Logs, or Old Growth/ Mature Forest Conditions are present | S2 | Imperiled/ declining | **MAMMALS:** American Badger, American Pika, Gray Wolf, Grizzly Bear, Hoary Bat, Silver-haired Bat, Spotted Bat, Townsend's Big-eared Bat, Western Gray Squirrel* |
| | | | **BIRDS:** Bald Eagle, Flammulated Owl*, Golden Eagle, Harlequin Duck, Lewis' Woodpecker, Mountain Quail*, Northern Spotted Owl, Peregrine Falcon, Pygmy Nuthatch*, White-headed Woodpecker* |
| | | | **REPTILES/AMPHIBIANS:** Columbia Spotted Frog, Tiger Salamander, Western Toad, California Mountain Kingsnake*, Desert Nightsnake, Ring-necked Snake*, Sharp-tailed Snake*, Pygmy Short-horned Lizard |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Chelan Mountainsnail*, Hoder's Mountainsnail, Mardon Skipper* |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

Pre-1900, this system was a mosaic of forest containing a substantial area of open and park like forest with few understory trees. Currently, much of this system has a younger tree cohort often including more shade-tolerant species, resulting in a more closed, multilayered canopy in patches that include older trees. Fire suppression has led to a buildup of fuels (e.g. higher density of trees, inter-connecting canopies of trees, multiple heights classes of trees) that in turn increase the likelihood of stand-replacing fires. Heavy grazing, in contrast to fire, removes the grass cover and tends to favor shrub and conifer species. Fire suppression combined with grazing creates conditions that support invasion by conifers. Large late-seral ponderosa pine and Douglas-fir are harvested in much of this habitat. Under most management regimes, typical tree size decreases and tree density increases in this habitat. Maintenance of a natural fire regime and longer stand rotation are key conservation actions.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment | • Fire management<br>• Vegetation management | Integrated habitat restoration using prescribed fire, weed control and seeding with natives |
| Fish and wildlife habitat loss or degradation | Habitat has been lost to agriculture, and development | • Environmental Review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration.<br>Monitor and improve implementation of land use regulations (e.g., GMA). |
| Invasive and other problematic species | Invasive trees, forbs and shrubs are degrading habitat | • Invasive species control | Mechanical and herbicide control of invasive species |

## Northern Rocky Mountain Western Larch Savanna (ESOC)

### Conservation Status and Concern

This is a fire-dependent system and was much more extensive in the past; it is now very patchy in distribution. Fire suppression has led to invasion of the more shade-tolerant tree species grand fir (*Abies grandis*), subalpine fir (*Abies lasiocarpa*), Engelmann spruce (*Picea engelmannii*), or hemlock species (*Tsuga* spp.) and loss of much of the single-story canopy woodlands. Fire suppression and climate change are significant threats. There are 12 terrestrial SCGN species that are generally associated with this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

This large patch system is restricted to the interior montane zone of the Pacific Northwest in northern Idaho and adjacent Montana, Washington, Oregon, and southeastern British Columbia. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e. east slope of the Cascades) and LANDFIRE data. The sporadic distribution of this system limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. There may be remnant stands in Yakima and Klickitat counties. Elevations range from 2230 to 7200 feet, and sites include drier, lower montane settings of toe slopes and ash deposits. Winter snowpack typically melts off in early spring at lower elevations.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes If Snags or Logs, or Old Growth /Mature Forest Conditions are present | S1 | Critically imperiled/ declining | **MAMMALS:** American Pika, Cascade Red Fox, Gray Wolf, Grizzly Bear, Hoary Bat, Silver-haired Bat, Townsends Big-eared Bat, Wolverine |
| | | | **BIRDS:** Bald Eagle, Golden Eagle, Lewis' Woodpecker |
| | | | **AMPHIBIANS:** Columbia Spotted Frog |
| | | | **FISH:** To be determined- research needed |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

This is a fire-dependent system and was much more extensive in the past; it is now very patchy in distribution. Fire suppression has led to invasion of the more shade-tolerant tree species such as grand fir, subalpine fir, Engelmann spruce, or hemlock species and loss of much of the single-story canopy woodlands. Maintenance of a natural fire regime is a key conservation action.

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment | • Fire management<br>• Vegetation management<br>• Invasive species control | Integrated habitat restoration using prescribed fire, weed control and seeding with natives |
| Roads and development | Habitat has been lost to housing and subdivisions | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration<br>Monitor and improve implementation of land use regulations (e.g., GMA). |

## Rocky Mountain Aspen Forest and Woodland (ESOC)

### Conservation Status and Concern

Conifers now dominate many seral aspen stands and extensive stands of young aspen are uncommon. Heavy livestock browsing can adversely impact aspen growth and regeneration. With fire suppression and alteration of fine fuels, fire rejuvenation of aspen habitat has been greatly reduced since about 1900. There are 12 generally associated terrestrial SCGN that use this ecological system. A complete analysis of habitat association has not been done for SGCN anadromous and freshwater fishes.

### Description and Distribution

Aspen forests and woodlands are a minor type found on the east side of the North Cascades and in the Okanogan. Although aspen can be associated with streams, ponds, or wetlands, this system consists of upland aspen stands found from low to moderate elevation. This widespread, large patch system is very common in the southern and central Rocky Mountains but occurs in the montane and subalpine zones throughout much of the western U.S. and north into Canada. The Washington map is based on recent modification of Washington's GAP map for Zone 1 (i.e. west side and east slope of the Cascades). The sporadic distribution of this system limits visibility of mapped occurrences, thus the map also displays the counties in which the system is known to occur. It often occurs on well-drained mountain slopes or canyon walls that have some moisture. Rockfalls, talus, or stony north slopes are often typical sites and the system may occur in steppe on moist microsites.

| PHS | NHP Rank | Status and trend | SGCN closely and generally associated with this ecological system |
|---|---|---|---|
| Yes. Snags and Logs and Aspen Stands | S2 | Imperiled/ declining<br><br>Declines of 50-70% within the last 50 years. | **MAMMALS:** Gray Wolf, Grizzly Bear, Hoary Bat, Lynx, Silver-haired Bat, Townsend's Big-eared Bat |
| | | | **BIRDS:** Bald Eagle, Harlequin Duck, Lewis' Woodpecker |
| | | | **AMPHIBIANS:** Columbia Spotted Frog , Western Toad |
| | | | **FISH:** To be determined- research needed |
| | | | **INVERTEBRATES:** Mardon Skipper |

* SGCN is closely associated with this ecological system

### Stressors and Actions Needed

| STRESSOR | DESCRIPTION | ACTION CATEGORY | ACTION DESCRIPTION |
|---|---|---|---|
| Altered disturbance regimes | Fire exclusion has resulted in tree and shrub encroachment, loss of habitat diversity | • Fire management<br>• Vegetation management<br>• Invasive species control | Integrated habitat restoration using prescribed fire, weed control and seeding with natives |
| Roads and development | Habitat has been lost to housing and subdivisions | • Environmental review<br>• Land acquisition<br>• Land use planning<br>• Private lands agreements | Acquisitions, conservation easements, landowner agreements, and restoration<br>Monitor and improve implementation of land use regulations (e.g., GMA). |

## MARINE ECOLOGICAL SYSTEMS

### Overview

Seven marine ecological systems that occur in Puget Sound and Washington's Pacific coast are described in Table 4-2 and include Temperate Pacific Tidal Salt and Brackish Marsh, Temperate Pacific Intertidal Mudflat, North Pacific Maritime Eelgrass Bed, Estuarine, Nearshore, Offshore, and Oceanic. Below, we provide information on the SGCN generally and closely associated with these systems, and following, a summary of key stressors, habitat values and actions needed.

| Ecological System | SGCN with close* and general association |
|---|---|
| **TEMPERATE PACIFIC TIDAL AND BRACKISH MARSH** | **MAMMALS:** Shaw Island Vole<br>**BIRDS:** Bald Eagle, Barrow's Goldeneye, Black Scoter, Brown Pelican, Common Loon, Dusky Canada Goose, Harlequin Duck, Marbled Godwit, Peregrine Falcon, Purple Martin, Red-necked Grebe, Surf Scoter, Western High Arctic Brant, White-winged Scoter<br>**FISH:** Eulachon-southern DPS, Pacific Lamprey, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit<br>**INVERTEBRATES:** Island Marble*, Oregon Silverspot, Taylor's Checkerspot, Valley Silverspot |
| **NORTH PACIFIC MARITIME EELGRASS BED** | **BIRDS:** Bald Eagle, Common Loon, Harlequin Duck*, Marbled Godwit*, Peregrine Falcon, Red Knot*, Western High Arctic Brant*<br>**FISH:** Broadnose Sevengill Shark, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Copper Rockfish, Quillback Rockfish, Pacific Cod-Salish Sea population, Pacific Herring-Georgia Basin DPS*, Pacific Sand Lance, Surf Smelt, Walleye Pollock-South Puget Sound, Pacific Lamprey, River Lamprey, Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit |
| **TEMPERATE PACIFIC INTERTIDAL MUDFLAT** | **BIRDS:** Bald Eagle, Marbled Godwit*, Peregrine Falcon, Purple Martin, Red Knot*, Western High Arctic Brant, Western Snowy Plover<br>**FISH:** Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU |

| Ecological System | SGCN with close* and general association |
|---|---|
| **ESTUARINE** | **MAMMALS:** Killer Whale, Sea Otter<br>**BIRDS:** Bald Eagle, Brown Pelican, Common Loon, Dusky Canada Goose*, Harlequin Duck, Marbled Murrelet, Peregrine Falcon, Red-necked Grebe, Surf Scoter*, Western Grebe, Western High Arctic Brant*, White-winged Scoter*<br>**FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark*, Pacific Herring-Georgia Basin DPS, Pacific Sand Lance, Surf Smelt, Eulachon-southern DPS, Pacific Lamprey, River Lamprey, Green Sturgeon-southern DPS, White sturgeon-Columbia River*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU*, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU*, Columbia River Chum Salmon ESU*, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Bull Trout-Coastal Recovery Unit |
| **NEARSHORE** | **MAMMALS:** Gray Whale, Humpback Whale, Killer Whale, Sea Otter<br>**BIRDS:** Bald Eagle, Barrow's Goldeneye, Brown Pelican, Clark's Grebe, Common Loon*, Dusky Canada Goose*, Harlequin Duck, Marbled Murrelet*, Peregrine Falcon, Red-necked Grebe, Surf Scoter*, Tufted Puffin, Western Grebe*, Western High Arctic Brant, White-winged Scoter*<br>**FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark*, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Canary Rockfish-Puget Sound/Georgia Basin DPS, Copper Rockfish*, Greenstriped Rockfish, Redstripe Rockfish, Tiger Rockfish, Quillback Rockfish, Yelloweye Rockfish-Puget Sound/Georgia Basin DPS, Pacific Cod-Salish Sea Population, Pacific Hake-Georgia Basin DPS, Pacific Herring-Georgia Basin DPS*, Pacific Sand Lance*, Surf Smelt*, Walleye Pollock-South Puget Sound, Eulachon-Southern DPS, Pacific Lamprey, River Lamprey, Green Sturgeon-Southern DPS, White Sturgeon-Columbia River*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU*, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Ozette Sockeye ESU, Bull Trout-Coastal Recovery Unit |

| Ecological System | SGCN with close* and general association |
|---|---|
| **OFFSHORE** | **MAMMALS:** Gray Whale, Humpback Whale, Killer Whale, Minke Whale, Sea Otter, **BIRDS:** Brown Pelican, Clark's Grebe, Common Loon*, Dusky Canada Goose*, Marbled Murrelet*, Peregrine Falcon, Red-necked Grebe*, Surf Scoter*, Tufted Puffin, Short-tailed Albatross, Western Grebe*, Western High Arctic Brant, White-winged Scoter* **FISH:** Bluntnose Sixgill Shark, Broadnose Sevengill Shark, Bocaccio-Puget Sound/Georgia Basin DPS, Brown Rockfish, Canary Rockfish-Puget Sound/Georgia Basin DPS, Copper Rockfish, Greenstriped Rockfish, Redstripe Rockfish, Tiger Rockfish, Quillback Rockfish, Yelloweye Rockfish-Puget Sound/Georgia Basin DPS, Pacific Cod-Salish Sea Population, Pacific Hake-Georgia Basin DPS, Pacific Herring-Georgia Basin DPS, Pacific Sand Lance, Surf Smelt, Walleye Pollock-South Puget Sound, Eulachon-southern DPS, Pacific Lamprey, Green Sturgeon-southern DPS, White Sturgeon-Columbia River, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Columbia River Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS, Ozette Sockeye ESU, Bull Trout-Coastal Recovery Unit |
| **OCEANIC** | **MAMMALS:** North Pacific Right Whale*, Blue Whale*, Fin Whale*, Gray Whale, Humpback Whale, Killer Whale, Minke Whale, Sei Whale*, Sperm Whale* **BIRDS:** Short-tailed Albatross*, Tufted Puffin **FISH:** Bluntnose Sixgill Shark*, Puget Sound Chinook Salmon ESU, Lower Columbia River Chinook Salmon ESU, Upper Columbia River Spring Chinook Salmon ESU, Snake River Spring/Summer Chinook Salmon ESU, Snake River Fall Chinook Salmon ESU, Lower Columbia Coho ESU, Hood Canal Summer Chum Salmon ESU, Puget Sound Steelhead DPS, Lower Columbia Steelhead DPS, Middle Columbia Steelhead DPS, Upper Columbia Steelhead DPS, Snake River Basin Steelhead DPS |

*SGCN is closely associated with this system

**Major Stressors**

Invasive species such as saltmarsh cordgrass (*Spartina alterniflora*) and the European Green Crab (*Carcinus maenas*), coastal development, overharvesting (fish and shellfish species), degraded water quality and climate change are all stressors which threaten the habitat values provided by these systems.

Degraded water quality resulting from land use practices have altered significant portions of the shallow marine systems and continue to alter remaining areas. The physical and chemical conditions of these habitats are degraded by the discharge of municipal, industrial, and agricultural effluents. The pollutants emitted by these sources have harmful impacts throughout marine food webs, but especially at the highest trophic levels. Invasions of non-native plants and animals pose significant long-term ecological and economic threats to this habitat.

Other threats include declining prey resources, for example forage fish for seabirds and Chinook Salmon for southern resident killer whales.

Sea level rise is the most significant climate change stressor for the salt and brackish marshes, leading to submergence of tidal salt marshes and declines in vegetation unless they are able to migrate inwards through sediment accretion. Nearshore and estuarine systems will also be affected by sea level rise, as well as impacts from increased wave height and intensity and increasing water temperatures. Oceanic systems are at risk from changing ocean chemistry and rising levels of acidification, which has already been affecting the viability of oysters and other shellfish in Puget Sound.

**Habitat needs for SGCN associated with marine systems**

| | |
|---|---|
| **Fish/invertebrate spawning grounds** | Many of these systems provide essential spawning habitat for forage fish and other species. |
| **High invertebrate diversity/abundance** | Invertebrates in mudflats are food for many of these species like Harlequin Duck and Marbled Godwit. |
| **High water quality** | Water must lack high levels of pollutants and have appropriate physiochemical attributes (temperature, salinity, etc.). |

**Actions needed to maintain habitat quality for SGCN**

- Invasive species control.
- Improvements to water quality, discharge from human development (variety of sources)
- Minimize risks from oil spills.
- Broad recovery of forage fish in the Salish Sea and outer coast would benefit a number of marine SGCN. In particular, development of appropriate land use planning that adequately protects spawning beaches for sand lance and surf smelt.
- Actions to reduce underwater anthropogenic noise would be beneficial for nearly all marine mammal SGCNs.

**Research and Data Needs**

- Areas used by life history stages and movements of juveniles before selection of adult habitat is poorly understood for many of our SGCN marine fishes, especially rockfish.
- Population, life history, and distribution information is needed for both shark species.
- Track and monitor evidence and effects of changing sea levels.

## 4.3 PUTTING IT ALL TOGETHER: PRIORITY LANDSCAPES INITIATIVE

The Priority Landscapes Initiative is a new effort intended to identify statewide priorities and provide a framework for place-based collaborative work aimed at preserving landscape conservation values throughout Washington State.

This initiative is one avenue by which the agency intends to link the conservation priorities identified for SGCN with those for our most important habitats and Ecological Systems of Concern and identify landscape level actions to benefit them. Products of the initiative will include the identification of specific geographies where landscape level conservation actions will have broad benefit across ecological systems and SGCN.

Between 2015 and 2017, WDFW intends to identify landscape level priorities statewide, and also to select two to four areas to be the near-term focus of efforts to promote collaborative conservation aimed at improving habitat conditions for wildlife.

### 4.3.1 Criteria for Priority Landscapes

The selection criteria is generally a combination of agency priorities for conservation (in part identified through the State Wildlife Action Plan), and an assessment of the readiness of local communities and constituents to engage in a place-based collaborative conservation. Specific criteria will likely include:

- Conservation benefit to SGCN/ecological systems of concern
- Priority for species recovery plans and/or a habitat connectivity priority
- Conservation partner priorities (including local governments, land trusts, conservation NGOs, federal and state partners, farming and forestry associations, tribes, etc.)
- Momentum, and political support and funding availability

Preliminary results indicate potential Priority Landscapes in marine/nearshore systems, urban/wild interface and in agriculture and forested landscapes. Our focus in the next phase of action is to develop a list of gaps (conservation needs that are still unmet in these landscapes) to focus on in the next 10 years.

### Distribution and Abundance

Distribution encompasses the world's oceans from the tropics to higher latitudes. Populations in the North Pacific are estimated to have once numbered 42,000-45,000 whales, but were reduced to estimated 13,000 to 18,700 animals during the whaling era. Fin Whales in Washington are part of the California/Oregon/Washington Stock, which was estimated to contain 3,044 whales in 2008. Stock trend is increasing or stable. Abundance off Washington and Oregon combined was estimated at 280 to 380 individuals from 1996 to 2001. Sightings and acoustic detections indicate this species is present off Oregon and Washington for most of the year. Observations of Fin Whales in the Salish Sea are very rare.

### Habitat

This species usually inhabits deep offshore waters and the outer slopes of continental shelves. Temperate and subpolar regions are preferred.

### References


Barlow, J. 2003. Preliminary estimates of the abundance of cetaceans along the U.S. west coast: 1991-2001. Administrative report LJ-03-03, Southwest Fisheries Science Center, La Jolla California.

Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p.

National Marine Fisheries Service (NMFS). 2010. Recovery plan for the fin whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, Maryland.

NOAA Fisheries Office of Protected Resources. http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/finwhale.htm


## Fin Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Overharvesting of biological resources | Ship strikes are a relatively important source of mortality and injury off the U.S. west coast. | Identify areas of greatest concern for ship strikes and work with the shipping industry to reduce this threat. | Current insufficient | External |
| 2 | Overharvesting of biological resources | Entanglement in fisheries gear (netting, pots, and traps) is a cause of mortality and injury off the U.S. west coast. | Determine ongoing sources of bycatch and manage those fisheries to reduce bycatch. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## GRAY WHALE (*Eschrichtius robustus*)

### Conservation Status and Concern

The eastern North Pacific stock of this whale has recovered from overharvest and has been stable for several decades. Status of a small group within this stock, the Pacific Coast Feeding Group, whose range includes Washington, requires further assessment.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Sensitive | Yes | G4 | SNA | Medium/stable | Low-moderate |

### Biology and Life History

Photo: RLeValley

The eastern North Pacific stock of this large baleen whale annually migrates 11,200 miles, roundtrip, between its summer range off Alaska and Siberia and its winter range off Mexico. Whales travel north from February to June and return south from October to January. Southward migration is more concentrated and closer to shore than its northward migration. Females are impregnated during southward migration or near the calving grounds. Gestation lasts about 13.5 months. A single calf is born in late December to early February. The calving interval is usually two years. Individuals become sexually mature at 5 to 11 years of age. Diet consists of small invertebrates obtained from the sea bottom in shallow waters.

### Distribution and Abundance

Year-round distribution of the Eastern North Pacific stock extends from the Bering and Chukchi seas southward to Baja California, Sonora, and Sinaloa in Mexico. A few individuals visit Puget Sound annually. Over the past several decades, stock numbers have recovered to levels near pre-whaling abundance. The most recent minimum population estimate is about 18,000 whales based on data from 2006 to 2007. Despite high levels of mortality in 1999 and 2000, the population has fluctuated around its average carrying capacity for the last 30 years. A small subpopulation, known as the Pacific Coast Feeding Group, numbers about 200 whales and summers between southeastern Alaska and northern California, including Washington. Recent genetic data suggest this group is somewhat distinct from the main stock, but that some interbreeding occurs between the two groups.

### Habitat

Gray Whales forage and migrate mostly in continental shelf and coastal waters. Young are born in lagoons and bays.

### References


Calambokidis, J., J.L. Laake and A. Klimek. 2012. Updated analysis of abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998-2010. Paper SC/M12/AWMP2 IWC Scientific Committee.

Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p.

Frasier, T. R., S. M. Koroscil, B. N. White, and J. D. Darling. 2011. Assessment of population substructure in relation to summer feeding ground use in the eastern North Pacific gray whale. Endangered Species Research 14:39-48.

Gray Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Better assessment of the status of the Pacific Coast Feeding Group is needed | Determine the status of the Pacific Coast Feeding Group in Washington waters. | Current insufficient | External |
| 2 | Resource information collection needs | Gray Whales regularly strand in Washington. | Necropsies of stranded individuals should continue to monitor causes of death, animal condition, and physical health of the stock | Current insufficient | Both |
| 4 | Energy development and distribution | Large oil spills could harm Gray Whale populations through negative impacts to health. | Minimize the risk of oil spills in Washington and elsewhere along the west coast of North America. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## HUMPBACK WHALE (*Megaptera novaeangliae*)

Conservation Status and Concern

Abundance of this species along the U.S. west coast, including Washington, has steadily grown in recent decades. Entanglements in fishing gear and ship strikes are relatively minor sources of mortality and injury.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | Yes | G4 | SNA | Low/increasing | Low-moderate |

Biology and Life History

Photo: R. LeValley

This large baleen whale is highly migratory, with most populations moving long distances from tropical and subtropical wintering areas to higher latitudes in the summer. Individuals show strong site fidelity to summering and wintering areas. Animals from multiple summering areas converge on common wintering areas. Most of the summer is spent feeding and accumulating fat deposits. Prey mainly include small schooling fishes and krill, which are caught at the surface or while submerged. Humpback Whales bear young and mate at wintering grounds, but do not feed. Mating behavior includes aggressive displays and long vocalizations known as singing. Gestation lasts 11 to 12 months. Most adult females bear a calf every two to three years. Humpback whales travel alone or in small groups of up to 10 to 15 whales. Most humpbacks occur off Washington from July to September.

## Distribution and Abundance

Distribution encompasses the world's oceans from the tropics to higher latitudes. Numbers in the North Pacific increased from about 1,200 to 1,400 whales in 1966 (following severe overharvest) to about 21,000 whales by 2004 to 2006. Humpback whales feeding along the U.S. west coast belong to the California/Oregon/Washington Stock, which is comprised of a California/Oregon feeding group and a Washington/southern British Columbia feeding group. This stock mainly winters in coastal areas off Mexico and Central America, although some members from the Washington/southern British Columbia feeding group winter in Hawaii. The stock has a long-term growth rate of about 7.5 percent per year and held an estimated 1,918 whales in 2007 to 2008, including about 189 whales in the Washington/southern British Columbia feeding group. Humpback Whales were common in the Salish Sea until the early 1900s, but were decimated by hunting and remain rare visitors.

## Habitat

Habitat includes the open ocean and coastal waters, with inshore areas such as bays sometimes used. Feeding grounds are usually located in cold, productive coastal waters. Calving areas occur in shallow waters near coasts or islands.

### References


Barlow, J., J. Calambokidis, E. A. Falcone, C. S. Baker, et al. 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science 27:793–818.

Calambokidis, J., E. Falcone, A. Douglas, L. Schlender, and J. Huggins. 2009. Photographic identification of humpback and blue whales off the U.S. west coast: results and updated abundance estimates from 2008 field season. Final Report for Contract AB133F08SE2786 for the Southwest Fisheries Science Center, La Jolla, California.


## Humpback Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Overharvesting of biological resources | Entanglement in fisheries gear (netting, pots, traps) remains a cause of mortality and injury to Humpback Whales off the U.S. west coast. | Determine ongoing sources of bycatch and manage those fisheries to reduce bycatch | Current insufficient | External |
| 2 | Overharvesting of biological resources | Ship strikes are another source of mortality and injury. | Identify areas of greatest concern for ship strikes and work with the shipping industry to reduce this threat. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## KILLER WHALE (*Orcinus orca*)

### Conservation Status and Concern

Of the three main populations occurring in Washington, southern resident Killer Whales have shown an overall decline since 1995, whereas transient and offshore populations are currently not of conservation concern. The reduced availability of depleted Chinook salmon populations has limited the population's productivity. High levels of chemical contaminants, noise and disturbance from vessels and other human activities, as well as large oil spills all have the potential to negatively impact the health and status of the population.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered (southern residents only) | Endangered | Yes | G4G5 | S1S2 | Low/declining (southern residents); Moderate/unknown (transients and offshores) | Southern residents: Moderate-high Transient/offshore Low-moderate |

### Biology and Life History


Photo: NOAA

Three populations of Killer Whales, known as the southern residents, transients, and offshores, regularly occur in Washington. The southern resident population is comprised of three highly stable social groups (J, K, and pods) and commonly inhabits waters around the San Juan Islands and the eastern Strait of Juan de Fuca from late spring to fall. Most of the rest of the year is spent along the outer coast. This population feeds primarily on Chinook salmon, chum salmon to a lesser extent, and occasionally other fish. Transient animals are part of a single population ranging from southeastern Alaska to California that feeds on seals and other marine mammals. Offshore Killer Whales are much less studied, but also form one population extending from southeastern Alaska to California. These whales usually occur more than nine miles off the outer coast and feed primarily on sharks and other fish. All Killer Whales become sexually mature at about 12 to 16 years of age. Females become reproductively senescent when 35 to 45 years old. Estimated maximum lifespan is 80 to 90 years in females and 50 to 60 years in males. Calving interval is about three to eight years.

### Distribution and Abundance

Killer Whales are distributed nearly worldwide. In Washington, they occur in nearly all of the state's marine waters. The southern resident population has shown an overall declining trend since 1995, falling from 98 whales to 81 whales in March 2015. Minimum estimates of transient and offshore populations are 243 and 240 whales, respectively, but only small portions of both populations normally occur in Washington at any one time. Trend information does not exist for these populations.

### Habitat

Pelagic and coastal waters are occupied. Southern resident and transient Killer Whales spend more time in coastal areas (including inland marine waters), where their preferred prey is typically found.

References

Allen, B. M., and R. P. Angliss. 2014. Alaska marine mammal stock assessments, 2013. NOAA Technical Memorandum NMFS-AFSC-277, Alaska Fisheries Science Center, Seattle, Washington.

Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p

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Orca Network. 2015. http://www.orcanetwork.org/Main/index.php?categories_file=Births%20and%20Deaths

Wiles, G. J. 2004. Washington state status report for the killer whale. Washington Department of Fish and Wildlife, Olympia, Washington.

## Killer Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Overharvesting of biological resources | Depleted populations of Chinook salmon reduce prey availability for the southern residents, thereby limiting the population's productivity. | Rebuild depleted populations of Chinook salmon through multiple restoration activities, including management of habitat, harvest, hydropower, and hatcheries. | Current insufficient | Both |
| 2 | Outreach needs | Noise and disturbance from vessels and other human activities has the potential to disrupt foraging and other behavior by the southern resident population. | Minimize disturbance from vessels by continued evaluation and enforcement of regulations and guidelines protecting Killer Whales from vessel noise and disturbance. | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | High levels of chemical contaminants continue to exist in southern resident whales and may be causing health impacts. | Minimize pollution levels in aquatic habitats. | Current insufficient | External |
| 4 | Energy development and distribution | Large oil spills could harm Killer Whale populations through negative impacts to health. | Minimize the risk of oil spills in Washington and elsewhere along the west coast of North America. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# MINKE WHALE (*Balaenoptera acutorostrata*)

## Conservation Status and Concern

The stock along the U.S. west coast, including Washington, is estimated at about 500 whales, with trend unknown. Ship strikes and fisheries entanglements may hinder population growth.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | SNA | Low/unknown | Low-moderate |

## Biology and Life History


Photo: NOAA

This small baleen whale is usually solitary or found in groups of two to three individuals, but occasionally forms larger loose aggregations with many animals at favored feeding locations. Some populations migrate between higher latitude waters in summer and lower latitude waters in winter, while others maintain home ranges and are not migratory. Adults tend to migrate farther than immatures. Gestation lasts 10 to 11 months. In the northern hemisphere, single calves are born from November-March. Young are weaned by four to six months of age; calving occurs every one to four years. Age of sexual maturity is usually six to eight years. Lifespan is estimated to reach 50 years. Diet consists mainly of small schooling forage fishes and krill.

## Distribution and Abundance

Minke Whales are found throughout the world's oceans in tropical, temperate, and subpolar waters. Global population size is unknown, but the species is relatively common overall. Minke Whales are rare along the U.S. west coast and belong to the California/Oregon/Washington Stock. Although this stock was never commercially harvested, it is estimated to total only about 478 whales based on surveys conducted in 2005 and 2008. Stock trend is not known. The stock is non-migratory. A few members of the stock reside in Washington's inner marine waters for part of the year.

## Habitat

Both coastal and pelagic waters are occupied. Important habitat features may include water temperature, depth, and underwater topography.

### References


Anderwald, P., P. G. H. Evans, R. Dyer, A. Dale, P. J. Wright, and A. R. Hoelzel. 2012. Spatial scale and environmental determinants in minke whale habitat use and foraging. Marine Ecology Progress Series 450:259-274.

Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p.

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Reilly, S.B., J. L. Bannister, P. B. Best, M. Brown. 2008. *Balaenoptera acutorostrata*. The IUCN Red List of Threatened Species. Version 2014.2. http://www.iucnredlist.org/details/full/2474/0

Minke Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Improve assessment of occurrence and threats in Washington. | Expand efforts to document the species in Washington waters. | Current insufficient | External |

## NORTH PACIFIC RIGHT WHALE (*Eubalaena japonica*)

Conservation Status and Concern

The stock along western North America, including Washington, is critically endangered, with trend unknown. Threats to the stock are poorly known.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | No | G1 | SNA | Critical/unknown | Moderate |

Biology and Life History

Photo: NOAA

A large slow-swimming baleen whale, North Pacific Right Whales migrate between higher latitudes during spring and summer and lower latitudes in winter. Females become sexually mature at 9 to 10 years of age. Calving occurs in coastal waters during winter and may occur every three to five years based on calving rates of similar species. Weaning takes place at about one year of age. The species feeds from spring to fall and also during parts of the winter. Diet consists of zooplankton, especially copepods. North Pacific Right Whales feed by swimming continuously with their mouths open and filtering prey against their baleen, a behavior known as skimming.

Distribution and Abundance

Distribution is restricted to the Pacific Ocean between 20° and 60°N latitude, with most remaining individuals concentrating in the northwestern Pacific and Bering Sea. Winter distribution is poorly known. The species was severely depleted by whaling and it is now one of the rarest of all marine mammals, with a total population of perhaps only a few hundred animals. Trend in abundance is unknown, but the population has failed to increase significantly following protection. Individuals in the northeastern Pacific, including Washington, belong to the Eastern North Pacific Stock. Size of this stock probably numbers below 50 whales. Stock trend is unknown, but sightings of calves are rare. The last record of a North Pacific Right Whale off Washington was in 1992. At least seven confirmed records off British Columbia, Oregon, California, and Mexico since 1994 suggest that the species still rarely visits Washington.

Habitat

The species mainly inhabits coastal and continental shelf waters, but is sometimes found in deep waters. Occurrence is often strongly linked to areas of high prey abundance.

References
Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p.

NMFS 2013. Final recovery plan for the North Pacific right whale (Eubalaena japonica). National Marine Fisheries Service, Silver Spring, Maryland.

Scarff, J. 2013. Records of North Pacific right whales along the coasts of California, Baja, Oregon and Washington. http://www.sfcelticmusic.com/js/RTWHALES/WestCoast_sightings.htm

Thomas, P. 2014. 'Astonishing' North Pacific right whale sighting only in second in 62 years off British Columbia. http://www.grindtv.com/outdoor/nature/post/astonishing-north-pacific-right-whale-sighting-is-only-the-second-in-62-years-off-british-columbia/

## North Pacific Right Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Document sightings in Washington and identify potential threats in state waters. | Expand efforts to document the species in Washington waters. | Current insufficient | External |

## SEA OTTER (*Enhydra lutris kenyoni*)

### Conservation Status and Concern

Washington's population of Sea Otters has shown steady growth to almost 1,600 animals since its reintroduction in 1969 and 1970. Oil spills are the greatest potential threat to the population.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G4T2T3 | S2S3 | Low/increasing | Low-moderate |

### Biology and Life History


Photo: R. LeValley

The Sea Otter is the smallest of the marine mammals and the largest member of the weasel family (Mustelidae). It is a carnivore and feeds on urchins, crabs, clams, mussels, snails and chitons. It uses rocks to break the shells and exoskeletons of its prey and expose the edible interior of these species. Predation by Sea Otters on urchins has been found to maintain stability within marine invertebrate communities; the species is considered a keystone species because of this effect. The dense fur of the Sea Otter made its pelt extremely valuable to fur traders, which led to overexploitation of the species in the 1700s and 1800s. Otter mortality can result from oil spills and incidental capture in nets and traps set for fish, shell fish, and crabs.

### Distribution and Abundance

The Sea Otter is found only in the northern Pacific Ocean. In Washington it is limited in distribution to the marine waters from just south of Destruction Island north to Cape Flattery, and east to Pillar Point in the Strait of Juan de Fuca. The Washington population had increased steadily from 59 individuals reintroduced in 1969 to 1970 to almost 1,600 otters in 2014.

## Habitat

Sea Otters are commonly found in rocky marine habitats and kelp beds within 1.2 miles of the coast. Females tend to use habitats closer to the shore than males. In rough weather, otters take refuge among kelp, or in coves and inlets.


References

Bodkin, J. L. 2003. Sea otter. Pp 735-743 in G.A. Feldhamer, B.C. Thompson and J.A. Chapman, editors. Wild mammals of North America: biology, management and conservation, 2nd edition. Johns Hopkins University Press, Baltimore, Maryland.

Laidre, K. L., R. J. Jameson, E. Gurarie, S. J. Jeffries, and H. Allen. 2009. Spatial habitat use patterns of sea otters in coastal Washington. Journal of Mammalogy 90:906-917.

Lance, M.M., S.A. Richardson, and H.L. Allen. 2004. Washington state recovery plan for the sea otter. Washington Department of Fish and Wildlife, Olympia, Washington.


## Sea Otter: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Energy development and distribution | Oil spills are potentially a major source of mortality and habitat loss and degradation. | Prevention of oil spills and responses to spills should remain a management priority. | Current insufficient | External |
| 2 | Fish and wildlife habitat loss or degradation | The population is vulnerable because of its limited distribution and size. | Continue current surveys to assess population trends and range expansion. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SEI WHALE (Balaenoptera borealis)

### Conservation Status and Concern

The stock along the U.S. west coast, which includes Washington, is quite small at about 125 whales, with trend unknown. Threats to the stock are poorly understood.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | No | G3 | SNA | Critical/unknown | Low-moderate |

### Biology and Life History


Photo: NOAA

This large baleen whale is the fastest swimming whale. The species usually travels alone or in groups of two to five, but occasionally forms loose gatherings of 30 to 50 animals on productive feeding grounds. Movement patterns are not well known, but many animals are thought to migrate between lower latitude wintering grounds and higher latitude feeding grounds in the summer. A single calf is born in winter (from September to March) after a gestation period of 11 to 13 months. Calving interval among females is two to three years. The species reaches sexual maturity at 6 to 12 years. Sei Whales are flexible in their prey selection and feed on copepods, krill, squid, and small schooling fishes (e.g., anchovies, saury, and mackerel). Foraging methods include both skim feeding at the surface and gulp feeding below the surface.

### Distribution and Abundance

Subtropical, temperate, and subpolar water are occupied worldwide, although overall distribution is not well understood. The current global population is estimated at 80,000 animals. Sei Whales along the west coast of North America, including Washington, are part of the Eastern North Pacific Stock, which extends west to 180° longitude. No population estimates or trend data are available for the full stock. Animals are rarely recorded off the U.S. west coast, with only nine confirmed sightings made in California, Oregon, and Washington waters during extensive ship and aerial surveys from 1991-2008. The most recent estimate of abundance for California, Oregon, and Washington waters out to 300 nautical miles was 126 whales from 2005 to 2008. Population trend for this area is unknown.

### Habitat

This species generally occurs along the edges of continental shelves and in deeper oceans, especially where ocean fronts and eddies exist. Temperate waters may be preferred.

### References


Carretta, J.V., E. Oleson, D.W. Weller, A.R. Lang, K.A. Forney, J. Baker, B. Hanson, K. Martien, M.M. Muto, A.J. Orr, H. Huber, M.S. Lowry, J. Barlow, D. Lynch, L. Carswell, R.L. Brownell Jr., and D.K. Mattila. 2014. U.S. Pacific Marine Mammal Stock Assessments: 2013. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC-532. 406 p.

NMFS. 2011. Final recovery plan for the sei whale (*Balaenoptera borealis*). National Marine Fisheries Service, Silver Spring, Maryland.

NOAA Fisheries Office of Protected Resources. http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/seiwhale.htm

Sei Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Improve assessment of occurrence and threats in Washington. | Expand efforts to document the species in Washington's waters. | Current insufficient | External |

## SPERM WHALE (*Physeter macrocephalus*)

### Conservation Status and Concern

The stock along the U.S. west coast, that includes Washington, numbers no more than several thousand whales, with trend probably stable. Fisheries entanglements are a relatively minor source of mortality and injury.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | Yes | G3G4 | SNA | Low/stable | Low-moderate |

### Biology and Life History

Photo: Wikimedia Commons

Sperm Whales are large toothed whales. Adult females, calves, and juveniles form groups of usually 20 to 40 animals. As males grow older, they join bachelor schools that can hold up to 50 whales, but eventually become solitary. Sperm Whales do not undertake predictable seasonal migrations, although there is a general trend among animals at mid-latitudes to move poleward during summer and return during winter. Single calves are produced every three to six years. Births occur in warmer regions, with those in the northern hemisphere taking place in May to September. Females reach sexual maturity at 7 to 11 years, whereas males may not breed until age 25. The species can dive beyond depths of 5900 feet when foraging. Diet is primarily composed of medium to large squid, sharks, skates, and other fish.

### Distribution and Abundance

Distribution encompasses the world's oceans from the tropics to higher latitudes. Females are generally found in warmer waters (greater than 60°F) at latitudes lower than 40°, but may occur to 50° latitude in the North Pacific. Adult males spend much of their time in colder waters near pack ice, but occasionally return to warmer regions to breed. Global population sizes are not accurately known. Most Sperm Whales in Washington belong to the California/Oregon/Washington Stock. The most recent estimate of stock size is 2,431 whales based on ship surveys made in 2008; trend was probably stable from 1991 to 2008. Sperm Whales are present in deeper waters off Washington in all seasons except winter. Members from another stock, the North Pacific Stock which inhabits Alaska, are also known to move through Washington's waters. Numbers for the entire eastern temperate North Pacific were last estimated at 26,300 to 32,100 whales in 1997.

Habitat

The species generally prefers deep water, but is sometimes found in shallower continental shelf waters. Densities are usually highest near productive waters, including near steep drop-offs or strong oceanographic features such as the edges of continental shelves, near offshore banks, and submarine trenches and canyons.

References

Moore, J. E. and J. P. Barlow. 2014. Improved abundance and trend estimates for sperm whales in the eastern North Pacific from Bayesian hierarchical modeling. Endangered Species Research 25:141-150.

NOAA Fisheries Office of Protected Resources. http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/spermwhale.htm

Straley, J. M., G. S. Schorr, A. M. Thode, J. Calambokidis, C. R. Lunsford, E. M. Chinoweth, V. M. O'Connell, and R. D. Andrews. 2014. Depredating sperm whales in the Gulf of Alaska: local habitat use and long distance movements across putative population boundaries. Endangered Species Research 24:125-145.

Sperm Whale: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Overharvesting of biological resources | Entanglement in fisheries gear (netting, pots, and traps) is a cause of mortality and injury off the U.S. west coast. | Determine ongoing sources of bycatch and manage those fisheries to reduce bycatch. | Current insufficient | External |

# UNGULATES

## BIGHORN SHEEP (*Ovis canadensis*)

### Conservation Status and Concern
Although a game species and sustainably hunted, Bighorn Sheep remain a conservation reliant species. Bighorns currently occupy approximately 15 to 20 percent of their historical habitat in Washington, and connectivity among individual herds is difficult to establish. Bighorns are susceptible to pneumonia caused by bacteria routinely carried by domestic sheep and goats.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G4 | S2S3 | Low/variable | Moderate |

### Biology and Life History

Photo: J. Cummins

This species is gregarious, but for most of the year adult males live apart from females and young. In the mating season, mature males generally dominate younger males and battle over access to females through vigorous head butting contests, but during most of the rest of the year they live amiably in small bands apart from the females. The timing the mating season is generally November in Washington. Lambing generally peaks in April into May in Washington. Females typically bear one lamb. Females first breed usually in their third year. Diet is diverse and variable. Bighorn Sheep are primarily grazers of grass and forbs, but the diet can also include significant amounts of shrubs. Their diet changes seasonally. Access to mineral licks may be important for the Rocky Mountain Bighorn Sheep (subspecies *O. canadensis canadensis*), especially in spring.

### Distribution and Abundance
Bighorn Sheep in Washington number approximately 1,330 individuals distributed in 17 identified herds, exclusive of those managed by tribal governments. The herds are distributed throughout eastern Washington except for the Columbia Plateau. As of early 2014, herds vary from as few as 21 to as many as 240 sheep. Populations are considered to be approximately stable in seven herds, increasing in four herds and declining in six herds.

### Habitat
Bighorn Sheep occur in mesic to xeric, alpine to desert grasslands or shrub-steppe in mountains, foothills, or river canyons. Many of these grasslands are fire maintained. Suitable escape terrain (cliffs, talus slopes, etc.) is an important feature of the habitat. Distribution is correlated with low precipitation levels, especially in winter and spring. Elevation varies considerably, both geographically and seasonally, in Washington from as low as 200 feet to over 6500 feet

### References

WDFW. 2014. Game management plan, July 2015-June 2021. Washington Department of Fish and Wildlife, Olympia, Washington.

Bighorn Sheep: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species | Introduction of pneumonia into wild Bighorn Sheep from domestic sheep and goats can eliminate Bighorn Sheep herds. | Reduce to the degree feasible the probability of contact between bighorn sheep and domestic sheep and goats in all bighorn herds as well as in areas identified for repatriation of bighorn sheep. | Current insufficient | Both |
| 2 | Resource information collection needs | Individual Bighorn Sheep herds are small and thus susceptible to deleterious effects of genetic drift and inbreeding. Exploratory movements that would normally provide Bighorn Sheep with opportunities for genetic exchange are limited now because human development, fire suppression, or natural lack of escape terrain renders these populations isolated. | Evaluate and prioritize the need for genetic rescue/augmentation of small isolated populations, find and procure source animals that are not closely related to target populations, and implement and monitor translocations. | Currently insufficient | Both |
| 3 | Management decision needs | Habitat succession and fire suppression. | On WDFW lands, continue prescribed burns where appropriate and feasible; encourage federal land managers to restore the natural role of fire where possible. | Currently insufficient | Both |
| 4 | Invasive and other problematic species | Predators, particularly Cougars, occasionally become specialists on Bighorn Sheep. Because Bighorn Sheep live in small,isolated, and predictable habitats, individual predators can occasionally cause declines and threaten persistence of entire herds. | Where excessive predation is suspected to be an important limiting factor, consider removing individual predators that specialize on Bighorn Sheep, or consider augmentations to allow imperiled herds to grow beyond the point where isolated predators are limiting. | Currently insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COLUMBIAN WHITE-TAILED DEER – COLUMBIA RIVER DPS (*Odocoileus virginianus leucurus*)

*See Appendix B for a potential range and habitat distribution map

### Conservation Status and Concern

This subspecies exists in small, isolated populations, rendering it vulnerable to such factors as disease and stochastic events. Continued habitat degradation will impede recovery by further fragmentation of existing habitat and loss of areas for future range expansion. In addition, this species has the potential to be greatly affected by climate change due to sea level rise that will reduce island and lowland coastal habitats. Periodic major flood events have already been shown to impact survival of all age classes. Coyote predation has been a significant cause of mortality among fawns in Washington. Vehicle collisions are another source of mortality, especially for newly translocated deer.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | Yes | G5T2Q | S1 | Low/stable | Moderate-high |

### Biology and Life History


Photo: J.V. Higbee

The Columbian White-tailed Deer is the westernmost subspecies of White-tailed Deer. Diet consists of grasses, forbs, and browse. The deer are sedentary year-round, with home ranges averaging 475 acres for males and 395 acres for females. Rutting activities peak in November. Fawns are born during the summer months, and peak in June.

### Distribution and Abundance

Historically, Columbian White-tailed Deer were distributed throughout the lowlands of southwestern Washington and western Oregon, but now remain in two geographically isolated populations: Douglas County, Oregon, and along the lower Columbia River. The latter population, known as the Columbia River Distinct Population Segment (DPS), is found on islands in the Columbia River and adjacent areas of Clark, Cowlitz, and Wahkiakum Counties, Washington, and Clatsop, Columbia, and Multnomah Counties, Oregon. The DPS has experienced a roughly stable trend since the mid-1990s. Puget Island (Washington), Wallace Island (Oregon), and the Oregon mainland near Westport support two of the largest and more stable subpopulations (each about 150 to 200 deer in 2011). Deer were translocated to Ridgefield National Wildlife Refuge from 2013 to 2015 to establish a subpopulation there. As of January 2014, the entire Columbia River DPS totaled about 600 deer.

### Habitat

Columbian White-tailed Deer are strongly associated with riparian habitat. They inhabit riparian forest, brushland, and pasture on islands and within the floodplain of the lower Columbia River. Forested swamps with tall shrubs and Sitka spruce, red-osier dogwood, red alder, black cottonwood, and willow characterize the native vegetation of this area.

### References


USFWS 2015. http://www.fws.gov/refuge/julia_butler_hansen/conservation/columbian_white_tailed_deer_recovery.html

USFWS. 2014. Final environmental assessment: proposed translocation of Columbian white-tailed deer from Puget Island to Ridgefield National Wildlife Refuge and Julia Butler Hansen Refuge. U.S. Fish and Wildlife Service, Cathlamet, Washington.
USFWS. 2013. Columbia River distinct population segment of the Columbian white-tailed deer (*Odocoileus virginianus leucurus*). Five-year review: summary and evaluation. U.S. Fish and Wildlife Service, Lacey, Washington.

## Columbian White-tailed Deer: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Populations are isolated due to historical harvest and habitat loss and fragmentation. | Continue conducting translocations and population augmentations. | Current sufficient | Both |
| 2 | Management decision needs | Significant flooding events can and have had impacts on subpopulations. | Build and maintain water control structures on refuges, as needed, to manage water levels in sloughs and marshes. Consider construction of high-water refugia. | Current insufficient | External |
| 3 | Management decision needs | Suitable natural habitat is unstable and limited. | Manage vegetation to maintain/expand a mosaic of marshes, woodlands and grasslands. | Current insufficient | Both |
| 4 | Resource information collection needs | Suitable natural habitat is unstable and limited. There is a need to search for suitable habitat beyond what is currently occupied. | Identify high quality upland habitat in areas that might support deer populations regardless of land ownership. | Current insufficient | Both |
| 5 | Invasive and other problematic species | Coyote predation causes high fawn mortality and has a disproportionate effect on small subpopulations. | Continue efforts to control Coyotes. | Current sufficient | External |
| 6 | Invasive and other problematic species | Invasive plants erode utility of habitats. | Implement efforts to control invasive plants. | Current insufficient | Both |
| 7 | Resource information collection needs | Recovery goals for population size and distribution may no longer be adequate to achieve recovery. | Conduct a population and habitat viability analysis (PHVA) of the DPS to address adequacy of current recovery priorities and activities. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WOODLAND CARIBOU (*Rangifer tarandus*)

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

The South Selkirk Woodland Caribou population has been adversely affected by predation and habitat change. The core range for this population, which overlaps into Washington, is in British Columbia. The population is at a perilously low level with recent annual calf mortality recorded at 40 to 70 percent mainly due to predation, severe weather, and malnutrition.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | Yes | G5T4 | S1 | Critical/declining | High |

### Biology and Life History

Photo: J. Adams

The Woodland Caribou that overlap into Washington belong to the South Selkirk population and are a unique ecotype of caribou distinguished from other Woodland Caribou by a diet of almost exclusively arboreal lichens during the coldest six months of the year. This trait allows them to inhabit the deep snow areas in the Selkirk Mountains above 4,000 feet, and these are often referred to as "mountain caribou." At other times of the year, diet consists largely of dried grasses, sedges, huckleberry leaves, willow and dwarf birch tips, and arboreal lichens. Woodland Caribou form relatively small groups. Herd size ranges from single females durir calving up to about 25 animals during late winter; small groups of two to five animals are typical during spring and summer. Most Woodland Caribou move to lower elevations in early winter and re-ascend in late winter. In spring, they again descend to lower elevations, and then in summer move back up to the mountains as the snowpack disappears.

### Distribution and Abundance

The South Selkirk population is restricted to southeastern British Columbia, northern Idaho, and northeastern Washington. The population has declined from an estimated 46 caribou in 2009 to 18 animals in 2014. Woodland Caribou were observed only in British Columbia during the March 2014 survey. In December 2014, a radio-collared individual was detected in the far northern Selkirk Mountains in Washington.

### Habitat

South Selkirk Woodland Caribou inhabit rugged mountainous regions with old-growth forests of Engelmann spruce/subalpine fir and western red cedar/western hemlock that are generally more than 100 to 150 years old. These forests support abundant arboreal lichens on which caribou forage. Tracts of old-growth spruce and western red cedar/western hemlock on moderate slopes are critical early-winter habitats. Young are born typically in severe isolated sites on high ridges.

References
USFWS. 1994. Recovery plan for Woodland Caribou in the Selkirk Mountains. U.S. Fish and Wildlife Service, Portland, Oregon.
WDFW. 2013. Threatened and endangered wildlife in Washington: 2012 annual report. Washington Department of Fish and Wildlife, Olympia, Washington

## Woodland Caribou: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Small population size | Genetic and demographic effects of small population size. | Consider measures to increase population size, including translocations, captive breeding, and shepherding. | Current insufficient | External |
| 2 | Management decisions | Predation by Cougars and Gray Wolves may result in mortality levels that are unsustainable for the very small population | Removal of individual Cougars and Gray Wolves may be needed to reduce predation levels. | Current sufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Highway mortality, especially in British Columbia. | Take steps to reduce highway collisions with vehicles, including increased signage to warn motorists, speed limit restrictions, and possible construction of highway underpasses. | Current insufficient | External |
| 4 | Fish and wildlife habitat loss or degradation | Human disturbance, including snowmobiles. | Maintain road closures and restrictions on snowmobile use in areas inhabited by Woodland Caribou. | Current insufficient | External |
| 5 | Fish and wildlife habitat loss or degradation | Loss and degradation of mature forest eliminates Woodland Caribou habitat. | Protect mature forest from harvest and road building, especially those areas important for calving. Presence of mature forest may also help reduce predation by Cougars and Gray Wolves and competition with White tailed Deer and Elk. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

# REFERENCES

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## Conservation Status Table

Federal Status
Refers to legal designations under the Federal ESA (listed as Endangered, Threatened or recognized as a Candidate species for listing), or designated as a Sensitive species.

State Status
The Washington Fish and Wildlife Commission has classified 46 species as Endangered, Threatened or Sensitive, under WAC 232-12-014 and WAC 232-12-011. Species can also be designated Candidate Species for state listing by WDFW policy.

PHS (Priority Habitats and Species Program)
A species listed under the PHS program is considered to be a priority for conservation and management and requires protective measures for survival due to population status, sensitivity to habitat alteration and/or tribal, recreational or commercial importance. Management recommendations have been developed for PHS species and habitats, and can assist landowners, managers and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife.

- Global (G) and State (S) Rankings: Refers to NatureServe status rankings provided by the Natural Heritage Program. These conservation status ranks complement legal status designations and are based on a one to five scale, ranging from critically imperiled (1) to demonstrably secure (5). The global (G) and state (S) geographic scales were used for the SGCN species fact sheets. For more on the methodology used for these assessments, please see: Methodology for Assigning Ranks - NatureServe

State Rank: characterizes the relative rarity or endangerment within the state of Washington.
S1= Critically imperiled
S2= Imperiled
S3= Rare or uncommon in the state – vulnerable
S4= Widespread, abundant, and apparently secure i
S5= Demonstrably widespread, abundant, and secure in the State
SA= Accidental in the state.
SE= An exotic species that has become established in the state.
SH= Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist in the state.
SNR or S?= Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
SP= Potential for occurrence of the taxon in the state but no occurrences have been documented.
SR= Reported in the state but without persuasive documentation which would provide a basis for either accepting or rejecting the report (e.g., misidentified specimen).
SRF= Reported falsely in the state but the error persists in the literature.
SU= Unrankable. Possibly in peril in the state, but status is uncertain. More information is need.
SX= Believed to be extirpated from the state with little likelihood that it will be rediscovered.
SZ= Not of conservation concern in the state.

Qualifiers are sometimes used in conjunction with the State Ranks described above:
B - Rank of the breeding population in the state.
N - Rank of the non-breeding population in the state.

Global Rank: characterizes the relative rarity or endangerment of the element world-wide.
G1= Critically imperiled globally
G2= Imperiled globally
G3= Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range-vulnerable
G4= Widespread, abundant, and apparently secure globally
G5= Demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range
GH= Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist somewhere in its former range.
GNR or G?= Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
GU= Unrankable. Possibly in peril range-wide but status uncertain. More information is needed.
GX= Believed to be extinct and there is little likelihood that it will be rediscovered.

Qualifiers are used in conjunction with the Global Ranks described above:
Tn Where n is a number or letter similar to those for Gn ranks, above, but indicating subspecies or variety rank. For example, G3TH indicates a species that is ranked G3 with its subspecies ranked as historic.

1. Key Conservation Threats (Stressor) and Actions Table

The "Level of Investment" column is meant to be a coarse assessment of whether the action referenced is sufficient (stay the course), insufficient (invest more resources when available), or "new action needed" (nothing is currently underway and new action needs to be initiated).

The "Lead" column refers to whether WDFW has the lead for that particular action (WDFW), or whether external conservation partners have the lead (external), or whether WDFW shares the lead with one or more organizations (Both).

## SECTION C: Full List of References


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State Wildlife Action Plan Update

# Appendix A-2

## Species of Greatest Conservation Need

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Washington Department of Fish and Wildlife
2015

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# What is Included in Appendix A-2

**Introduction**
Appendix A-2 is one component of the State Wildlife Action Plan (SWAP) Update, and contains information about birds included in our Species of Greatest Conservation Need (SGCN) list for 2015. Included are fact sheets for each of the birds identified as Species of Greatest Conservation Need in the 2015 SWAP. The information provided includes a summary of the conservation concern and conservation status, description distribution and habitat, climate change sensitivity and an overview of key threats and conservation actions needed.

**What it means to be an SGCN**
The SGCN list includes both birds that have some form of legal protection status and those which may be in decline, but are not yet listed as part of either the Federal or State Endangered Species program. One of the purposes of the SWAP is to direct conservation attention to species and habitats *before* they become imperiled and recovery becomes more difficult and costly. Presence on this list does not necessarily mean that conservation attention will be directed towards these species; rather, that conservation actions for the species are *eligible* for State Wildlife Grants funding, and may be more competitive for other grant programs. It also raises the profile of a species to a wide audience of conservation partners and may encourage other organizations to initiate projects that may benefit the species.

**Climate Vulnerability**
Please see Chapter 5 for an explanation of the methodology used to assess climate vulnerability. For a full list of all the SGCN ranks, including a narrative description of sensitivity and references, please see Appendix C.

**Explanation of terms used in the document**
Please see Section B (page 117) for a description of terms and abbreviations used in this document.

**Alphabetical List of Species**
For an alphabetical list of all the birds included, please see Section A (page 116).

**References**
References are provided separately with each fact sheet, and also collectively for all SGCN birds in the REFERENCES section at the end of this document.

# WATERFOWL

## BARROW'S GOLDENEYE (*Bucephala islandica*)

**Conservation Status and Concern**

This sea duck species breeds in Washington, has low population numbers and has been declining in Puget Sound. Sources of impacts have not been clearly identified. Increasing development in the Puget Sound region has led to more disturbance, pollution, and degradation of foraging areas used by sea ducks. Some aquaculture practices may impact foraging areas through exclusion of sea ducks. Forest management activities may remove older trees and snags that provide most nest cavities and may increase predation at remaining cavities.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3B,S4N | Low/declining | Moderate-high |

**Biology and Life History**

Photo: R. LeValley

Like other sea ducks, Barrow's Goldeneye adults are more site-faithful to use areas, breed at an older age, and have lower recruitment compared to other waterfowl. WDFW surveys in 2010 on Puget Sound recorded only 9.7 percent juveniles in the population. Both male and female Barrow's Goldeneyes are territorial during the breeding season. Females nest in tree cavities, including those excavated by Pileated Woodpeckers, or in artificial nest boxes. Availability of suitable cavity nest sites may affect population size. Animal matter can comprise over 75 percent of the diets of breeding Barrow's Goldeneyes, including aquatic insects, mollusks, crustaceans, and small fish. During winter they feed in shallow water, primarily on mussels but also clams, crustaceans, and fish eggs. Most wintering birds depart for breeding areas from mid-March to early April.

**Distribution and Abundance**

The breeding population of Barrow's Goldeneye is thought to be widespread within the Cascades and between Okanogan and Pend Oreille Counties. A unique population nests in cavities within the talus slopes and basalt cliffs surrounding Lake Lenore and Alkali Lake in central Washington. Approximately 22 percent of goldeneyes on Puget Sound are Barrow's. The average population of Barrow's Goldeneye on Puget Sound was estimated at 5,297 during 2012 to 2014. Winter 2012 to 2014 counts of both goldeneye species (combined) on Puget Sound declined 44 percent to 24,077 from the 1994 to 1996 counts. The statewide breeding population of goldeneye (both species) averaged 858 in 2012 to 2014.

**Habitat**

Barrow's Goldeneyes nest primarily in mature and late successional forests and riparian areas adjacent to low gradient rivers, sloughs, lakes, and beaver ponds. Most Barrow's Goldeneyes wintering in Washington occur on Puget Sound bays, inlets, harbors, and rocky shores, and some use ice-free inland lakes, ponds, and rivers.

**References**

Sea Duck Joint Venture Species Fact Sheet – Barrow's Goldeneye http://seaduckjv.org/meetseaduck/bge.html
Washington Department of Fish and Wildlife (WDFW) Sea Duck Management Strategies:
http://wdfw.wa.gov/publications/pub.php?id=01007

### Barrow's Goldeneye: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment and species composition surveys | Current insufficient | Both |
| 3 | Resource information collection needs | Rangewide delineation of Puget Sound winter population | Develop satellite telemetry study to document use areas | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Development impacts on breeding and wintering habitat | Document and address limiting factors | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## BLACK SCOTER (*Melanitta nigra*)

### Conservation Status and Concern

This species has undergone significant population declines on Puget Sound. Increasing development in the Puget Sound region has led to more disturbance, pollution, and degradation of foraging areas used by sea ducks. Reduction of marine foraging areas may be reducing populations in some areas. Some aquaculture practices can impact foraging areas through exclusion of sea ducks.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Moderate/declining | Moderate |

### Biology and Life History

Photo: P. Massas

Like other sea ducks, Black Scoters are believed to reach sexual maturity when they are two or three years old. Courting begins in spring, and they arrive paired on the breeding grounds. Black Scoters are long-lived, nest later than most ducks, and on average have low reproductive output. Birds depart coastal molting areas from late August through November and then spend most of their annual cycle on wintering areas in Puget Sound. The diet of Black Scoters in Washington is predominantly mollusks (e.g., mussels and clams), but also crustaceans (e.g., snails, periwinkles), limpets, barnacles, and vegetation. Ducks usually feed in depths less than 33 feet, diving to take prey which they then swallow whole; powerful muscles of the gizzard crush the prey, shell and all.

### Distribution and Abundance

The western population of Black Scoters breeds on tundra of north-central Alaska Peninsula, Alaska's Bristol Bay lowlands, Yukon-Kuskokwim Delta, and to a lesser extent in Kotzebue Sound and the Alaska North Slope. Currently, there are believed to be about 200,000 Black Scoters in Alaska. Their population in western Alaska has declined by about 50 percent since aerial surveys were begun in the 1950s, although recent trends appear to be stable. In winter, Black Scoters are found as far south as Baja California and west into the Aleutian Islands. The Black Scoter is the least numerous scoter species on Puget Sound. Wintering numbers of all scoters on Puget Sound total approximately 50,000, and only about one percent are Black Scoters. The total scoter population index (three-year average) for Puget Sound has declined over 50 percent since 1994 to 1996, and may have declined as much as 78 percent since 1978 to 1979. WDFW has implemented progressively restrictive hunting regulations for scoters since 1998 in response to population declines.

### Habitat

Black Scoters breed near shallow tundra lakes in Alaska. In Washington, they frequent marine nearshore waters.

#### References

Sea Duck Joint Venture Species Fact Sheet - Black Scoter: http://seaduckjv.org/meetseaduck/bs.html
WDFW Sea Duck Management Strategies: http://wdfw.wa.gov/publications/pub.php?id=01007

**Black Scoter: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts on marine environment | Document and address limiting factors | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 3 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment and species composition surveys | Current insufficient | Both |
| 4 | Resource information collection needs | Rangewide delineation of Puget Sound winter population | Develop satellite telemetry study to document use areas | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## CINNAMON TEAL (*Anas cyanoptera septentrionalum*)

### Conservation Status and Concern

Cinnamon Teal is a once fairly common breeding species in Washington that has declined significantly in the past 40 years. Breeding areas in eastern Washington have been affected by wetland succession, exotic and invasive vegetation such as loosestrife and *Phragmites*, development, hydroelectric dam impacts to freshwater wetlands, and intensive grazing in some areas.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | S5B | Moderate/declining | Moderate |

### Biology and Life History

Cinnamon Teal are primarily found in Washington during the breeding season, and one of the last dabbling ducks to arrive on the breeding areas in early May. The peak of nesting occurs in mid-May to mid-June. Food habits of adults during the nesting season appear to be equally comprised of plant and animal food items. As the season progresses and fall migration grows closer, their food preference shifts toward plants. Cinnamon Teal depart Washington breeding areas for southern wintering areas in late summer, usually before most other dabbling duck species.

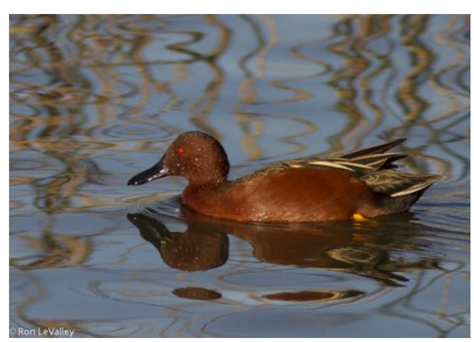

Photo: R. LeValley

**Distribution and Abundance**

Of the three North American teal species, Cinnamon Teal are the least widely distributed, and much less is known of their population dynamics than Blue- or Green-winged Teal. Cinnamon Teal occur in Washington during the breeding season mainly in eastern Washington, in the Columbia Basin and channeled scablands. Cinnamon Teal are rarely encountered in Washington during winter, and migrate south as far as northern South America. Recent WDFW aerial surveys indicate an average breeding population of approximately 7,000 in Washington during 2009 to 2014. Breeding Bird Survey estimates for Cinnamon Teal in Washington have declined significantly from 1968 to 2012 (-3.3 percent annually), and causes are unknown.

**Habitat**

Cinnamon Teal breeding areas typically contain dense upland vegetation near freshwater ponds and lakes, usually with dense aquatic vegetation. Where preferred upland plant cover is poor, they are known to nest over water in emergent vegetation.

**References**


Gammonley, J. H. 2012. Cinnamon Teal (*Anas cyanoptera*), The Birds of North America Online (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: http://bna.birds.cornell.edu/bna/species/209


**Cinnamon Teal: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Wetland losses and degradation due to irrigation management | Restore freshwater wetlands | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Intensive grazing impacts on freshwater wetlands | Mitigate grazing impacts on nesting and brood cover | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Wetland losses and degradation due to hydrologic impacts from development | Acquire important breeding habitat and manage nesting cover through prescribed grazing and other methods | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## DUSKY CANADA GOOSE (*Branta canadensis occidentalis*)

**Conservation Status and Concern**

Habitat changes on the Dusky Canada Goose breeding grounds on the Copper River Delta, Alaska have led to high predation pressure; combined with losses of wintering habitat in western Washington, these factors are responsible for a long-term population decline for this subspecies.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5T3 | SNR | Low/stable | N/A |

**Biology and Life History**

The primary nesting area for Dusky Canada Geese is the Copper River Delta, near Cordova, Alaska, although a small part of the population nests on Middleton Island in the Gulf of Alaska. The 1964 earthquake uplifted the Copper River Delta by two to six feet, drastically altering the frequency of tidal inundation and promoting drying of slough banks and meadows. As a result, the number and species composition of predators on the delta changed, and nest predation increased from less than six percent in 1959 to an average of over 60 percent from the 1990s to present. Recent work suggested that Bald Eagles might account for as much as 80 percent of nest predation, with another 15 percent attributable to Brown Bears.

Photo: WDFW

**Distribution and Abundance**

Most Dusky Canada Geese in Washington occur in Clark, Cowlitz, Pacific, and Wahkiakum Counties, where they use agricultural areas (mostly pasture and grain crops). Wintering numbers rangewide were relatively high between 1975 and 1981, from 23,000 to 26,500. Since that time, numbers decreased to 6,700 in 2009, and were estimated at approximately 14,000 birds in 2014 (three-year average) due to good production beginning in 2010. Due to an extensive hunter training program and restrictive hunting seasons since 1984, winter survival of this species is very high (approximately 80 percent) compared to other most other goose populations.

**Habitat**

Changes in nesting habitat caused by the Alaska earthquake resulted in drier conditions and invasion of alder, willow, cottonwood, and Sitka spruce. Between 1974 and 1984, shrub cover increased nine-fold on the coastal delta. Since 1983, a total of 861 artificial nest islands of six different designs have been installed on the Copper River Delta by the US Forest Service to deter nest predation. Several National Wildlife Refuges were created in the Pacific Northwest during the 1960s to conserve habitat for Dusky Canada Geese.

**References**

Pacific Flyway Council. 2014. Draft Pacific Flyway management plan for the dusky Canada goose. Dusky Canada Goose Subcommittee, Pacific Flyway Study Comm. [c/o USFWS], Portland, OR. Unpublished report.

**Dusky Canada Goose: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Loss of foraging habitat on public lands | Maintain adequate foraging habitat on public lands | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Conversion of agricultural use areas to crops not utilized for forage | Acquire fee-title or easements to conserve adequate winter habitat | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Loss of wintering habitat to residential development | Acquire fee-title or easements to conserve adequate winter habitat | Current insufficient | Both |
| 4 | Resource information collection needs | Lack of information on status and distribution | Conduct annual distribution surveys | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## HARLEQUIN DUCK (*Histrionicus histrionicus*)

**Conservation Status and Concern**

Declines in wintering numbers of Harlequin Ducks have occurred on Puget Sound. Conservation concerns include the effects of human disturbance, degradation of coastal habitats, pollutant discharge and reduction of marine forage.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G4 | S2B,S3N | Low/declining | Moderate-high |

**Biology and Life History**


Photo: S. Fitkin

Similar to other sea duck species, annual recruitment is low due to delayed maturity, variable breeding propensity, small clutch size, relatively low numbers of successful breeders, and other factors related to productivity and brood survival. Natural events, particularly flooding, have the potential to negatively impact prey populations (e.g. caddisfly larvae), which have been associated with decreased reproductive efforts for Harlequin Ducks. WDFW surveys documented an average of approximately 10 percent young in the winter population during 2008 to 2010. Breeding males and subadults move to the coast to molt during June and July, with females and broods arriving during August-September. These same molting areas are important wintering areas for Harlequin Ducks from several western states and provinces. Adult Harlequin Ducks exhibit a substantial degree of faithfulness to wintering areas.

**Distribution and Abundance**

Surveys in 1996 documented approximately 400 breeding pairs on Washington streams, primarily in the Cascade and Olympic mountain ranges. An average of approximately 3,000 harlequins wintered on Puget Sound during 2012 to 2014, a reduction of 15 percent since 1994 to 1996. Hunting seasons have been restricted for harlequin ducks since 1998, and the current bag limit is one per hunter each season.

**Habitat**

The species is found on fast-flowing streams in riparian, subalpine, and coastal habitats during the breeding season.

**References**

Pacific Harlequin Duck Management: Recommendations for Rocky Mountain-Northwest Coast Segment. July 23, 2004. Pacific Flyway Study Comm. [c/o USFWS], Portland, OR.

WDFW Sea Duck Management Strategies: http://wdfw.wa.gov/publications/pub.php?id=01007

**Harlequin Duck: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment surveys | Current insufficient | Both |
| 2 | Resource information collection needs | Rangewide delineation of Puget Sound winter population | Develop satellite telemetry study to document use areas | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts | Research/surveys to document and address limiting factors | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## LONG-TAILED DUCK (*Clangula hyemalis*)

### Conservation Status and Concern

This species has undergone significant population declines on Puget Sound. Increasing development in the Puget Sound region has led to more disturbance, pollution, and degradation of foraging areas used by sea ducks. Reduction of marine forage (primarily herring spawn) may be reducing populations in some areas.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | S3S4N | Moderate/declining | Low-moderate |

### Biology and Life History

Photo: T. Bowman

Like other sea ducks, Long-tailed Ducks are believed to reach sexual maturity when they are two or three years old, are long-lived, nest later than most ducks, and on average have low reproductive output. Birds depart coastal molting areas from late August through November and then spend most of their annual cycle on wintering areas in the Puget Sound area. Their winter diet is varied but chiefly animal matter, including bottom-dwelling crustaceans, clams, mussels, small fish, and snails. Most feeding is in water less than 30 feet deep, but the Long-tailed Duck has been documented to dive more than 200 feet, deeper than any other duck.

### Distribution and Abundance

Long-tailed Ducks breed in arctic and subarctic wetlands from the west coast of Alaska across most of northern Canada. Approximately 200,000 Long-tailed Ducks are thought to breed in Alaska. Population numbers have declined about 80 percent in Alaska since surveys began in 1957, although numbers have recently stabilized. Long-tailed Ducks winter along the Pacific coast from the Bering Sea to California. Some birds from Alaska may winter in the northern Bering Sea and across to Russia. The current Puget Sound population is estimated at approximately 5,200 Long-tailed Ducks. Puget Sound populations have declined 39 percent since 1994 to 1996, and as much as 94 percent since 1978 to 1979. WDFW implemented restrictive hunting regulations for Long-tailed Ducks in 2010 in response to population declines.

### Habitat

The Long-tailed Duck spends most of the year (approximately nine months) primarily in coastal marine waters. Only during the breeding season does it frequent shallow wetlands of low-lying tundra, ranging southward to the northern edge of the boreal forest. Non-breeding and molting birds tend to use deeper ponds and lakes and nearshore marine areas.

#### References

Sea Duck Joint Venture Species Fact Sheet – Long-tailed Duck: http://seaduckjv.org/meetseaduck/ltd.html
WDFW Sea Duck Management Strategies: http://wdfw.wa.gov/publications/pub.php?id=0100

**Long-Tailed Duck: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment and species composition surveys | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts on marine environment | Document and address limiting factors | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SURF SCOTER (*Melanitta perspicillata*)

**Conservation Status and Concern**

This species has undergone significant population declines on Puget Sound. Increasing development in the Puget Sound region has led to more disturbance, pollution, and degradation of foraging areas used by sea ducks. Reduction of marine forage may be reducing populations in some areas. Some aquaculture practices can impact foraging areas through exclusion of sea ducks.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Moderate/declining | Moderate-high |

**Biology and Life History**

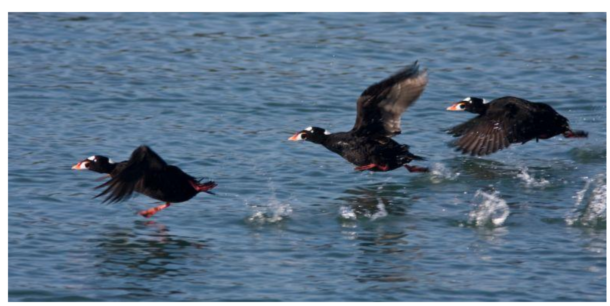
Photo: R. LeValley

The Surf Scoter is one of the least studied ducks in North America. Surf Scoters do not breed until two to three years old, and are believed to be long-lived but on average have low reproductive output (e.g. an average of approximately eight percent young in Puget Sound wintering flocks during 2008 to 2010). Nests are well concealed and the few that have been found are typically near shallow lakes within the boreal forest of Northwest Territories and Nunavut, an area threatened by energy development and climate change effects. Males and nonbreeding females often undertake extensive molt migrations to coastal areas (e.g. Padilla Bay) that are hundreds of miles from breeding areas. Molting flocks may number in the hundreds to thousands, although the location and characteristics of molting areas has not been well documented. Birds depart coastal molting areas from late August through November and move to wintering areas, primarily in Puget Sound. Adults are site-faithful to wintering sites.

**Distribution and Abundance**

Although Surf Scoters are found in many marine coastal areas, they are most numerous on Puget Sound. Wintering numbers of all scoters on Puget Sound total approximately 50,000, and most (80 percent) are Surf Scoters. The total scoter population index (three-year average) for Puget Sound has declined over 50 percent since 1994 to 1996, and may have declined as much as 78 percent since 1978 to 1979. WDFW has implemented progressively restrictive hunting regulations for scoters since 1998 in response to population declines.

**Habitat**

Wintering Surf Scoters feed mostly on mussels and clams at up to 66 feet in depth, before switching to herring eggs or other seasonally abundant prey during spring migration.

**References**

WDFW Sea Duck Management Strategies: http://wdfw.wa.gov/publications/pub.php?id=01007

**Surf Scoter: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment and species composition surveys | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Some aquaculture practices may exclude sea ducks | Develop best management practices; identify and protect important foraging areas | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts on marine environment | Document and address limiting factors | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WHITE-WINGED SCOTER (*Melanitta fusca)*

**Conservation Status and Concern**

This species has undergone significant population declines on Puget Sound. Increasing development in the Puget Sound has led to more disturbance, pollution, and degradation of foraging areas used by sea ducks. Reduction of marine forage (primarily herring spawn) may be reducing populations in some areas. Some aquaculture practices can impact foraging areas through exclusion of sea ducks.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Low/declining | Moderate |

**Biology and Life History**

Photo: R. Gilbert

The White-winged Scoter is the largest scoter species in Washington. White-winged Scoters first breed at two to three years old, and are believed to be long-lived and have low recruitment in most years. In spring, White-winged Scoters move from saltwater wintering habitats to inland breeding areas in the boreal forests of northern Alberta and Northwest Territories. Many of their breeding areas are threatened by resource extraction and climate change effects. In some areas, White-winged Scoters nest predominantly on islands, although gulls, Common Ravens, and American Crows often destroy 10 to 30 percent of nests and a large number of ducklings. Birds depart coastal molting areas from late August through November. In Washington, White-winged Scoters spend most of their annual cycle on wintering areas in the Puget Sound area. Based on satellite telemetry studies by WDFW, adults have a high degree of site-fidelity to wintering sites.

**Distribution and Abundance**

White-winged Scoters have virtually disappeared from the more southern reaches of their breeding range in the prairie/parkland region of Canada and the U.S. Most White-winged Scoters in Washington are found on Puget Sound during winter. Wintering numbers of all scoters on Puget Sound total approximately 50,000 and approximately 20 percent are White-winged Scoters. The total scoter population index (three-year average) for Puget Sound has declined over 50 percent since 1994 to 1996, and may have declined as much as 78 percent since 1978 to 1979. WDFW has implemented progressively restrictive hunting regulations for scoters since 1998 in response to population declines.

**Habitat**

Wintering White-winged Scoters feed mostly on bottom-dwelling animals such as mollusks (clams, mussels, snails) and crustaceans (crabs, shrimp) at up to 66 feet in depth, before switching to herring eggs or other seasonally abundant prey during spring migration.

**References**


Sea Duck Joint Venture Species Fact Sheet – White-winged Scoter: http://seaduckjv.org/meetseaduck/wws.html
WDFW Sea Duck Management Strategies: http://wdfw.wa.gov/publications/pub.php?id=01007

**White-winged Scoter: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on population demography | Conduct periodic recruitment and species composition surveys | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Some aquaculture practices can exclude sea ducks | Develop best management practices; identify and protect important foraging areas | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts on marine environment | Document and address limiting factors | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN HIGH ARCTIC BRANT (*Branta bernicla*)

**Conservation Status and Concern**

Western High Arctic Brant include a small population which has experienced a long-term decline in numbers. Factors affecting population status and distribution are currently unknown. Potential disturbance factors include increased water-based recreation, commercial and residential development, shellfish harvest, and fishing.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Low/stable | Moderate |

**Biology and Life History**

This is one of two stocks of Brant that occur in Washington during winter, and is not currently recognized as a distinct subspecies separate from Black Brant. They breed in Canada on the Parry Islands, located in Northwest Territories and Nunavut. These Brant exhibit breast color plumage characteristics closer to the pale gray of Brant on the Atlantic coast, in contrast to typical Black Brant with dark breast plumage in the Pacific Flyway. In their high latitude nesting area, extreme weather conditions during summer can lead to total breeding failures in some years.

Photo: M. Axelson

**Distribution and Abundance**
Status and trends of this Brant are less clear than those for Black Brant. In 1993, there were 500 nesting birds on Prince Patrick Island and 1,500 on Melville Island. Only two percent of the area of Mellville, Prince Patrick, and Eglinton Islands, and associated smaller islands in the Parry group are suitable for nesting, and the scarcity of vegetation likely limits abundance and distribution. Following the breeding season, these Brant migrate to the Izembek National Wildlife Refuge area in Alaska and stage for up to six weeks in the fall. Marking information indicates the north Puget Sound area is the major wintering area for this stock, although Brant populations wintering in Alaska have been growing recently and may contain Brant from this same population. The percentage of these Brant in north Puget Sound during winter averaged 48 percent (4,248) in 2007 to 2013.

**Habitat**
On breeding areas in the Parry Islands, Brant nest as widely dispersed solitary pairs, often well away from water. Some nesting and much available feeding habitat is susceptible to inundation by storm tides, and is susceptible to spills by petroleum exploration and development. Brant utilizing north Puget Sound use coastal estuaries with sufficient quantities of eelgrass and sea lettuce, as well as adequate haul-out and grit access sites. Numbers of Brant utilizing migration and wintering habitats in Washington have been related to trends in the size of eelgrass beds that have been reduced in some areas. Several major oil refineries in north Puget Sound are located in key wintering areas, including Padilla Bay.

**References**
Pacific Flyway Council. 2014. Draft Pacific Flyway Management Plan for Pacific Brant. USFWS, Portland, Oregon.

**Western High Arctic Brant: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution | Conduct annual winter inventory | Current insufficient | Both |
| 2 | Resource information collection needs | Lack of information on population demography | Conduct annual recruitment and stock assessments | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Puget Sound development impacts on marine environment | Acquire or facilitate protection of critical shoreline use areas | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Disturbance and direct habitat impacts at important use areas on Padilla, Samish, and Fidalgo Bays | Acquire and enhance critical shoreline use areas | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# UPLAND GAME BIRDS

## COLUMBIAN SHARP-TAILED GROUSE (*Tympanuchus phasianellus columbianus*)

**Conservation Status and Concern**

The statewide population of Columbian Sharp-tailed Grouse is distributed in seven subpopulations that are not sustainable at current levels. Maintaining the species in Washington will require restoring habitat and increasing populations.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Threatened | Yes | G5 | S1S2 | Low/declining | Moderate |

**Biology and Life History**

Photo: B. Griffith

Sharp-tailed Grouse inhabit grassland and shrublands, and feed on plant material and insects. Males gather at traditional sites in spring to perform elaborate dances on leks to attract females for mating. Females nest under a grass clump or shrub and incubate a clutch of approximately 10 to 14 eggs. The precocial chicks feed on insects, gradually shifting to more plant material. Young chicks are particularly vulnerable to predators. Maturing broods aggregate into flocks in late summer. During late fall and winter, particularly after snow covers the ground, Sharp-tailed Grouse will move to areas with riparian deciduous cover where they often eat buds and fruits of deciduous trees and shrubs, such as water birch, serviceberry, hawthorn, and aspen. Annual adult survival of non-hunted populations ranges from 30 to 60 percent; maximum life span reported is 7.5 years.

**Distribution and Abundance**

The subspecies in Washington is the Columbian (*T. p. columbianus*), the rarest subspecies. Seven remnant populations remain in Douglas, Lincoln, and Okanogan Counties. Washington populations may have once numbered in the hundreds of thousands. The total population now numbers fewer than 1,000 birds, and they occupy less than five percent of their historical range.

**Habitat**

Sharp-tailed Grouse are a grassland and steppe species, and the Palouse prairie probably once supported the highest numbers in Washington. Diverse native grassland with sparse shrubs provides the best nesting habitat, but deciduous riparian habitat must be available in the area for overwintering. Sharp-tailed Grouse will also use cropland near native habitat, such as wheat stubble and alfalfa, and have benefitted from the Conservation Reserve Program.

**References**

Stinson, D. W., and M. A. Schroeder. 2012. Washington State recovery plan for the Columbian sharp-tailed grouse. Washington Department of Fish and Wildlife, Olympia, Washington.

**Columbian Sharp-Tailed Grouse: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Habitat converted to cropland (loss and fragmentation); lack of connectivity | Protect and restore key habitats using a variety of conservation tools; translocations may be needed in some cases | Current insufficient | WDFW |
| 2 | Agriculture and aquaculture side effects | Habitat converted to cropland | Sage and Sharp-tailed Grouse SAFE contracts | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Small populations, potential declining genetic health | Population augmentation | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## GREATER SAGE-GROUSE (*Centrocercus urophasianus*)

**Conservation Status and Concern**

Greater Sage-grouse require landscapes of sagebrush steppe, much of which has been converted to cropland or degraded. Remaining populations are small and unlikely to persist at their current size. The USFWS found in 2001 that listing of the Columbia Basin Distinct Population Segment under the Endangered Species Act was "warranted but precluded" by higher priority listing actions.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Candidate | Threatened | Yes | G3G4 | S1 | Low/stable | Moderate-high |

**Biology and Life History**

Greater Sage-grouse are closely tied to sagebrush. Mating occurs at leks where males display to attract females. Females incubate a clutch of six to nine eggs in a nest on the ground. Males and females gather into flocks in winter, as do broodless hens in early summer. During the winter, Greater Sage-grouse feed almost exclusively on sagebrush; at other times they also feed on forbs. They also eat insects including ants and grasshoppers, which are essential in the diet of growing chicks. Birds generally move between winter and summer ranges returning to traditional lek sites in February. Annual adult survival averages 50 to 75 percent, and females may live eight years or more.


Photo: WDFW

**Distribution and Abundance**

The Washington population in 2014 totaled less than 1,000 birds. There are two remnant populations: one in Douglas and Grant Counties, and one on the Yakima Training Center in Yakima and Kittitas Counties; small reintroduced populations also exist in Lincoln County and on the Yakama Indian Reservation.

**Habitat**

This species requires large areas of shrub-steppe habitat dominated by sagebrush. Productive breeding habitat is sagebrush steppe with a diverse herbaceous understory, and springs or wet areas that retain green vegetation in late summer. Nest predation rates are affected by habitat quality, because residual grasses help conceal hide nests. Some degraded habitat that lacks the grass and forb understory needed for nesting and brood rearing is nonetheless suitable for wintering grouse. Greater Sage-grouse will also use edges of wheat and alfalfa fields near shrub-steppe habitat.

**References**

Stinson, D. W., D. W. Hays, and M. A. Schroeder. 2004. Washington State recovery plan for the greater sage-grouse. Washington Department of Fish and Wildlife, Olympia, Washington.

US Fish and Wildlife Service (USFWS). 2001. 12-month finding for a petition to list the Washington population of western sage grouse (*Centrocercus urophasianus phaios*). Federal Register 66:22984-22994.

**Greater Sage-grouse: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Habitat converted to cropland | Protect and restore key habitats using a variety of conservation tools | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Habitat converted to cropland | Sage and Sharp-tailed Grouse SAFE contracts | Current insufficient | Both |
| 3 | Habitat loss or degradation | Wildfire impacts to sagebrush | Sagebrush replanting | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Small populations, potential declining genetic health | Population reintroductions, augmentations | Current insufficient | Both |
| 5 | Agriculture and aquaculture side effects | Wire fences pose collision hazard | Attach markers to improve visibility to fences in breeding habitat | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## MOUNTAIN QUAIL (*Oreortyx pictus*)

**Conservation Status and Concern**

Mountain Quail populations have declined to very low levels within their native range in Washington and were (or continue to be) absent in some areas. The decline is thought to be due to loss or degradation of dense shrub communities resulting from intensive cattle grazing practices and hydroelectric and other development in riparian zones.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S1 | Low/unknown | Moderate |

**Biology and Life History**


Photo: K. Chou

Mountain Quail nest on the ground in dense cover, usually sheltered by a shrub, log, or clump of grass. Like other quail, their nests are shallow depressions lined with grass, needles, leaves, and feathers. Diet varies with the season but consists primarily of seeds, bulbs, leaves, berries, and some insects. One of the most important foods is sumac. Insect and other animal matter are a minor source of food, comprising less than five percent of the diet overall. Females lay nine to 10 eggs, which both parents incubate. Shortly after hatching, the young leave the nest. Both parents incubate their own nest and then tend and actively defend the young and lead them to food sources, where they feed themselves.

**Distribution and Abundance**

Although the species has been introduced to parts of western Washington, where it is somewhat common, Asotin, Garfield, and Columbia Counties are the Mountain Quail's native range. The species was once abundant in Klickitat County and may have been native there historically. After being extirpated from portions of the historical distribution, 309 mountain quail were released in the Asotin Creek watershed between 2005 and 2013. Survival of released birds to six months post-release has ranged between 18 to 34 percent. It is not clear whether these attempts have established populations that will become self-sustaining. While incidental observations of Mountain Quail continue to occur in the area, deriving a population estimate for this small, widely dispersed population in remote habitat is not currently practical.

**Habitat**

This species requires dense shrub cover, brushy, riparian habitat in dry areas, and brushy slopes. They are found in dense cover with scattered open areas on slopes in foothills and mountains. They use dense thickets resulting from fires or clearcuts, and they are seldom found far from this cover. In summer, the quail require a source of water, which may limit their nesting range.

**References**

WDFW. 2015. Game Management Plan July 2015 - June 2021. Washington Department of Fish and Wildlife, Olympia, Washington.

WDFW. 2014. 2014 Game status and trend report. Washington Department of Fish and Wildlife, Olympia, Washington.

### Mountain Quail: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Energy development and distribution | Hydroelectric development along the Snake River has resulted in the loss of key riparian habitat | Protect as-yet undeveloped habitat along tributaries | Nothing current - new action needed | Both |
| 2 | Agriculture and aquaculture side effects | Mountain Quail require dense shrub cover and brushy areas. Use of herbicides kills shrubs and plants required for cover and forage, particularly sumac | Work with landowners to use best management practices | Current insufficient | WDFW |
| 3 | Agriculture and aquaculture side effects | Mountain Quail require dense shrub cover and brushy areas. Intensive grazing practices have damaged habitat required for cover and forage | Protect as-yet undeveloped habitat along tributaries | Current insufficient | Both |
| 4 | Resource information collection needs | Success of translocation efforts is not clear and trend data are lacking | Evaluate results from translocations to assess effectiveness of release strategies | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## SPRUCE GROUSE (*Falcipennis canadensis*)

### Conservation Status and Concern

Although a gamebird, the indirect effects of climate change including disease of trees and wildfire, the direct effects of certain timber harvest practices, and the uncertainty about taxonomy mean that Spruce Grouse conservation status is unclear.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | S4 | Declining | High |

### Biology and Life History

Spruce Grouse dwell mostly in trees from late autumn through early spring and on the ground from late spring through early autumn. Both males and females are territorial during the spring. Females generally produce a clutch of five to six eggs. Nest and brood success are usually not very high, but are compensated for with relatively high adult survival.

Photo: M. Schroeder

### Distribution and Abundance

These grouse are distributed throughout the boreal forest of Canada and Alaska and small portions of other northern states. Most evidence suggests that this grouse consists of types that are genetically, phenotypically, and behaviorally distinct, and taxonomic reclassification may occur at some point in the future. In Washington, they are primarily found on the east slope of the Cascades from the U.S.-Canada border south to Yakima County and in Okanogan, Ferry, Stevens, and Pend Oreille Counties. Cascade populations are believed to be relatively sparse and discontinuous while populations in the Okanogan highlands have historically been abundant and continuous. Spruce Grouse have declined in many portions of northern Washington due to wildfires between 1994 and 2014. The Washington population is approximately 5,000 individuals.

### Habitat

Spruce Grouse depend on conifer forests, especially fire-adapted lodgepole pine, but also spruce and fir. Greatest densities appear to be in young successional stands of dense lodgepole pine, with a well-developed middle and understory of spruce, fir, and/or deciduous shrubs. Populations close to the crest of the Cascades live in habitats with greater tree diversity, but these populations are poorly understood. Grouse forage in winter primarily on lodgepole pine needles, and secondarily on spruce needles. Nesting and brood-rearing females often use small riparian meadows and forest openings. Spruce Grouse living in fragmented habitats have lower survival.

### References


Boag, D. A., and M. A. Schroeder. 1991. Spruce grouse (Falcipennis canadensis). Birds of North America 5: 1-28.

Boag, D. A., and M. A. Schroeder. 1987. Population fluctuations in spruce grouse: what determines their numbers in spring? Canadian Journal of Zoology 65:2430-2435.

**Spruce Grouse: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species and genes | Increased fire size resulting from beetle infestations | Fire management | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Salvage harvest in areas impacted by beetle infestations | Develop and implement best management practices | Current insufficient | Both |
| 3 | Climate change and severe weather | Beetle infestations due to climate temperature change killing lodgepole pine, spruce and fir | Forest management | Current insufficient | External |
| 4 | Resource information collection needs | Lack of population data poses risk of over-harvesting | Monitor annual harvest | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## WHITE-TAILED PTARMIGAN (*Lagopus leucura*)

**Conservation Status and Concern**

The greatest threat to the long-term survival of White-tailed Ptarmigan populations appears to be climate change, which may lead to a gradual loss of alpine habitats as the tree line moves upward. Consequently, they have been petitioned for listing under the Endangered Species Act and the USFWS decided that the petition was valid and worthy of consideration.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Petitioned | None | No | G5 | S3 | Low/unknown | High |

**Biology and Life History**

White-tailed Ptarmigan dwell mostly on the ground in alpine tundra habitats. They are generally resident in the same general habitats throughout the year but some birds may migrate more than six miles. They are monogamous and the breeding pair defends a territory during the breeding and nesting seasons. Females generally produce a clutch of five to seven eggs. Nest and brood success are usually not very high, but are compensated for with relatively high survival.

Photo: M. Schroeder

**Distribution and Abundance**
White-tailed Ptarmigan are distributed in alpine tundra habitats of western North America. In Washington they are found in the Cascades from Mt. Adams north to the U.S.-Canada border. There has been little work done with White-Tailed Ptarmigan, but birds are believed to be relatively rare on Mt. Adams, uncommon on Mt. Rainier, and common in areas further north, such as the Pasayten Wilderness. There is an apparent gap of about 31 miles in occupancy between Mt. Rainier and the Alpine Lakes Wilderness to the north. The Washington population may be about 1,000 individuals.

**Habitat**
White-tailed Ptarmigan depend on alpine tundra habitats that are forb-rich with occasional shrubs such as willow. During winter they may spend time feeding on vegetation in wind-exposed areas, avalanche chutes, and riparian areas with exposed shrubs.

**References**
Braun, C. E., K. Martin, and L. A. Robb. 1993. White-tailed Ptarmigan (*Lagopus leucurus*). Birds of North America 68: 1-24.
USFWS. 2012. Endangered and threatened wildlife and plants; 90-day finding on a petition to list the southern white-tailed ptarmigan and the Mt. Rainier white-tailed ptarmigan as threatened with critical habitat. Federal Register 77:33143–33155.

**White-Tailed Ptarmigan: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Climate change and severe weather | Low elevation habitats influenced by indirect impacts of climate change due to drier conditions, longer growing seasons, and encroachment by trees | Continue to minimize human disturbance (direct and indirect) in White-tailed Ptarmigan habitats | Current insufficient | WDFW |
| 2 | Education needs | Outreach for the general public to educate them about White-tailed Ptarmigan and the risks they face | Improved outreach | Current insufficient | WDFW |
| 3 | Resource information collection needs | Little known about abundance, distribution, and connectivity in Washington | Surveys needed to make management effective | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

# MARINE AND WATERBIRDS

## AMERICAN WHITE PELICAN (*Pelecanus erythrorhynchos*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

American White Pelicans nest in only one location in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G4 | S1B | Low/increasing | Low-moderate |

**Biology and Life History**


Photo: R. LeValley

American White Pelicans are large, highly gregarious, migratory birds that nest in colonies. Breeding sites include isolated islands in freshwater lakes and rivers. Females typically breed at age three and lay an average of two eggs; most pairs fledge only one young. Nesting pelicans are highly susceptible to disturbance and females rarely lay a second clutch if the first clutch is lost. Young are cared for by both parents for three to four weeks, then join other young within the colony and fledge at 9 to 10 weeks of age. Adult life span is 12 to 14 years. Natural predators of eggs and chicks include gulls, Coyotes, large corvids and other mammals. Foraging areas may be 30 miles or more from breeding sites and include the shallows of lakes, rivers and marshes; prey includes fish (including, in some areas, commercially important species), amphibians and crustaceans.

**Distribution and Abundance**

American White Pelicans breed in the western and central Canadian provinces and in the north-central and western United States. They overwinter from central California to southern Arizona, Mexico and northern Central America, as well as Texas to Florida. In Washington, they are a locally uncommon to common visitor and migrant, a very local breeder in the eastern part of state and a rare visitor in western Washington. American White Pelicans did not breed in Washington from about 1930 to 1995. The only known breeding colony of around 1,000 pairs occurs at Badger Island in the Columbia River in Walla Walla County.

**Habitat**

American White Pelicans nest on isolated islands in freshwater systems. These islands can be permanent or ephemeral. Most American White Pelicans spend the winter along coastal areas in bays, inlets and estuaries that contain exposed places, such as sand islands, for loafing and roosting, with nearby foraging sites, and on inland freshwater reservoirs, lakes, or rivers.

**References**


Evans, R. M., and F. L. Knopf. 1993. American white pelican (Pelecanus erythrorhynchos). Birds of North America 57: 1-24.

WDFW. 2013. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Listing and Recovery Section, Wildlife Program, Washington Department of Fish and Wildlife, Olympia.

**American White Pelican: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Dredging and deposition of dredged materials may impact nesting and roosting sites | Work with US Army Corps of Engineers on Columbia River to avoid impacts to potential nest sites | Current insufficient | Both |
| 2 | Resource information collection needs | Monitor for impacts from contaminants and prey resource declines | Monitor local breeding sites | Nothing current - new action needed | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## BROWN PELICAN (*Pelecanus occidentalis*)

### Conservation Status and Concern

This species has recovered from its previous population decline and has been delisted by the USFWS.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G4 | S3N | Stable/increasing | Moderate |

### Biology and Life History

Photo: R. LeValley

The Brown Pelican does not breed in Washington, although a few nests have recently been found along the lower Columbia River. They breed in colonies on small offshore islands. Nesting can occur from December to August, and in the Gulf of California generally occurs from November to May. Brown Pelicans are slow to mature and reach sexual maturity at three to five years of age. The oldest individual lived 43 years. Reproductive success varies with level of disturbance by humans, starvation of young, and/or flooding of nests, but typically the number of young fledged per nest averages one or less. Brown Pelicans feed primarily on small marine fishes such as Northern Anchovy, Pacific Sardine, and Pacific Mackerel.

### Distribution and Abundance

Brown Pelicans are common to abundant in Washington's outer coastal waters from spring through autumn. Up to 16,000 have been reported roosting at East Sand Island in the Columbia River estuary. Brown Pelicans in Washington belong to the subspecies *P. o. californicus*. These birds nest in the Gulf of California and along the coast of Baja California in Mexico north to Channel Islands in southern

California. After breeding, California Brown Pelicans disperse north along the coast as far as southern British Columbia. The origin of birds that occur in Washington is uncertain.

**Habitat**

Brown Pelicans inhabit mainly coastal waters and are rarely seen inland or far out at sea. They feed mostly in shallow estuarine waters, and occasionally up to 40 miles from shore. They use sand spits, offshore sand bars, and islets for nocturnal roosting and daily loafing, especially non-breeders and during the non-nesting season. Dry roosting sites are essential. Brown Pelicans that roost on beaches can be disturbed by humans, including pedestrians and motorists.

**References**

Shields, M. 2002. Brown Pelican (*Pelecanus occidentalis*). Birds of North America 609: 1-36.

Stinson, D. W. 2015. Periodic status review for the Brown Pelican. Washington Department of Fish and Wildlife, Olympia, Washington.

USFWS. 2009. Removal of the Brown Pelican (*Pelecanus occidentalis*) from the federal list of endangered and threatened wildlife: Final Rule. Federal Register 74:59444-59472.

**Brown Pelican: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Potential oil spills | Plan to minimize risks during oil and other toxic spills | Current sufficient | Both |
| 2 | Invasive and other problematic species and genes | Harmful algae blooms, fluctuations in prey populations-natural oscillations | Monitor; particularly the roost sites. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## CLARK'S GREBE (*Aechmophorus clarkii*)

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

The small breeding population of this species in Washington, which occurs at a small number of Columbia Basin lakes and reservoirs, is strongly impacted by various threats relating to water drawdowns and recreational boating activity.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S2B | Low/declining | Low-moderate |

### Biology and Life History

This species is gregarious and nests in colonies. Clutch size usually numbers two to four eggs and brood size is usually one to three chicks which depart nests soon after hatching. Nesting and brood rearing extend from early June to late August. Spring migration is mainly from late April to early May; fall migration extends from mid-September to November. Clark's Grebes will flock with Western Grebes. Wintering birds can occur in daytime flocks, but disperse at night to forage. Diet is mainly fishes, and aquatic invertebrates are also consumed; considered opportunistic as to the species eaten. Prey are caught underwater by diving.

Photo: R. LeValley

### Distribution and Abundance

Clark's Grebes are a rare nester in Washington and the size of the state's breeding population is not well known, but may number only 75 to 150 birds. All known nesting localities are in Grant County except for one site in Adams County. The species occurs more widely in the state during migration, including rarely in western Washington; it is rare during winter.

### Habitat

Large freshwater lakes, reservoirs, and marshes are used during the summer breeding season. These habitats as well as sheltered coastal marine areas are occupied during migration and winter. Nesting sites usually contain at least a few square miles of open water and areas of emergent vegetation. Nests are built in emergent vegetation.

### References

Storer, R. W. and G. L. Nuechterlein. 1992. Western and Clark's Grebes. Birds of North America 26: 1-24.

Wahl, T. R. 2005. Clark's Grebe. Page 83 *In* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.). Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, Oregon.

**Clark's Grebe: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Major water drawdowns at reservoirs used by nesting colonies | Devise effective floating nest platforms; work with irrigation authorities to manage water levels to reduce impacts to grebes | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Boater activity and boat wakes at nesting colonies can destroy nests, spill eggs, or cause gull predation | Identify wake-free zones near breeding colonies | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COMMON LOON (*Gavia immer)*

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The Common Loon's life history characteristics and small breeding population in Washington render it highly vulnerable to impacts unless monitored and managed appropriately.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Sensitive | Yes | G5 | S2B,S4N | Low/stable | Low-moderate |

**Biology and Life History**

Nests are built at the water's edge and egg-laying generally begins between mid-May and mid-July. Chicks leave the nest within 24 hours of hatching and are soon moved to nursery areas. Chicks may be carried on their parents' backs until they reach three weeks of age. Most juveniles are capable of flight at 11 to 12 weeks, and some leave their small, natal lakes or parental territories shortly afterward. Non-breeders aggregate in marine waters, but also inland freshwater bodies.

Photo: J. Picken

**Distribution and Abundance**

Common Loons breed in freshwater habitats of northern North America including much of Canada, Alaska, northern portions of the contiguous United States, and southern Greenland. It also breeds in Iceland. The southern portion of its historical breeding range has contracted. These birds spend winters on inland larger freshwater bodies and marine environments from Alaska to northern Mexico in the American west. In Washington, breeding areas are freshwater lakes and reservoirs, mainly in remote areas of northeastern and northwestern parts of the state. Common Loons spend the winter in almost all nearshore marine and larger freshwater bodies of western Washington. They are uncommon and irregular in winter in eastern Washington where they are found in large water bodies and Columbia Basin impoundments. The size of Washington's breeding population is unknown.

**Habitat**

In winter and during migration, Common Loons use inland lakes and rivers and marine and estuarine coastal waters. Breeding habitat includes usually clear lakes containing both shallow and deep water areas. Nest sites are on small islands, quiet backwaters, or mainland shores. Loons have been found nesting in marshy portions of lakes in water depths no greater than 1.6 feet. Optimal nest sites include overhead cover to conceal eggs from predators, protection from wind and waves, good visibility by incubating adults, and a steep slope adjacent to the nest for adequate underwater approaches and exits. Brood-rearing areas are typically located in shallow coves of fairly uniform depth, sheltered from prevailing winds and wave action, and are independent of nest site location.

**References**

Evers, D. C., J. D. Paruk, J.W. Mcintyre and J. F. Barr. 2010. Common loon (*Gavia immer*). Birds of North America 313: 1-32.

Wahl , T. R. and S. Richardson. 2005. Common Loon (*Gavia immer*). Pp 76 – 77 in T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Common Loon: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Shoreline and adjacent upland development, use and degradation by various land use change actions (e.g. development, timber harvest, stormwater runoff impacts increase pollutant exposure) | Work with private and public landowners to support and sustain habitat and support health ecosystem processes | Current sufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Human consumptive and non-consumptive recreational intrusion on breeding lakes; lead tackle impacts; direct disturbance of nesting and brooding by recreation activities | Provide outreach to educate constituents regarding curbing recreation impacts | Current insufficient | Both |
| 3 | Outreach Needs | Lead tackle use, gear entanglement, oil spill, commercial fish bycatch impacts require more outreach and management attention | Provide outreach to educate constituents regarding curbing recreation impacts | Current sufficient | Both |
| 4 | Coordination-Administration Needs | Maintain and increase collaboration with landowners and constituents to manage hydroelectric sites used for breeding by providing platforms | Emphasize need for platforms on managed waters that have flux and resident loons | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## MARBLED MURRELET (*Brachyramphus marmoratus*)

**Conservation Status and Concern**

Because of its breeding association with old forests, Marbled Murrelet populations have been severely affected by loss of mature and old forest habitat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Threatened | Yes | G3G4 | S2 | Low/declining | Moderate |

**Biology and Life History**

Marbled Murrelets forage in marine waters and nest inland in mature and old-growth conifer forests. Small schooling fish (e.g. Pacific Anchovy, Pacific Herring, Candlefish) and Pacific Sand Lance make up most of the diet, which may include small crustaceans when fish are not abundant. Marbled Murrelets appear to establish long-term pair bonds and fidelity to nesting areas and nest trees.


Photo: USFWS

**Distribution and Abundance**

This species is an uncommon resident in marine waters in general proximity to nesting habitat; it is most abundant in northern Puget Sound and the Strait of Juan de Fuca, and least abundant along the coast of southwestern Washington. Surveys indicate highest nesting presence on the Olympic Peninsula, the northern Cascades and in limited remaining habitat in southwest Washington. Population estimate for 2013 in Puget Sound and Strait of Juan de Fuca was 4,395 birds, and on the Washington coast was 1,257 birds. The overall estimate of rate of annual decline in Marbled Murrelet density for Washington was -4.65 percent for the period from 2001 through 2013.

**Habitat**

In Washington, Marbled Murrelets nest in mature and old-growth conifer forests, and sometimes in comparatively younger forests with residual old-growth trees. The nest is located in a depression on a mat of moss, lichen or debris accumulations on large branches. The primary factor influencing breeding distribution is likely the availability of suitable nesting platforms within close proximity to marine water foraging areas. Marine foraging areas are usually within 1.2 to 3 miles of shore, typically in waters less than 100 feet deep.

**References**


Ralph, C. J., G. L. Hunt, M. G. Raphael, and J. F. Piatt (technical editors). 1995. Ecology and conservation of the Marbled Murrelet. Gen. Tech. Rep. PSW-GTR-152. Albany, California.

Raphael, M. G., A. Shirk, G. A. Falxa, S. F. Pearson. 2014 Habitat associations of marbled murrelets during the nesting season in nearshore waters along the Washington to California coast. Journal of Marine Systems. DOI: 10.1016/j.jmarsys.2014.06.010

**Marbled Murrelet: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion of old forest nesting habitat to commercial forestry. Fragmentation of nesting habitat isolates remaining breeding areas, increases hard edge (attracting predators), and decreases nest success | Use land acquisitions, conservation easements and landowner agreements to protect nesting habitat and create larger contiguous forest blocks | Current insufficient | Both |
| 2 | Management decision needs | Conversion of old forest nesting habitat to commercial forestry. Fragmentation of nesting habitat isolates remaining breeding areas, increases hard edge (attracting predators), and decreases nest success | Identify and retain future potential recruitment habitat near and adjacent to currently occupied sites. Block and connect forests to reduce edge with "security forest" goal of more than 40 years old adjacent to nesting habitat. Increase nearshore terrestrial habitat | Current insufficient | Both |
| 3 | Resource information collection needs | Chronic low juvenile recruitment in a declining population | Collect data needed for comprehensive understanding of demography | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Campgrounds/recreation sites in and near habitat can attract avian predators (corvids) and human disturbance to nesting birds | Outreach and education to to enhance refuse management at campgrounds; develop visitor management guidelines for murrelet breeding areas | Current insufficient | Both |
| 5 | Energy development and distribution | Environmental contamination in marine habitat; very vulnerable to periodic and chronic spills that may have lethal and sub-lethal effects that affect populations | Control, monitor, and timely response to contaminant (oil) spills. Identify important nearshore foraging areas and include in spill response team's maps/databases | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## RED-NECKED GREBE (*Podiceps grisegena)*

*See Appendix B for a potential range and habitat distribution map

### Conservation Status and Concern

Status of this species is not clear. Wintering populations in Washington exhibit ecological traits identified as risk factors for marine birds that occur in the Salish Sea and are declining.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | Yes | G5 | S3B,S5N | Unknown/unknown | Low-moderate |

### Biology and Life History

Red-necked Grebes nest on freshwater lakes, reservoirs and sloughs where marsh vegetation is present and overwinter in marine bays, estuaries and protected shorelines. By May, they have usually arrived at their breeding sites where they remain until fall. By mid-November, most have returned to their wintering areas. Breeding pairs typically nest solitarily and both members of the pair incubate one brood/year. Red-necked Grebes dive for their prey and feed on fish and insects, as well as crustaceans, mollusks, amphibian eggs and larvae, and some vegetation.

Photo: R. LeValley

### Distribution and Abundance

The Red-necked Grebe overwinters along the Pacific coast from Alaska to southern California. In western Washington, it is a fairly common to common migrant and winter visitor; it rarely occurs in summer in marine waters and on freshwater lakes west of the Cascades. East of the Cascades, the Red-necked Grebe is a local, fairly common breeder in northeastern Washington, but is a rare to uncommon winter visitor. The size of Washington's breeding population is unknown.

### Habitat

Winter habitats include saltwater bays and estuaries and other protected locations. In migration, they are found on lakes, ponds, and rivers. Nesting occurs on shallow, freshwater lakes, as well as shallow protected marsh areas and secluded bays of larger lakes. Nests are constructed in reeds along lake margins and are raised slightly above the surface of the water. Nest sites are selected based on a combination of attributes including shelter from wind and waves, availability of nest materials and anchorage, easy swimming access, proximity to open water, and distance from terrestrial predators.

### References


Stout, B. E., and G. L Nuechterlein. 1999. Red-necked Grebe (*Podiceps grisegena*). Birds of North America 465: 1-32.

Vischis, L. I., C. K. Johnson, J. R. Evenson, S. F. Pearson, K. L. Barry, P. D. Davidson, M. G. Raphael and J. K. Gaydos. 2014. Assessing ecological correlates of marine bird declines to inform marine conservation. Conservation Biology: doi: 10.1111/cobi.12378.

Wahl , T. R. 2005. Red-necked grebe (*Podiceps grisegena*). Pp 79 – 80 in T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Red-Necked Grebe: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Determine population trend for both winter and breeding populations | Conduct surveys to understand species trend and distribution | Current insufficient | Both |

## SHORT-TAILED ALBATROSS (*Phoebastria albatrus)*

**Conservation Status and Concern**

The Short-tailed Albatross main population is vulnerable to extreme reduction and breeding capacity due to about 90 percent of nesting pairs located in one colony (Torishima Island, Japan). Fishing vessels and fishing tactics are a mortality threat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Candidate | Yes | G1 | SNA | Rare/increasing | Low |

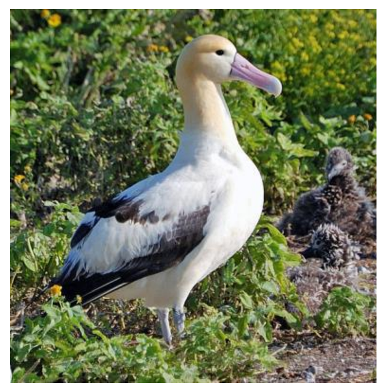
Photo: J.L. Place

**Biology and Life History**

The Short-tailed Albatross is the largest pelagic seabird in the North Pacific Ocean with a wingspan of 7 to 7.5 feet. It first breeds at five to nine years of age with most beginning at six years; pairs mate for life and lifespan is about 45 years. They are ocean surface feeders, relying primarily on squid, Flying Fish and fish eggs and crustaceans; they also follow fishing vessels for bait lines and processing scraps.

**Distribution and Abundance**

Once thought to be the most abundant albatross species in the North Pacific, this species was hunted to near-extinction by 1949. Exact populations were not known; between 1885 and 1903 it is estimated that more than five million birds were harvested from one island colony alone (Torishima, Japan). The 2014 estimate is 661 breeding pairs among all locales and the total population estimate is 4,354 individuals, of which 1,928 are estimated to be of breeding age. Recolonization efforts began in the late 1970s, and the population is now growing at an average rate of 7.5 percent per year. However, they are still vulnerable to extreme population reduction and breeding capacity because the main breeding colony which supports about 90 percent of nesting pairs is located on an unstable volcanic island. This species was known to have occurred offshore of Washington and British Columbia, where they were considered common, in the mid-19th to early 20th century.

**Habitat**

During breeding, adults forage primarily in the upwelling zones off northern Japan. During northern summers, mostly adult birds follow trade winds to the edges of the continental shelves from China north to the Aleutian Islands and Bering Strait.  Immature birds (less than three years) largely occur at the eastern Pacific continental shelf from the Alaskan gulf south to southern California.

**References**

Campbell R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. Kaiser, A. C. Stewart, and M. C. E. McNall. 1990. Birds of British Columbia, Vol. 1. University of British Columbia Press, Vancouver, British Columbia.

Jewett S. G., W. P. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. Pp 67-68 *in* Birds of Washington. University of Washington Press, Seattle, Washington. 767 pp.

USFWS. 2014. Short-tailed Albatross 5-year review: summary and evaluation. Region 7, Anchorage, Alaska.

USFWS. 2008. Short-tailed Albatross recovery plan. Region 7, Anchorage, Alaska.

### Short-Tailed Albatross:   Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Habitat loss or degradation | Natural volcanic disturbance on main breeding island could decimate recovering populations.  Eroding soils at site cause nest failure | Use land acquisitions, conservation easements and landowner agreements to protect significant colonies; reintroduce on former breeding sites; translocation of chicks | Current sufficient | External |
| 2 | Overharvesting of biological resources | Bycatch from commercial longline fisheries; wire/cable strikes from trawlers | Enforce North Pacific protective fishing equipment regulations. Increase on-board vessel observer efforts | Current sufficient | External |
| 3 | Habitat degradation | Chronic pelagic pollution: plastic debris, chemical and petroleum contaminants and toxic metals | Monitor and conduct research of short/long-term effects on chicks and adults | Current sufficient | External |

NOTE:  Numbers are for reference only and do not reflect priority.

## TUFTED PUFFIN (*Fratercula cirrhata*)

### Conservation Status and Concern

In Washington, this species has experienced an order-of-magnitude population decline in recent decades and has disappeared from more than half of its historical breeding sites.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G5 | S34B,S4N | Low/declining | Moderate |

### Biology and Life History

Photo: R. LeValley

Tufted Puffins gather in colonies on islands and headlands during spring and summer to breed and rear young. Breeding extends from mid-April to early September in Washington. Nesting occurs in burrows, where a single egg is laid. Incubation is by both members of the breeding pair and usually lasts 43 to 46 days. Rates of chick growth and survival depend on prey availability and quality. Nesting adults forage up to 38 miles from their colonies to catch prey for nestlings. Chicks are fully independent upon fledging. The species feeds on fishes, crustaceans, and cephalopods, which are caught underwater. Tufted Puffins at colonies experience predation by Bald Eagles and other predators, and kleptoparasitism by gulls. Birds winter alone or in small groups at sea.

### Distribution and Abundance

In Washington, breeding occurs on islands along the northern outer coast and in the Strait of Juan de Fuca. The population has been declining since at least the 1980s, with minimum population estimates falling from 23,342 birds in 1978 to 1982 to 2,958 birds in 2009, and only 19 of 44 historical breeding sites remaining occupied. Nearly all breeding now occurs along the outer coast. The species is very rare during winter.

### Habitat

Nesting takes place on isolated offshore islands and inaccessible headlands. Preferred nesting habitat includes grassy slopes, bluffs, and plateaus with soil deep enough for burrowing in locations free of introduced predators and human disturbance. Rocky areas and thickets are sometimes used for nesting. Foraging occurs from nearshore waters to open sea during the breeding season. The species is pelagic during the non-breeding season.

#### References


Piatt, J. F., and A. S. Kitaysky. 2002. Tufted Puffin (*Fratercula cirrhata*). Birds of North America 708: 1-31.

Hanson, T. and G. J. Wiles. 2015. Washington state status report for the Tufted Puffin. Washington Department of Fish and Wildlife, Olympia, Washington.

**Tufted Puffin: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | The cause(s) of population declines in Washington are unknown | Conduct research to determine causes of population declines | Current insufficient | Both |
| 2 | Climate change and severe weather | Reduced prey availability can result from changing ocean conditions (including climate change), overharvest, shoreline habitat loss, and other factors | Determine causes of declining prey availability; manage causes of forage fish decline to enhance prey populations | Current insufficient | Both |
| 3 | Overharvesting of biological resources | Entrapment in fishing nets | Determine ongoing sources of bycatch and manage those fisheries to reduce bycatch | Current insufficient | Both |
| 4 | Energy development and distribution | Mortality from oil spills | Expand safeguards to prevent oil spills | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN GREBE (*Aechmophorus occidentalis*)

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

Western Grebe breeding populations occur in freshwater and wintering populations occur in marine waters. Each of these populations and their habitats are strongly impacted by unique threats.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3B,S3N | Low/declining | Low-moderate |

### Biology and Life History

Western Grebes are gregarious throughout the year. They nest in colonies that usually contain tens or hundreds of nests. Nesting and brood rearing extend from early June to late August. Brood size is usually one to three young. Chicks depart nests soon after hatching. Spring migration is mainly from late April to early May; fall migration extends from mid-September to November. Wintering birds occur in daytime flocks of up to hundreds or thousands of birds. Diet is mainly fishes and is opportunistic as to the species eaten. Aquatic invertebrates are also eaten. Prey are captured underwater by diving.

Photo: R. Gilbert

### Distribution and Abundance

Nesting in Washington mainly occurs at several locations in Grant County, with single sites also known from Adams, Spokane, Okanogan, Lincoln, and possibly Ferry Counties. Overwintering birds are distributed throughout the Salish Sea, along the outer coast, and in nearby freshwater lakes. Size of the state's nesting population is not well known, but may number 1,000-2,000 adults, with most nesting at Potholes Reservoir. The wintering population in the state's inner marine waters has declined 99 percent since 1978 to 1979, with the population index from the 2014 annual winter survey being the lowest (9,100 ± 4,343 birds) since surveys began.

### Habitat

Large freshwater lakes, reservoirs, and marshes are inhabited during the summer breeding season, whereas primarily coastal marine areas with relatively sheltered waters are used in winter. Both types of habitats are occupied during spring and fall migration. Nesting sites usually contain at least a few square miles of open water and areas of emergent vegetation. Nests are built in emergent vegetation.

#### References

Storer, R. W. and G. L. Nuechterlein. 1992. Western and Clark's Grebes. Birds of North America 26: 1-24.

Wahl, T. R. 2005. Western Grebe (*Aechmophorus occidentalis*). Pp 81-82 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.). Birds of Washington: status and distribution. Oregon State University Press, Corvallis, OR. 436 pp.

**Western Grebe: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Major water drawdowns at reservoirs used by nesting colonies | Devise effective floating nest platforms; work with irrigation authorities to manage water levels to reduce impacts to grebes | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Boater activity and boat wakes at nesting colonies can destroy nests, spill eggs, or cause gull predation | Identify wake-free zones near breeding colonies | Current insufficient | Both |
| 3 | Resource information collection needs | Prey base appears to have declined in the Salish Sea | Determine causes of declining forage fish availability; manage causes of forage fish decline to enhance prey populations | Current insufficient | Both |
| 4 | Energy development and distribution | Oil spills in the wintering range | Expand safeguards to prevent oil spills | Current insufficient | External |
| 5 | Overharvesting of biological resources | Bycatch in gillnet fisheries in the wintering range | Determine ongoing sources of bycatch and manage those fisheries to reduce bycatch | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# FALCONS, HAWKS, EAGLES

## BALD EAGLE (*Haliaeetus leucocephalus*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species has experienced recovery as a result of removal of DDT from most of its range. This species is protected under the Bald and Golden Eagle Protection Act.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Sensitive | Yes | G5 | S4B,S4N | Medium/increasing | Low-moderate |

**Biology and Life History**

Bald Eagles nest in large trees, usually near marine shorelines, large lakes or rivers. They prey on fish, waterfowl, and small mammals, or scavenge. Many birds that nest in Canada and Alaska migrate south to overwinter in Washington concentrating on rivers with spawned-out salmon, especially chum. Bald Eagles generally first breed at about five to six years of age, and adults may not lay eggs every year. They commonly roost communally, especially in winter. Bald Eagles return to their breeding territories year after year and may repair and use the same nest for many successive years or may construct alternate nests within the territory. Territories also typically contain large perch trees.

Photo: R. LeValley

**Distribution and Abundance**

The resident population was about 1,500 breeding pairs as of the last comprehensive census conducted in 2005; up to 4,000 individuals overwinter in Washington. Bald Eagles nest primarily along marine shorelines and major rivers of western and northeastern Washington. Nests are rare or absent from the Columbia Basin and southeastern Washington, but overwintering birds can be locally common.

**Habitat**

Breeding habitat most commonly includes areas close to coastal areas, bays, rivers, lakes, reservoirs, or other bodies of water that reflect the general availability of primary food sources including fish, waterfowl, or seabirds. Nests are usually constructed in large trees. Tree species used for nesting vary and may include conifers and hardwoods. Winter roosts are usually located in uneven-aged patches of trees in locations that are protected from wind and inclement weather.

**References**

Seavey, J. R. 2005. Bald Eagle (*Haliaeetus leucocephalus*). Pp 111-112 *in* T.R. Wahl, B. Tweit, and S.G. Mlodinow (eds.). Birds of Washington: status and distribution. Oregon State University Press, Corvallis, OR. 436 pp.

Stinson, D. W., J. W. Watson, and K. R. McAllister. 2007. Washington State Status Report for the Bald Eagle. Washington Department of Fish and Wildlife, Olympia. 86 + viii pp.

**Bald Eagle: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Management decision needs | Retention of trees in various size and age classes within Bald Eagle habitat | Provide landowners with incentives to maintain trees on their property | Current insufficient | External |
| 2 | Management decision needs | Population has recovered and appears to be robust | Conduct status review | Nothing current – new action needed | WDFW |
| 3 | Resource information collection needs | Location and site status data are not current | Participate in development of strategy to update information for management purposes | Nothing current - new action needed | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## FERRUGINOUS HAWK *(Buteo regalis)*

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

This species is impacted by the loss and fragmentation of shrub-steppe and grasslands from agriculture and residential development and associated declines in distribution and abundance of its primary prey, jackrabbits and ground squirrels. Integrity of shrub-steppe and grassland ecosystems in supporting abundant and diverse populations of prey species is critical to the recovery of this hawk. In addition, direct sources of mortality include illegal shooting, electrocution, and collision with wind turbines.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Threatened | Yes | G4 | S2B | Low/declining | Low-moderate |

### Biology and Life History

This species is migratory and arrives on the breeding areas from late April through July. Prey species include primarily jackrabbits and ground squirrels historically, with a recent shift to pocket gophers, reptiles, and insects. Following nesting, Ferruginous Hawks typically migrate to the eastern front of the Rocky Mountains to exploit abundant ground squirrels, followed by a subsequent migration to central California.

Photo: Bureau of Land Management

**Distribution and Abundance**

Washington State is on the northwestern edge of the species' breeding range. Over 200 territories have been documented in Washington; Franklin and Benton Counties together host about 60 percent of the Ferruginous Hawk territories, and Grant, Walla Walla, Adams, and Yakima Counties have had 13 or more territories each. In 2002, only 20 percent of historical Ferruginous Hawk nesting territories in Washington were occupied, with many vacant for years. The current population size is unknown, but likely is very small.

**Habitat**

Ferruginous Hawks occur in arid grasslands and shrub-steppe habitats. Nests occur on small rock outcrops on the slope of steep hillsides or canyons or in isolated trees, such as junipers.

**References**

Bechard, M. J. and J. K. Schmutz. 1995. Ferruginous Hawk (*Buteo regalis*). Birds of North America. 172: 1-20.
Richardson, S. A., A. E. Potter, K. L. Lehmkuhl, R. Mazaika, M. E. McFadzen, and R. Estes. 2001. Prey of ferruginous hawks breeding in Washington. Northwestern Naturalist 82:58–64.
Watson, J. W. 2003. Migration and winter ranges of ferruginous hawks from Washington. Final Report. WDFW, Olympia, Washington, USA. http://wdfw.wa.gov/publications/00131/

**Ferruginous Hawk: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Loss, degradation, and fragmentation of shrub-steppe foraging habitat and associated declines in distribution and abundance of major prey species, especially jackrabbits and ground squirrels | Protect and restore shrub-steppe habitat | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Human disturbance may cause nesting failure and nest abandonment | Protect nest sites from disturbance | Current insufficient | Both |
| 3 | Overharvesting of biological resources | Poisoning of ground squirrels, low prey abundance negatively influences reproduction | Consider reclassifying some ground squirrels as protected wildlife; public outreach | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## GOLDEN EAGLE (*Aquila chrysaetos*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species is of concern due to declines in the distribution and abundance of its primary prey species, jackrabbits and ground squirrels; additional mortality factors include continued exposure to lead in the environment and collisions at wind energy facilities. Foraging habitat in shrub-steppe and grasslands has declined due to loss and degradation of these habitats from agriculture, human development, and overgrazing. This species is protected under the Bald and Golden Eagle Protection Act.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3 | Low/unknown | Moderate |

**Biology and Life History**

The same nest sites are typically used year after year and the pair maintains one or more alternate nests. Preferred prey include medium to large-sized mammals and birds, including hares, rabbits, ground squirrels, and marmots with Mountain Beaver being an important prey source in western Washington. Nesting success varies by year and region.

Photo: J. Watson

**Distribution and Abundance**

Golden Eagles have a broad distribution throughout the mountainous areas of the state, especially in eastern Washington. Breeding is limited primarily to the Okanogan highlands, rainshadows of the Olympics and Cascades, the Blue Mountains along the Snake and Grande Ronde rivers, and the San Juan Islands. The resident population occurs at low densities in areas where suitable nest sites (cliffs and trees) are found in proximity to abundant prey. There are over 300 documented breeding territories in Washington, of which over 80 percent are in eastern Washington. Occupancy of these sites is not well understood and information on the number of sites occupied in a given year, as well as an estimate of abundance, are currently lacking.

**Habitat**

This species is found mostly in dry open forests of eastern Washington, shrub-steppe, canyonlands, in high-elevation alpine zones of all regions, and sparingly in clearcut areas in western Washington. It is associated with steep terrain, which often includes cliffs where nests occur. Nests are situated on cliff ledges, rocky outcrops, large trees, or human made structures, such as power poles and transmission towers. Most eastside nests are on cliffs; westside nests are above timberline or in very large trees that border on extensive clearcuts. Shrublands and grasslands, open meadows, avalanche chutes, talus fields and rock outcrops, balds, bogs, recently burned areas, and clearcuts are used as hunting sites.

**References**

Bosakowski, T. 2005. Golden eagle (*Aquila chrysaetos)*. Pp 121 – 122 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Kochert, M. N., K. Steenhof, C. L. McIntyre, and E. H. Craig. 2002. Golden eagle (*Aquila chrysaetos*). Birds of North America 684: 1-44.

**Golden Eagle: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Loss, degradation, and fragmentation of shrub-steppe foraging habitat and associated declines in distribution and abundance of major prey species, especially jackrabbits and ground squirrels | Protect and restore habitat; conservation of prey populations | Current insufficient | Both |
| 2 | Energy development and distribution | Collisions at wind energy facilities | Implement measures to minimize mortality risks at wind energy facilities | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## PEREGRINE FALCON (*Falco peregrinus*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species has experienced a remarkable recovery and the population continues to increase across Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Sensitive | Yes | G4 | S2B,S3N | Low/increasing | N/A |

**Biology and Life History**

Peregrine Falcons are predators of other birds ranging in size up to waterfowl and gulls. Peregrine Falcons are generally monogamous, and may form long-term pair bonds. They usually nest on a cliff near water, but as the species recovers and its range expands, they can also be found nesting on human-built structures (e.g. tall buildings, bridges).

Photo: R. LeValley

**Distribution and Abundance**

Breeds up to about 3000 feet in elevation (sometimes higher) in nearly all parts of the state; highest densities are along the northern outer coast and San Juan Islands. Also found in Cascade Range foothills, along the Columbia River and associated with other water bodies in the Columbia Basin. Over 170 breeding territories have been documented as of 2014. This is an uncommon resident, migrant, and wintering species in western lowlands, and rare to uncommon summer resident and migrant in the mountains and eastern lowlands.

**Habitat**
Peregrine Falcons breed on cliffs, and occasionally tall buildings, bridges and other locations that offer security and a vantage point above surrounding terrain. They hunt primarily in areas of open cover types that include estuaries, agricultural fields, coastal beaches, water bodies, and in some urban areas.

**References**
Anderson, C. M. and S. G. Herman. 2005. Peregrine Falcon (*Falco peregrinus*). Pp 126-127 *in* Wahl, T.R., B. Tweit, and S.G. Mlodinow (Eds.), Birds of Washington: status and distribution. Oregon State University, Corvallis, OR, USA. 436 pp.

White, C. M., N. J. Clum, T. J. Cade, and G. Hunt. 2002. Peregrine Falcon (*Falco peregrinus*). The Birds of North America 660: 1-48.

**Peregrine Falcon: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Management decision needs | Population has recovered and appears to be robust | Conduct status review | Nothing current - new action needed | WDFW |

# CRANES

## SANDHILL CRANE (GREATER) (*Grus canadensis tabida*)

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

The Washington population of Greater Sandhill Cranes numbers about 80 adult and sub-adult birds, with about 30 breeding pairs. Sandhill Cranes are long-lived, but have a low reproductive rate, and nests are vulnerable to predators, disturbance, and fluctuating water levels.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G5T4 | S1B,S3N | Critical/increasing | Moderate |

### Biology and Life History

Sandhill Cranes eat insects, rodents, snails, small reptiles and amphibians, nestling birds, the roots of aquatic plants, tubers, berries, seeds, and grains. The courtship of cranes includes elaborate rituals. Pairs return to the same nesting territories year after year and sometimes use the same nest repeatedly. Nests, which are built in emergent vegetation in shallow water or close to water, are a mound of plant material pulled up from around the site and anchored to surrounding vegetation. The young learn migratory routes from adults, and Washington birds migrate to the Central Valley of California. Reproductive rates are low and birds often mate for life.

Photo: R. LeValley

### Distribution and Abundance

This species formerly nested at numerous sites throughout eastern Washington, and was extirpated for about 30 years; they currently breed at about six locations in Klickitat and Yakima Counties. The breeding population in Washington numbers only about 30 pairs, but has been slowly increasing.

### Habitat

Sandhill Cranes live in wet meadows and grasslands, and they feed in grain fields and pastures. Breeding territories contain wetlands, grassy uplands, partially forested uplands, and wet meadows, and are sometimes surrounded by forest. Emergent vegetation is a key component of their preferred nesting areas. During migration and in winter they live in more open grassland, agricultural fields, and river valleys. Sandhill Cranes typically use habitats where they have clear views of their surroundings.

### References

Littlefield, C. D., and G. L. Ivey. 2002. Washington State Recovery Plan for the Sandhill Crane. Washington Department of Fish and Wildlife, Olympia, Washington.

Tacha, T. C., S. A. Nesbitt, and P. A. Vohs. 1992. Sandhill crane (*Grus canadensis tabida*). Birds of North America 31: 1-24.

**Sandhill Crane (Greater): Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Inadequate information needed to manage small population | Aerial surveys of nesting territories | Current insufficient | Both |
| 2 | Resource information collection needs | Assess survival, recruitment | Analysis of banding data to assess recruitment/survival | Current insufficient | External |
| 3 | Agriculture and aquaculture side effects | Nests vulnerable to water-level changes | Enhance effectiveness of water management | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

# SHOREBIRDS

## MARBLED GODWIT (*Limosa fedoa*)

**Conservation Status and Concern**

Due to the extremely small size of the *beringiae* subspecies population and the localized area of foraging and roosting in coastal Washington, the Marbled Godwit is vulnerable to oil spills or other actions that would degrade or impact its habitat. Human disturbance currently does not appear to be a concern.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Low/increasing | Moderate |

**Biology and Life History**

The Marbled Godwit is one of the largest shorebirds in the world. In coastal areas, they use a variety of intertidal invertebrates that are extracted from mudflats. They nest in native prairie grasslands, wet meadows and similar cover types.

Photo: R. LeValley

**Distribution and Abundance**

Three separate breeding regions are known in North America and both *fedoa* and *beringiae* subspecies likely occur in Washington. The *beringiae* subspecies breeds in a small area of the Alaska Peninsula. The estimated global population is 140,000 to 200,000, and this includes the *beringiae* population of about 2,000. The latter subspecies is thought to overwinter between Washington and California, whereas the *fedoa* population from the northern Great Plains overwinters between central California and coastal Mexico. Marbled Godwits occur primarily at Willapa Bay and Grays Harbor. The primary area for the species is northern Willapa Bay (they roost at the Tokeland Marina) and southern Grays Harbor (they roost at Westport). Considered a very rare visitor several decades ago, Marbled Godwit abundance in Washington has increased steadily and some recent counts have exceeded 1500 birds.

### Habitat
Typically associated with tidal mudflats and sandflats, but small numbers at times also use coastal beaches. In the Columbia Basin, where it is very uncommon, short grass areas and shorelines are used.

#### References
Buchanan, J. B. 2005. Marbled Godwit (*Limosa fedoa*). Page 149 *in* T. R.Wahl, B. Tweit, and S.G. Mlodinow (Eds.), Birds of Washington: status and distribution. Oregon State University, Corvallis, OR, USA. 436 pp.
Gratto-Trevor, C. L. 2000. Marbled Godwit (*Limosa fedoa*). The Birds of North America 492: 1-24.

### Marbled Godwit: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Oil spill that impacts foraging area and fouls foraging birds | Maintain spill response effectiveness | | Both |
| 2 | Resource information collection needs | Small population size | Clarify subspecies occurrence in Washington | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## RED KNOT (*Calidris canutus roselaari*)

**Conservation Status and Concern**

Limited information suggests the population has declined; its localized use of food resources in tidal areas along the flyway suggests it will be sensitive to climate change effects.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G4 | S3N | Low/declining | Moderate |

**Biology and Life History**

Red Knots of the subspecies *roselaari* are found in Washington, chiefly during spring migration. Spring migration occurs primarily in May. Red Knots are known to consume a variety of invertebrates, but they are considered bivalve specialists. Red Knots nest in Arctic and sub-arctic tundra where nests are situated on the ground.


Photo: J. Buchanan

**Distribution and Abundance**

The species is very local in its distribution, both in Washington and elsewhere along the flyway. It is found on the outer coast, almost exclusively in Willapa Bay and Grays Harbor; these sites are major stopovers along the Pacific Flyway and likely support a large proportion of the population. The population estimate in coastal Washington is about 17,000, making *roselaari* the least common of six global subspecies and one of the least common sandpipers to use the Pacific Flyway as its primary flyway. This subspecies breeds in northwestern Alaska and Wrangel Island, Russia and overwinters primarily at coastal locations in northwestern Mexico. Limited information suggests a decline in abundance in the last 35 years. Most autumn migrants bypass Washington; very rare in summer and winter, and in any season away from the outer coast.

**Habitat**

Primary foraging habitats include estuarine intertidal mud and sand flats; they will occasionally forage in pastures adjacent to estuaries during high tide. Red Knots roost primarily on sand islands and low marsh shorelines, but they also use sand spits, and rarely sandy beaches or pastures in or near estuaries.

**References**


Chappell, C. B. 2005. Red Knot (*Calidris canutus*). Pp 152-153 in Wahl, T. R., B. Tweit, and S. G. Mlodinow (Eds.), Birds of Washington: status and distribution. Oregon State University, Corvallis, OR, USA. 436 pp.

Harrington, B. A. 2001. Red Knot (*Calidris canutus*). The Birds of North America 563:1-32.

**Red Knot: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Population appears to have declined; more information needed to assess risks, vulnerability, population status | Collect information to address threats | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Oil spill that impacts foraging area and fouls foraging birds | Spill response effectiveness | | Both |
| 3 | Invasive and other problematic species and genes | Spartina removal has been successful, but tideflat elevation has increased due to trapped sediments. This may have altered food resources | Investigate food habits and prey availability; conduct experiments to restore tideflats to former elevation | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## ROCK SANDPIPER (*Calidris ptilocnemis*)

**Conservation Status and Concern**

Studies predicting vulnerabilities of Rock Sandpipers to climate change indicate no change in risk associated with wintering and migration habitats; all breeding habitat exists outside Washington State, and does have expected increased risk associated with climate change.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S3N | Low/unknown | Low-moderate |

**Biology and Life History**

Washington has migratory and wintering populations of Rock Sandpipers. Rock Sandpipers in Washington migrate to breeding sites on Pribilof and St. Matthew islands. In Washington, Rock Sandpipers usually aggregate in small flocks (or as singles), although in Alaska they aggregate in flocks of hundreds or even thousands. As might be indicated by the size and shape of their bill, Rock Sandpipers probe into rocky crevices and do not chip or pry prey from the surface of the rocks.

Photo: A.D. Wilson

**Distribution and Abundance**

Most Rock Sandpipers spend the winter in Alaska and British Columbia, and comparatively small numbers migrate as far south as California. The species is almost completely limited to outer coastal areas. Perhaps fewer than 100 to 200 birds overwinter in Washington, although survey efforts along coastal areas are impractical in many areas, so this estimate is uncertain. The abundance of Rock Sandpipers at Christmas Bird Count locations south of southern British Columbia declined beginning in the early 1980s, and this coincided with increases in abundance in Alaska, which suggested a range contraction.

**Habitat**

The Rock Sandpiper is almost exclusively associated with rocky shoreline habitats. These areas include rock shorelines and rock jetties. They are sometimes found on sand beaches in very small numbers. Large numbers of Rock Sandpipers use mudflats in Alaska and also roost on floating ice there.

**References**

Andres, B. A., P. A. Smith, R. I. G. Morrison, C. L. Gratto-Trevor, S. C. Brown, and C. A. Friis. 2012. Population estimates of North American shorebirds, 2012. Wader Study Group Bull. 119: 178-194.

Galbraith, H., D. W. DesRochers, S. Brown, J. M. Reed. 2014. Predicting vulnerabilities of North American shorebirds to climate change. PLoS ONE 9(9):e108899. Doi:10.1371/journal.pone.0108899

Ruthrauff, D. R. 2014. On the frozen edge: environmental and physiological constraints in the life history of a northerly-wintering shorebird. PhD Thesis, University of Groningen, Groningen, The Netherlands.

### Rock Sandpiper: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information about abundance in Washington | Work with partners on surveys to understand species distribution and abundance | Current insufficient | Both |
| 2 | Resource information collection needs | Trends in populations are unknown | Conduct monitoring and demographic studies on the breeding grounds to understand population trend | Unknown | External |

NOTE: Numbers are for reference only and do not reflect priority.

## UPLAND SANDPIPER (*Bartramia longicauda*)

**Conservation Status and Concern**

Habitat loss most likely contributed to population decline of this species in Washington. Incomplete information on distribution prevents meaningful protection should there be breeding birds in the state. Scarcity of records suggests it may no longer breed in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G5 | SHB | Critical/unknown | Moderate |

**Biology and Life History**

Nests are situated on the ground in wet meadow vegetation where the loosely woven cup of grasses is well concealed. This species is inconspicuous, and is typically detected when giving courtship calls in flight or while on a perch such as a wooden fence post. Upland Sandpipers feed almost exclusively on insects, especially grasshoppers and crickets, weevils, and other small invertebrates gathered from or close to the ground. Occasional seeds of weeds, grasses and waste grains, including wheat, are also consumed.

Photo: G. Lasley

**Distribution and Abundance**

This species may be extirpated as a breeder in the state, although comprehensive surveys in potential habitat away from documented historical breeding areas have not been conducted. As a breeder in eastern Washington, the Upland Sandpiper's known distribution in the state has always been very limited. Breeding was documented at Turnbull NWR and in the Spokane Valley. Regular observations were made in this area from the mid-1950s into the late-1980s. Virtually all habitat in the Spokane Valley has been converted. Migrants are rare in Washington.

**Habitat**

This species nests in wet meadows with relatively tall grasses. During migration, it is found in a variety of open habitats with relatively short or sparse vegetation such as plowed fields, airports, golf courses, beach dunes, and sod farms.

**References**


Houston, C. S. and D. E. Bowen, Jr. 2001. Upland Sandpiper (*Bartramia longicauda*). The Birds of North America 580:1-32.

Mlodinow, S. G. 2005. Upland Sandpiper (*Bartramia longicauda*). Page 145 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Upland Sandpiper: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Need to assess current distribution and abundance of species | Identify areas of habitat within likely range; conduct breeding season surveys | Current insufficient | Both |
| 2 | Resource information collection needs | Protection status of habitat | Need to assess current distribution and protection status of habitat | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN SNOWY PLOVER (*Charadrius alexandrinus nivosus*)

**Conservation Status and Concern**

Washington's population is very small and vulnerable to a variety of impacts such as predation, adverse weather, shoreline modification, dune stabilization, and recreational activities.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Endangered | Yes | G3 | S1 | Low/increasing | Moderate-high |

**Biology and Life History**

Snowy Plovers nest on the ground and leave the n s (or male only), and the female often then abandons its first mate and brood within a few days to renest with a new mate. Predation by gulls, Common Ravens, Red Foxes, skunks, Raccoons, and/or Coyotes may result in a high rate of clutch loss in some areas.

**Distribution and Abundance**

The Pacific coast breeding population extends from Washington to northwestern Mexico; some are found farther south during winter. In Washington, Snowy Plovers are found only in Pacific and Grays Harbor Counties. The Washington population consists of less than 50 adult birds, and is dependent on immigration from Oregon. Populations are responding to intensive conservation efforts, but viability analysis indicates that the Pacific coast population is unlikely to reach the federal recovery objective of 3,000 birds.

**Habitat**

In Washington, Snowy Plovers are found (in any season) primarily above the high tide line on coastal beaches, sand spits, dune-backed beaches, and sparsely vegetated dunes. Nests are on the ground on broad open beaches or salt or dry mud flats, where vegetation is sparse or absent (small clumps of vegetation are used for cover by chicks).

**References**


Pearson, S. F., C. Sundstrom, B. Hoenes, and W. Ritchie. 2014. Washington State Snowy Plover Population Monitoring, Research, and Management: 2013 Nesting Season Research Progress Report. Washington Department of Fish and Wildlife, Olympia, Washington.

USFWS. 2007. Recovery plan for the Pacific coast population of the western snowy plover(*Charadrius alexandrinus nivosus)*. USFWS, Sacramento, California.

WDFW. 1995. Washington State recovery plan for the Snowy Plover. Olympia, Washington.


**Western Snowy Plover: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Human disturbance; beach walkers, pets, cars | Expand efforts to reduce disturbance to areas used by plovers | Current insufficient | Both |
| 2 | Invasive and other problematic species and genes | Nest predation by corvids | Control nest predation; continue ongoing program that uses nest exclosures and other measures | Current sufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Degradation of habitat | Continue programs to enhance nesting habitat by removing beach grass in key areas | Current insufficient | Both |
| 4 | Resource information collection needs | Ongoing surveys and nesting protection measures | Continue annual surveys conducted during breeding and winter periods | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# PIGEONS

## BAND-TAILED PIGEON (*Patagioenas fasciata)*

**Conservation Status and Concern**

The Band-tailed Pigeon population, which is reliant on upland forests and limited mineral sources in western Washington, has declined due to a combination of factors.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G4 | S34B,S4N | Low/declining | Low-moderate |

**Biology and Life History**


Photo: R. LeValley

Band-tailed Pigeons in Washington are presumably monogamous, and most clutches have one egg; however, some pairs may nest up to three times a year depending on weather conditions. In some years, the protozoan *Trichomoniasis gallinae* contributes to increased mortality of Band-tailed Pigeons, and is passed directly from one bird to another through food, water, and other means. Band-tailed Pigeons seek a mineral supplement to their diet of berries, which contains few minerals. Mineral sites are important for Band-tailed Pigeons; they provide needed sodium (and possibly calcium) during the nesting season. The species is site-faithful to breeding areas, which are usually in proximity to mineral sources, but flocks can be nomadic depending on food availability.

**Distribution and Abundance**

Band-tailed Pigeons in Washington are found primarily west of the Cascades during spring and summer. Direct population estimates of Pacific coast Band-tailed Pigeons are extremely difficult to obtain because of poor visibility and inaccessibility at use sites. Breeding Bird Survey results indicate that the trend since 1968 has decreased two percent per year; results of a mineral site survey since 2003 have been inconclusive. Population declines have led to very restrictive hunting regulations since 1990 in the Pacific coast states, and the season was closed in Washington from 1991 to 2001. The size of Washington's breeding population is unknown.

**Habitat**

Band-tailed Pigeons nest primarily in conifers, occasionally in hardwoods and shrubs, within closed canopy conifer, or mixed hardwood and conifer forests. Food resources include berry- and nut-producing trees and shrubs such as cascara, elderberry, wild cherry, huckleberry, and madrone. Habitats for Band-tailed Pigeons have been influenced by timber harvest and management of clearcuts to reduce forage species. Less than 40 mineral sites used by Band-tailed Pigeons have been identified in Washington, and many are in private ownership without protection from loss or degradation.

**References**

Pacific Flyway Council 2010. Pacific Flyway management plan for the Pacific Coast population of band-tailed pigeons. Pacific Coast Band-tailed Pigeon Subcommittee, Pacific Flyway Study Committee [c/o USFWS], Portland, Oregon.

### Band-Tailed Pigeon: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Management decision needs | Effects of timber management practices | Promote use of best management practices (PHS) by timber companies | Current insufficient | Both |
| 2 | Resource information collection needs | Unknown use of alternate mineral sites | Conduct telemetry study to document new mineral sites and understand spatial context of site use | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Loss of foraging habitat due to broadleaf / shrub suppression in managed forests | Research to quantify forage distribution, abundance, and trends | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Loss of mineral sites due to development | Protect existing mineral sites using a variety of strategies | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# CUCKOOS

## YELLOW-BILLED CUCKOO *(Coccyzus americanus)*

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species is not known to have bred in Washington since about 1940 and has been a very rare migrant and summer resident since then. Recovery efforts are probably best directed at remnant nesting habitats still occupied in the southwest U.S.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Candidate | Candidate | Yes | G5 | SH | Extirpated/declining | Moderate |

**Biology and Life History**

A migratory species, Yellow-billed Cuckoos begin arriving in western North America in mid- to late May. Most nesting occurs between June and early August, but can extend from late May until late September. This species usually builds its own nests and cares for its own young. In the west, nests are often placed in willows, cottonwoods, and shrubs. Two clutches may be laid in years of good food supply. Females occasionally lay their eggs in the nests of other birds. Diet consists mainly of large insects such as caterpillars, grasshoppers, katydids, beetles, and crickets, with small vertebrate prey also taken.

Photo: US Forest Service

**Distribution and Abundance**

Yellow-billed Cuckoos nest across much of the eastern and central U.S. and parts of Canada, Mexico, and the Caribbean, and overwinter in the northern three-quarters of South America. Breeding also once occurred over much of the western U.S., but is now largely restricted to a few areas of the Southwest after major population declines. The species formerly bred uncommonly in parts of western Washington, but is now a very rare migrant statewide, with single records in four years between 2000 and 2014. Breeding probably ended in the state by about 1940.

**Habitat**

Yellow-billed Cuckoos display a strong preference for large, continuous riparian zones with cottonwoods and willows. In Washington, nesting also took place in fir woodlands and open brushy hillsides.

**References**

Tweit, B. 2005. Yellow-billed cuckoo *(Coccyzus americanus)*. Page 210 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow(eds.). Birds of Washington: status and distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

USFWS. 2013. Endangered and threatened wildlife and plants; proposed threatened status for the western distinct population segment of the yellow-billed cuckoo (*Coccyzus americanus*). Federal Register 78:61622-61666.

**Yellow-Billed Cuckoo: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Document records of Yellow-billed Cuckoo occurrence in Washington | Continue working with the birdwatching community to continue documenting sightings of cuckoos in Washington | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Loss and degradation of riparian forests are a broad problem across the west | No management activities targeting this species are currently conducted due to its scarcity in the state, although broader efforts to protect and restore riparian forests would perhaps be beneficial | Nothing current - new action needed | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# OWLS

## BURROWING OWL (*Athene cunicularia*)

**Conservation Status and Concern**

This species is associated with shrub-steppe and grassland habitats and has experienced a contraction of its range and possible decline in numbers due to loss of native grassland and shrub-steppe and eradication of burrowing mammals such as ground squirrels, Yellow-bellied Marmots, and American Badgers.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S2B | Low/declining | Low-moderate |

**Biology and Life History**

Burrowing Owls are migratory, although some regularly overwinter in Washington. It is an uncommon breeder in eastern Washington and is extremely rare during migration in western Washington. Burrowing Owls are dependent upon abandoned burrows created by mammals for nesting, food caching and roosting in shrub-steppe and grasslands. Each spring, pairs return to the same burrows they inhabited previously, if still available, and defend the immediate area around the burrow entrance from other Burrowing Owls.

Photo: R. LeValley

Perches are important for the early detection of predators and potential prey. Diet includes small mammals and insects.

### Distribution and Abundance

Burrowing Owls may be declining in Washington (based on Breeding Bird Survey data). The size of Washington's breeding population is unknown.

### Habitat

Burrowing Owls are inhabitants of shrub-steppe and steppe and use abandoned mammal burrows for nesting. Habitats include open grasslands, especially prairie, plains, and savanna, sometimes other open areas such as vacant lots near human habitation or airports. This owl spends much time on the ground or on low perches such as fence posts or dirt mounds.

#### References

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing owl (*Speotyto cunicularia*). Birds of North America 61: 1-20.

WDFW. 2013. Threatened and Endangered Wildlife in Washington: 2012 Annual Report. Washington Department of Fish and Wildlife, Olympia.

### Burrowing Owl: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion of grasslands destroys nesting burrows and foraging habitat, degrades habitat quality, and may increase vulnerability to predators | Work with land owners to restore native vegetation and conserve local populations of burrowing mammals around breeding colonies of owls. Implement voluntary agreements and conservation easements to conserve habitat | Current insufficient | Both |
| 2 | Overharvesting of biological resources | Decline in burrowing mammals due to poisoning, trapping, shooting | Reduce persecution of burrowing mammals through regulation, outreach and education | Current insufficient | Both |
| 3 | Resource information collection needs | Unknown abundance and population trend | Conduct surveys to assess status and trends | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## FLAMMULATED OWL (*Otus flammeolus*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

Flammulated Owls are probably impacted by habitat loss (and degradation) and fire suppression in dry forest landscapes.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S3B | Low/unknown | Moderate-high |

**Biology and Life History**

The Flammulated Owl is the only Neotropical migrant owl in North America. It breeds in western North America and migrates to Mexico and Guatemala. In Washington, it is found in dry forests where pairs occupy small territories. Prey items are generally dominated by insects, including moths. The maximum recorded longevity of a Flammulated Owl in the wild is about seven to eight years. Rates of nest success and productivity in Washington are not known.

Photo: J. Patterson

**Distribution and Abundance**

This species appears to be uncommon and is found in ponderosa pine and other dry forest regions on the eastern slope of the Cascade Range, the Kettle Range, Selkirk Mountains, and Blue Mountains. Surveys conducted in Washington found the species most often in ponderosa pine and dry Douglas-fir forests, but also in other forest types. Studies from other parts of the species' range have concluded the species may be somewhat more common than originally thought. The size of Washington's breeding population is unknown.

**Habitat**

Most strongly associated with mid- and late-seral ponderosa pine forests with an open canopy cover, a presence of cavity trees or snags, and at least some areas of dense foliage (perhaps used as protective cover) within an otherwise generally open understory.

**References**


Buchanan, J. B. 2005. Flammulated Owl (*Otus flammeolus*). Pp 211-212 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

McCallum, D. A. 1994. Flammulated Owl (*Otus flammeolus*). The Birds of North America 93:1-24.

**Flammulated Owl: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Effects of fire suppression | Develop and implement dry forest management and restoration programs | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Loss of ponderosa pine forest (and other dry forests) | Promote protection and effective management of dry forests using a variety of tools | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## GREAT GRAY OWL (*Strix nebulosa*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

Little is known about this species, and although impacts and range contraction may have occurred over the last century, current threats and impacts are not understood.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S2B | Low/unknown | Moderate-high |

**Biology and Life History**

This is one of the least-studied owl species in Washington. Research in other regions indicates that the diet of this forest-dwelling owl is dominated by voles and pocket gophers. Most Great Gray Owls breed by three years of age, although some pairs may not breed in years of low prey abundance.

Photo: A. List

**Distribution and Abundance**

This is a rare local breeder in parts of northern Washington such as the Okanogan Highlands (and perhaps other locations), and a rare winter visitor elsewhere in the state, occasionally including lowland areas. Records from a century ago suggest the species formerly nested at low elevations in western Washington. The population in Washington is very small (likely fewer than 20 to 40 territories) and is thought to be stable.

**Habitat**

Mature conifer forests of Douglas-fir, western larch, ponderosa pine, Engelmann spruce, subalpine fir, and lodgepole pine adjacent to foraging areas in openings and wet meadows, sometimes in association with quaking aspen, are cover types used by this species. Great Gray Owls nest in broken-topped snags, clusters of mistletoe-infected branches, and nests built by other species (for example, Northern Goshawk).

**References**

Anderson, C. M. and K. Woodruff. 2005. Great Gray Owl (*Strix nebulosa*). Pp 219-220 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Bull, E. L. and J. R. Duncan. 1993. Great Gray Owl (*Strix nebulosa*). The Birds of North America 41:1-16.

**Great Gray Owl: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Recent threats not clear | Conduct surveys of habitat and owls to increase knowledge | Current insufficient | External |

## NORTHERN SPOTTED OWL (*Strix occidentalis caurina*)

**Conservation Status and Concern**

Impacts from habitat loss of mature forest are now exacerbated by effects of competition with Barred Owls for prey and habitat. As the population declines and becomes even smaller, other threat factors may become more relevant.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Endangered | Yes | G3T3 | S1 | Low/declining | High |

**Biology and Life History**

The Northern Spotted Owl is relatively long-lived, has a long reproductive life span, invests significantly in parental care, and exhibits high adult survivorship. The majority of pairs do not breed every year. Courtship usually begins in February or March, and females typically lay eggs in late March or April. Northern Spotted Owls have large home ranges and in those areas use a number of prey species, chief among them the Northern Flying Squirrel, but also Bushy-tailed Woodrats, Snowshoe Hares and other small mammals. Spotted Owls are at a competitive disadvantage to the more generalist Barred Owl which has expanded its range to now include the entire distribution of the Northern Spotted Owl.

Photo: R. LeValley

**Distribution and Abundance**

Formerly a widespread and uncommon resident of coniferous forests in western Washington and the east slope of the Cascade Range, the Northern Spotted Owl is now rare throughout Washington. It has been very rare in southwestern Washington for several decades and no longer breeds in the Puget Lowlands. The population of Northern Spotted Owls in Washington continues to decline, and some landscapes where long-term monitoring has been conducted now support several or fewer pairs. About 1,200 territories have been documented in Washington; trend data suggest that perhaps 25 percent or less of these remain occupied.

**Habitat**

The Northern Spotted Owl inhabits mid- and late-seral coniferous forests. Typical habitat characteristics include: generally high canopy closure; complex canopy structure involving trees of multiple age or size classes; large decaying trees and/or snags; and, in most forest areas, a high volume of downed wood. The presence of mistletoe infection is important in the eastern Cascade Range. The species occurs up to about 5,000 feet in elevation.

**References**

Buchanan, J. B. 2005. Spotted Owl (*Strix occidentalis*). Pp 217-218 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Gutiérrez, R. J., A. B. Franklin, and W. S. LaHaye. 1995. Spotted Owl (*Strix occidentalis*). The Birds of North America 179:1-28.

**Northern Spotted Owl: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species and genes | Competition with Barred Owls | Management of Barred Owl population to reduce competition | Current insufficient | External |
| 2 | Fish and wildlife habitat loss or degradation | Loss of habitat | Continue existing habitat protection measures and develop incentives to protect habitat on private lands | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SHORT-EARED OWL *(Asio flammeus)*

**Conservation Status and Concern**

This species is thought to be experiencing a range-wide, long-term decline in North America. The primary threats are the loss, fragmentation and degradation of habitat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | S23B,S3N | Low/unknown | N/A |

**Biology and Life History**

These are probably the most diurnal of owls and may be active from late afternoon until nightfall, or at dawn, also hunting at night. When Short-eared Owls find areas of especially abundant resources they may breed in large numbers and produce super-normal clutches.

Photo by S. Garvie

**Distribution and Abundance**

This is an uncommon winter visitor, migrant, and summer resident in open lowland habitats in eastern Washington, with a much more restricted distribution in western Washington where breeding is considered rare. In western Washington, they are now scarce or absent in many areas where formerly encountered (e.g. estuaries, prairies, coastal dunes). Similarly, in eastern Washington they are uncommon, although comprehensive trend data are lacking. Populations of Short-eared Owls are naturally irruptive and nomadic, compounding the difficulty in detecting population changes. There is no population estimate for this species in Washington.

**Habitat**

Short-eared Owls breed in landscapes with extensive areas of open land with low vegetation. Cover types used include fresh and saltwater marshes, dunes, prairies, grassy plains, old fields, and meadows. Breeding habitat may also be occupied by wintering birds. Short-eared Owls tend to congregate and roost communally in the winter, often in sheltered sites near hunting areas.

**References**

Booms, T. L., G. L. Holroyd, M. A. Gahbauer, H. E. Trefry, D. A. Wiggins, D. W. Holt, J. A. Johnson, S. B. Lewis, M. D. Larson, K. L. Keyes, and S. Swengel. 2014. Assessing the status and conservation priorities of the short-eared owl in North America. Journal of Wildlife Management 78: 772-778.

Wahl, T. R. 2005. Short-eared Owl (*Asio flammeus*). Pp 221-222 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Short-Eared Owl: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat is converted, degraded or fragmented | Evaluate and determine the need to actively manage for Short-eared Owls | Current insufficient | WDFW |
| 2 | Resource information collection needs | Need for rigorous inventory and monitoring of species | Implement monitoring program, potentially in conjunction with other states | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN SCREECH OWL (*Otus kennicottii macfarlanei*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

This species appears to have been impacted by the presence of Barred Owls in western Washington. More information is needed to assess whether its population has declined or if suspected changes reflect only a behavioral response to Barred Owls.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | S4 | Unknown/unknown | Low-moderate |

**Biology and Life History**

This small resident owl is strongly associated with coniferous forests although other forest types are also used. It preys mainly on small mammals (mice and shrews), birds and insects. Clutch size averages three to four eggs. Incubation is about 26 days.

Photo: R. Magnuson

**Distribution and Abundance**

This owl was formerly a fairly common resident statewide except in the Columbia Basin. There are no population estimates, but this species' population likely ranged in the tens of thousands as recently as the 1980s. Recent surveys in southwestern Washington and published information from Bainbridge Island and British Columbia indicate it has either experienced a substantial population decline or has changed its vocalization behavior (i.e., reducing its detectability), likely due to increased predation risk by Barred Owls. Other information regarding the abundance or distribution of this species is lacking and population status is unknown.

## Habitat

This species is found in many forest types, from urban to rural and including riparian zones and forests dominated by Douglas-fir, western hemlock, Sitka spruce and grand fir. They are virtually absent from the Columbia Basin but should be expected to occur there if suitable conditions develop along riparian zones or in small woodlots near human dwellings.


### References

Buchanan, J. B. 2005. Western Screech Owl *(Otus kennicottii).* Pp 212-213 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Cannings, R. J. and T. Angell. 2001. Western Screech Owl (*Otus kennicottii*). The Birds of North America 597:1-20.

Elliott, K. 2006. Declining numbers of Western Screech-owl in the lower mainland of British Columbia. British Columbia Birds 14: 2-11.


### Western Screech Owl: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species and genes | Potential impacts from Barred Owls | Management of Barred Owl population to reduce predation risk | Nothing current - new action needed | External |
| 2 | Invasive and other problematic species and genes | Potential impacts from Barred Owls | Conduct surveys to evaluate species response to Barred Owl presence or removal | Nothing current - new action needed | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# WOODPECKERS

## LEWIS' WOODPECKER *(Melanerpes lewis)*

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species may be impacted by habitat loss and effects of fire suppression practices. Intensive salvage harvest of trees in recently-burned forest may preclude or limit breeding in such areas. Historically, breeding records included many areas in western Washington, but there have been no breeding records in that region for decades.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S2S3 | Low/declining | Low-moderate |

**Biology and Life History**

Lewis' Woodpecker prefers snags of advanced decay and softer woods (e.g., cottonwood, aspen) for nesting. This species rarely drills bark, as it lacks the physical structural integrity to excavate or forage in harder woods. Its main diet is insects in spring and summer, fruit and berries in late summer/fall, and conifer seeds and acorns in winter. They are strongly site-faithful, and a life-long pair bond is suspected.


Photo: Wikimedia Commons

**Distribution and Abundance**

This species is uncommon in summer and generally rare in winter in eastern Washington. It is rare in western Washington. Many individuals from Washington appear to move southward for the winter. Breeding Bird Survey data indicate only a slight decline between 1999 and 2009. Breeding season territories reported to vary between 2.5 to 15 acres in the Blue Mountains. Foraging ranges broadly overlap and large numbers may forage together where there is a local abundance of food. The size of Washington's breeding population is unknown.

**Habitat**

Lewis' Woodpecker is typically restricted to lower elevation forests. It breeds in tree cavities in ponderosa pine forests and oak woodlands with open canopy (e.g. less than 30 percent canopy cover), as well as riparian cottonwood with a brushy undergrowth (e.g., sage brush, bitterbrush) and larger (greater than 20 inches diameter at breast height) snags of late decay stages. In addition, it often nests in burned forest. Birds that overwinter in eastern Washington are often associated with oak woodlands and commercial orchards. During winter, food supply is the most important aspect of habitat selection, and is dependent on conifer seed, mast and nut production.

**References**
Lewis, J. C., M. Whalen, and E. A. Rodrick. 2002. Lewis' Woodpecker. Priority Habitats and Species, Vol. IV: Birds. Washington Dept. of Fish and Wildlife, Olympia, Washington.
Tobalske, B. W. 1997. Lewis' Woodpecker. Birds of North America 284: 1-28.
Zhu, X., D. S. Srivastava, J. N. M. Smith, and K. Martin. 2012. Habitat selection and reproductive success of Lewis' woodpecker (*Melanerpes lewis*) at its northern limit. PloS ONE 7(9): e44346. DOI: 10.1371/journal.pone.0044346

**Lewis' Woodpecker: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion to agriculture and development. Habitat fragmentation may isolate remaining populations. Urban-wildland interface and clearing of forest habitats (cottonwood, low elevation ponderosa pine) in/near human habitation | Use land acquisitions, conservation easements and landowner agreements to protect habitat. Work with county planners to establish buffers for habitat. Work with landowners to reduce the density of younger trees in ponderosa pine forests; in some areas this will enhance oak development | Nothing current - new action needed | Both |
| 2 | Fish and wildlife habitat loss or degradation | Unknown population size and extent | Understand and map forest burned areas, low elevation open pine stands and cottonwoods to determine source habitats and landscapes | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Loss of mature and old trees with cavities harvested and snag habitat felled for safety reasons | Restore open ponderosa pine conditions that mimic natural fire regimes; maintain and recruit large-diameter snags; retain large live cottonwoods | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WHITE-HEADED WOODPECKER (*Picoides albolarvatus*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

White-headed Woodpeckers are probably impacted by habitat loss (and degradation) and fire suppression in dry forest landscapes.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S2S3 | Low/declining | Low-moderate |

**Biology and Life History**

This species has been considered by some to be an obligate of ponderosa pine (or other long-needle pine) forests, but in some cases it has been associated with other forest types. Pine seeds are a major part of its diet, especially in fall and winter. They also consume a variety of insects and other invertebrates. White-headed Woodpeckers use both live and dead trees for foraging and nesting. In some areas, individuals may descend to lower elevations during winter, and this is reflected in annual home range estimates some of which exceed several hundred acres.

Photo: R. Gilbert

**Distribution and Abundance**

White-headed Woodpeckers occupy dry forests in the eastern Cascade Range; also found east of the Okanogan River and in the Blue Mountains. Except for a small area in southern British Columbia, northern Washington represents the northwestern extent of the species' range. It is uncommon, and a population estimate is not available.

**Habitat**

This species uses conifer forests dominated by ponderosa pine, Douglas-fir, and occasionally other tree species such as aspen. Most areas are characterized by wide tree spacing, which produces an open canopy. The species was associated with large-diameter trees and snags in some studies, but recent work also indicates use (including nesting) of smaller trees and snags retained in clearcut harvest units.

**References**

Garrett, K. L., M. G. Raphael, and R. D. Dixon. 1996. White-headed Woodpecker (*Picoides albolarvatus*). Birds of North America 252:1-24.

Leach, R. H. 2005. White-headed Woodpecker (*Picoides albolarvatus*). Pp 239-240 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**White-Headed Woodpecker: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Effects of fire suppression | Develop and implement dry forest management and restoration programs | Current insufficient | Both |
| 2 | Resource information collection needs | Dry forest management and restoration needs | Evaluate response of species to dry forest management and restoration efforts | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Loss of ponderosa pine forest (and other dry forests) | Promote protection and effective management of dry forests using a variety of tools | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# PERCHING BIRDS

## LOGGERHEAD SHRIKE (*Lanius ludovicianus)*

*See Appendix B for a range and potential habitat distribution map

### Conservation Status and Concern

This species is strongly associated with shrub-steppe in Washington and has likely experienced a population decline in accordance with loss and conversion of shrub-steppe habitat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S3B | Low/stable | Low-moderate |

Photo: R. LeValley

### Biology and Life History

The Loggerhead Shrike is a predator of lizards, small mammals, small birds, and insects. It impales prey on thorns and barbed wire fences; prey may be left at such sites for later consumption. Loggerhead Shrikes have small territories, but are generally found in low densities. They hunt by watching from high perches, then flying swiftly down after prey.

### Distribution and Abundance

This species is a local summer resident in eastern Washington; it is rare there during winter. There are no population estimates for the species in Washington. The size of Washington's breeding population is unknown. Breeding Bird Survey data indicate a slight but non-significant downward trend in Washington for the period 1966 to 2012.

### Habitat

The species breeds in open country, including shrub-steppe and grasslands where there are scattered tall shrubs, fence posts, utility wires, or other lookout posts. Loggerhead Shrikes generally nest in dense, thorny trees or shrubs.

#### References


Wahl, T. R. 2005. Loggerhead Shrike (*Lanius ludovicianus*). Pp 254-255 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). The Birds of North America 231:1-28.


### Loggerhead Shrike: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion of shrub-steppe habitat; most of impact has already occurred; amount of continuing impact uncertain | Restoration of degraded or lost habitat; protection of existing habitat | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Loss of sagebrush from wildfire | Reduce wildfire risk and prevent establishment of exotic plant species after fires | Current insufficient | Both |
| 3 | Resource Information needs | Unknown if Breeding Bird Surveys results accurately reflect actual Washington population trend | Conduct comprehensive surveys | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## OREGON VESPER SPARROW (Pooecetes gramineus affinis)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

Due to loss and degradation of habitat this subspecies is now in danger of extirpation in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5T3 | S1B | Low/declining | Low-moderate |

**Biology and Life History**

Oregon Vesper Sparrows breed in dry grassland and open habitats (e.g., lowland prairies, some airfields) in western Washington. They build a bulky, loose, cup-like nest of grasses and rootlets on the ground in a small depression, often near the base of a grass clump, weed, or shrub. The female typically lays three to five eggs in mid-May, and incubates them for 11 to 13 days. The young fledge in 7 to 12 days, and pairs commonly raise two broods per season. They are often seen in loose flocks before fall migration.

Photo: ODFW

**Distribution and Abundance**

The Oregon Vesper Sparrow subspecies (*P. g. affinis*) has a restricted breeding range that includes southwestern British Columbia, western Washington, western Oregon, and northwestern California. It is migratory and overwinters from central California west of the Sierra Nevadas to northwestern Baja California, Mexico. It is now mainly limited in Washington to remnant prairies and grasslands in Pierce and Thurston Counties, with smaller numbers on islands in the lower Columbia River and grasslands on San Juan Island; a few may still breed in eastern Clallam County and near Shelton (Mason County). The size of Washington's breeding population is probably less than 500 individuals.

**Habitat**

Breeding territories at Joint Base Lewis-McChord were in areas of high-quality prairie supporting intact Idaho fescue near prairie edges. Prairie size appears to be an important factor in site selection, with only large prairies occupied now. In western Oregon, they use areas with extensive grass and weed cover, or in lightly grazed pastures with scattered shrubs and grass heights of less than one to two feet tall.

**References**


Altman, B. 2011. Historical and current distribution and populations of bird species in Prairie-Oak habitats in the Pacific Northwest. Northwest Science 85:194-222.

Mlodinow, S. G. 2005. Vesper Sparrow *Pooecetes gramineus.* Pp 326-327 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

Smith, M. R., P. W. Mattocks, Jr., and K. M. Cassidy. 1997. Breeding birds of Washington state: location data and predicted distribution. *In* Cassidy, K. M., C. E. Grue, M. R. Smith, and K. M. Dvornich (eds.). Washington state GAP analysis- final report. Vol. 4 Seattle Audubon Society Publications in Zoology No. 1, Seattle, Washington.

**Oregon Vesper Sparrow: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion to agriculture and development. Habitat loss isolates remaining populations | Use land acquisitions, conservation easements and landowner agreements to protect habitat | Current insufficient | Both |
| 2 | Invasive and other problematic species and genes | Invasive Scot's broom and native conifer forest succession (due to alteration of prairie fire regime) | Restore and manage degraded habitat at prairies; use prescribed fire where possible; coordinate with airport vegetation management | Current insufficient | Both |
| 3 | War, civil unrest and military exercises | Military training exercises disturb nesting and degrades habitat | Work with Joint Base Lewis-McChord to develop management plan for known breeding habitat | Current insufficient | Both |
| 4 | Outreach and education | Recreational use of prairies; vegetation management (e.g. mowing airports) | Public outreach/education and coordination | Current insufficient | Both |
| 5 | Invasive and other problematic species and genes | Increased predation pressure from encroaching urbanization (domestic and feral cats) | Assess impacts of predation by cats, and assess need for, and approach to, effectively address this risk factor | Current insufficient | Both |
| 6 | Agriculture and aquaculture side effects | Potential herbicide and pesticide effects | Education/outreach | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## PURPLE MARTIN *(Progne subis)*

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The population of Purple Martins in Washington is very small and is essentially dependent on humans to provide nest structures, a relationship that likely has not changed since European settlement. Consequently, persistence of the population likely requires ongoing human intervention (e.g. erecting and maintaining nest structures).

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3B | Low/stable | Low-moderate |

**Biology and Life History**

Purple Martins are aerial insectivores and nest in cavities. They nest almost exclusively in human-made nest structures (e.g. nest boxes and gourds). Females lay four to five eggs and incubation lasts for 15 to 18 days. The young leave the nest at 28 to 29 days, and are fed by the parents for several more days.

Photo: Wikimedia Commons

**Distribution and Abundance**

Purple Martins are found throughout much of eastern North America and along the Pacific coast. In Washington, they are found in much of the Puget Trough, Grays Harbor, Willapa Bay and the lower Columbia River; they are rare elsewhere. They migrate to the Neotropics for the winter. It is thought that their presence and abundance in Washington was facilitated by availability of nests associated with humans. The population is estimated at about 600, with 400 in the Puget Trough and 200 along the Columbia River; comprehensive monitoring is required to refine this population estimate.

**Habitat**

Purple Martins are secondary cavity users; they do not create their own. Most nests are situated in the marine environment (e.g. nest cavities in pilings or nest structures attached to pilings), and they nest less commonly at lakes and marshes. They rarely nest in snags or in uplands.

**References**

Brown, C. R. 1997. Purple Martin (*Progne subis*). The Birds of North America 287: 1-32.

Kostka, S. and K. McAllister. 2005. Purple Martin (*Progne subis*). Pp 269-270 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Purple Martin: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| | Resource information collection needs | Reliable information on population size and trend | Develop a comprehensive monitoring program to monitor the population | Current insufficient | Both |

## PYGMY NUTHATCH *(Sitta pygmaea)*

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Pygmy Nuthatch is a species of concern because of its dependence on old ponderosa pine forests to provide suitable nesting cavities in dead and decadent trees and a year-round food source of pine seed. Certain timber management practices and fire suppression have altered the structure and species composition of ponderosa pine forests.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | Yes | G5 | S3S4 | Low/unknown | Moderate-high |

**Biology and Life History**

Pygmy Nuthatches are one of only a few cooperatively breeding songbirds in North America. During the breeding season, about a third of the pairs have up to three helpers at the nest. These helpers are usually related males, often offspring from the previous year, and help defend the nest site and raise the young. Pairs form long-term bonds and remain paired year round. Pygmy Nuthatches are cavity nesters. They nest and roost in natural cavities and woodpecker holes. Winter flocks roost together in cavities. Both members of the pair dig the nest hole in a dead branch or snag of a ponderosa pine or aspen. The nest hole is lined with bark strips, plant down, moss, cocoons, fur, and feathers. Pygmy Nuthatches forage primarily on insects during the breeding season and on pine seed and insects in winter.

Photo: R. LeValley

**Distribution and Abundance**

This species is an uncommon resident in northeastern counties and along the east slope of Cascades, and in the Blue Mountains**.** Breeding Bird Survey data from 1966 to 2013 and from 2003 to 2013 indicate stable trends in the Great Basin province, all western USA routes combined, Washington, Oregon, California, and British Columbia; data confidence is high for California and western USA routes combined and moderate for all other areas. The size of Washington's breeding population is unknown.

**Habitat**

The Pygmy Nuthatch is restricted almost completely to ponderosa pine forests at low elevation in eastern Washington, and may be rarely found in adjacent Douglas-fir forest.

**References**

Leach, R. H. 2005. Pygmy Nuthatch (*Sitta pygmaea*). Pp 281-282 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Pygmy Nuthatch: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Agriculture and aquaculture side effects | Forest managementLogging, fire suppression and commercial and residential development that removes or degrades mature ponderosa pine habitat | Protect existing habitat using a variety of conservation tools. Restore degraded pine forests by reducing the density of smaller trees and understory vegetation | Current insufficient | Both |
| 2 | Resource information collection needs | Better define the range of the species | Conduct standard surveys to better define range | Current insufficient | Both |
| 3 | Resource information collection needs | Information lacking for trends of population | Recruit volunteers to enable inclusion of additional BBS routes to increase reliability of data for Washington | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SAGE THRASHER (*Oreoscoptes montanus*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This sagebrush obligate is vulnerable to population declines and range contractions due to loss or degradation of shrub-steppe habitat. Loss of shrub-steppe to conversion and fire, and degradation of habitat due to cheatgrass invasion and intensive livestock grazing are impacts.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S2B | Low/declining | Moderate-high |

**Biology and Life History**

The Sage Thrasher is a short-distance migrant with individuals arriving in eastern Washington by late March. Builds nest mostly in big sagebrush or three-tip sagebrush below the densest part of the shrub to provide concealment from aerial predators. Sage Thrashers may raise two broods annually.

Photo: M. Vander Haegen

**Distribution and Abundance**

This species is found throughout the Columbia Basin, primarily in areas with a substantial amount of sage. In those limited areas the species is a common breeder. Sage Thrashers are not present in Methow Valley and are locally distributed and uncommon in Okanogan Valley. Breeding Bird Survey data indicate downward trends at the scale of the Great Basin and individual states (Idaho, Nevada, Oregon and Utah) from 1966 to 2013, although the trend in Washington was stable, where reliability was moderate compared to high reliability in all other states and the province. In the period 2003 to 2013 the trend was stable in all states noted above and the Great Basin. The size of Washington's breeding population is unknown.

**Habitat**

Sage Thrashers are generally dependent on large patches and expanses of sagebrush for breeding, but will use small fragments of sagebrush among agricultural fields. This species does not use other habitats for foraging or nesting, but sometimes uses other habitats during dispersal and migration.

**References**

Reynolds, T. D., T. D. Rich, and D. A. Stephens. 1999. Sage Thrasher (O*reoscoptes montanus*). Birds of North America 463: 1-24.

Vander Hagen, W. M. 2005. Sage Thrasher (O*reoscoptes montanus*). Pp 299 - 300 *in* T. R. Wahl, B. Tweit, and S. G. Mlodinow (eds.) Birds of Washington: Status and Distribution. Oregon State University Press, Corvallis, OR, USA. 436 pp.

**Sage Thrasher: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat loss and fragmentation to residential development, burning, and herbicide and pesticide treatments | Protect habitat; control cheatgrass; identify degraded habitat for restoration | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Habitat loss and fragmentation to agricultural conversion, burning, herbicide and pesticide treatments | Protect habitat; identify degraded habitat for restoration; evaluate CRP leases to provide functional habitat on private lands | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Habitat degradation due to intensive grazing by livestock | Develop and promote best management practices for grazing in shrub-steppe habitat; protect habitat; control cheatgrass; identify degraded habitat for restoration; identify ways to reduce intensive grazing pressure; evaluate CRP leases to provide functional habitat on private lands | Current insufficient | Both |
| 4 | Invasive and other problematic species and genes | Invasion by cheatgrass and other exotic plants degrades the ecological integrity of the habitat | Control cheatgrass; identify degraded habitat for restoration; evaluate CRP leases to provide functional habitat on private lands | Current insufficient | Both |
| 5 | Resource information collection needs | Need to assess ecological integrity of existing shrub-steppe for Sage Thrasher | Conduct studies on use of sagebrush patches in landscapes of differing patchiness to support design of conservation strategy | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SAGEBRUSH SPARROW (*Artemisiospiza nevadensis*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The Sagebrush Sparrow is a species of concern because large expanses of big sagebrush, its preferred habitat, have been lost or degraded.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3B | Low/declining | Moderate-high |

**Biology and Life History**

This is a sagebrush obligate species, typically associated with big sagebrush in eastern Washington. Most males arrive on the breeding grounds already paired and begin singing from the tops of sagebrush to establish and defend a breeding territory. Nest building begins in mid-March, typically within or under a big sagebrush shrub. While the male sings to defend the territory, the female builds an open cup nest and lays three eggs that she will incubate for 10 to 16 days. After eggs hatch, the young usually leave the nest in 9 to 10 days. Most females raise two broods per year. Females that are successful at raising young typically return to the same site in successive years. During the breeding season, they forage on the ground for insects, spiders, small fruits and seeds. During the non-breeding season, diet includes seeds, plant material and insects.

Photo: M. Vander Haegen

**Distribution and Abundance**

The Sagebrush Sparrow prefers sagebrush/bunchgrass shrub-steppe landscapes of the Columbia Basin and is an uncommon migrant and summer resident in shrub-steppe of eastern Washington. This sparrow migrates to overwintering areas between central California and central Nevada, south to northern Mexico. Trends in the Great Basin and in individual states (Nevada, Utah) since 1966 are stable, as is the trend in Washington; however, the Washington trend is based on a small sample that may not be reliable. Declining trends have been reported in Idaho (moderate reliability) and Oregon (high reliability). There is no population estimate for Washington.

**Habitat**

This species' preferred habitat is big sagebrush. Sagebrush Sparrows appear to be sensitive to patch size, and probability that they will use a site is higher in areas with large expanses of unconverted shrub-steppe, typically areas greater than 2,500 acres.

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**Sagebrush Sparrow: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat loss and fragmentation | Protect core areas of habitat; identify degraded habitat for restoration and establish connectivity between core areas | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Habitat loss and fragmentation due to agricultural conversion | Protect and restore habitat; evaluate CRP leases to provide functional habitat on private lands | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Habitat degraded by intensive grazing | Outreach; develop and promote best management practices | Current insufficient | Both |
| 4 | Invasive and other problematic species and genes | Habitat degradation | Identify degraded habitat for restoration; control cheatgrass | Current insufficient | Both |
| 5 | Resource information collection needs | Landscape-level habitat use | Conduct studies on use of sagebrush patches in landscapes of differing patchiness and connectivity | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SLENDER-BILLED WHITE-BREASTED NUTHATCH (*Sitta carolinensis aculeata*)

**Conservation Status and Concern**

This species is of concern due to its dependence on large, mature oak trees to provide nest cavities and food and the fragmentation of oak trees from agriculture and residential development.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5TU | S1 | Critical/declining | Low-moderate |

**Biology and Life History**

The Slender-billed White-breasted Nuthatch often uses naturally occurring cavities, including those made by woodpeckers, in living trees for roosting and nesting. Individuals use multiple cavities during the year. Pairs establish territories of about 25 to 37 acres and occupy the same territories year-round. Foraging typically occurs on the trunk and larger limbs of trees. Weevils and earwigs are important parts of the diet during breeding and post-breeding periods; they also feed on acorns during winter.

Photo: WDNR

**Distribution and Abundance**

This subspecies formerly occurred from the Puget Trough south to Oregon. The northern extent of the distribution has contracted southward and the range is currently primarily limited to Clark and Cowlitz Counties where it is rare. The Washington population likely consists of fewer than 50 individuals.

**Habitat**

This subspecies appears to be dependent on oak and oak-conifer woodlands. In Washington and Oregon, they are commonly associated with Oregon white oak, as well as black cottonwood and Oregon ash. Nuthatch densities are greater in areas with higher numbers of large trees, which provide more surface area for foraging and have more natural cavities for nesting and roosting. Large open-grown oaks in woodlands with sparse understories are particularly important as habitat because these trees have more cavities and foraging substrate than oaks grown in densely vegetated habitats. Birds are therefore more abundant in smaller (less than 30 acres) woodland patches, which by definition have more edge, than in larger (greater than 62 acres) patches.

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**Slender-Billed White Breasted Nuthatch: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Conversion of oak and oak-conifer woodlands | Work with landowners to incorporate conservation of this species and oak woodlands into long-term land management | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Small size and isolation of Washington populations | Conduct feasibility study for reintroductions; implement translocations if feasible | Current insufficient | Both |
| 3 | Resource information collection needs | Current status is unclear | Conduct surveys where pairs were historically found, characterize habitat, and identify additional areas to target surveys; assess factors that may account for loss of pairs at formerly occupied sites | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## STREAKED HORNED LARK (*Eremophila alpestris strigata*)

### Conservation Status and Concern

The Streaked Horned Lark is a subspecies only found in southwest Washington and western Oregon, with a total population estimated at less than 2,000.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Endangered | Yes | G5T2 | S1B | Critical/unknown | Moderate-high |

### Biology and Life History

Streaked Horned Larks forage on the ground in short vegetation of bare fields. They breed in grassland and remnant prairies of south Puget Sound, coastal beaches, and some islands in the lower Columbia River. They are known to overwinter in Oregon and on some of the lower Columbia River sites. They may rear two to three broods per season. This species is a coastal subspecies of the Pacific Northwest.

Photo: C. Baker

### Distribution and Abundance

This subspecies is an uncommon breeder on airport grasslands and remnant prairies and beaches of western Washington and Oregon; it is considered extirpated in British Columbia. In Washington, it currently breeds at 14 to 16 sites, including: three prairie areas used for Army training and five airports in the southern Puget lowlands; two to four sandy coastal sites; and four sites along the lower Columbia River. The entire subspecies population is estimated at 1,170 to 1,610 birds, with about 245 pairs detected in Washington in 2013. Density trends from standardized transect data for 2010 through 2012 produced an estimated average annual decline of 11.7 percent; intensive management may have stabilized the inland and Columbia River populations, but data suggest that females may be subject to high mortality rates.

### Habitat

In Washington, Streaked Horned Larks are found on prairie and grassland south of Puget Sound, coastal beaches, and islands and sparsely vegetated shoreline sites on the lower Columbia River. Streaked Horned Larks are also found on agricultural fields and drying seasonal wetlands in Oregon. Habitat consists of large expanses of bare or sparsely vegetated land, including fields, prairies, upper beaches, airports, and similar areas with low/sparse grassy vegetation.

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**Streaked Horned Lark: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Information needed on distribution, abundance and status | Occupancy surveys/counts at known and potential sites; compile, analyze data | Current sufficient | Both |
| 2 | Management Decision Needs | Disturbance/mortalities on Columbia River sites from dredged material deposition | Promote development of a management plan for dredged material at Columbia River sites | Current sufficient | External |
| 3 | Overharvesting of biological resources | Mortalities from collisions with aircraft on airfields | Create/restore nesting habitat away from runways | Current insufficient | External |
| 4 | Fish and wildlife habitat loss or degradation | Loss of prairie/grassland habitat | Acquire or restore nesting habitat | Current insufficient | External |
| 5 | Fish and wildlife habitat loss or degradation | Inbreeding/declining genetic health | Translocation from Oregon for genetic augmentation | Current sufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN BLUEBIRD *(Sialia mexicana)*

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

Declines in recent decades caused primarily by habitat loss. Recent reintroductions onto San Juan Island may need additional translocations and removal of competitor's nests from nest boxes to be successful.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3B | Low/declining | Moderate |

Photo: W. Siegmund

**Biology and Life History**

Western Bluebirds are mainly insectivorous, feeding seasonally also on berries and other fruit. They are secondary cavity nesters, relying on cavities created by other species. Most females produce or attempt two broods per year. Fledged young are tended by the male if the female re-nests.

**Distribution and Abundance**

This is an uncommon migrant and summer resident in western Washington, except for the Fort Lewis area, where it is common due to an unprecedented nest box program. It was recently reintroduced onto San Juan Island. Availability of nesting cavities is a major limiting factor for bluebird populations. Breeding Bird Survey data show no significant change in numbers from 1966 to 2012. Nest box programs have been used with much success; a breeding population that has exceeded 200 pairs has been documented at Joint Base Lewis McChord, which constitutes by far the largest breeding location in western Washington; the remainder of the western population is dispersed and a total population estimate has not been established.

**Habitat**

Western Bluebirds inhabit woodland/prairie mosaic, agricultural areas and recently harvested or burned forest where snags or cavity trees are present. Cover types includes open woodlands, farmlands, orchards, savanna, riparian woodlands, and burned forests. They use many open forest types, including post-fire and post-harvest forests, if sufficient snags are present to provide nest and perch sites. Nests are in natural tree cavities, abandoned woodpecker holes, or bird nest boxes, and standing snags/cavity trees are important habitat features.

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**Western Bluebird: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Management decision needs | Scarcity of snags in some forest landscapes | Retention of snags via incentive-based programs or other strategies | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss and degradation | Long-term success of translocation efforts | Continue to monitor and evaluate success of translocation efforts to the San Juan Islands | TBD | TBD |

NOTE: Numbers are for reference only and do not reflect priority.

# REFERENCE MATERIAL

## SECTION A: Alphabetical list of species


| | |
|---|---|
| American White Pelican | 26 |
| Bald Eagle | 42 |
| Band-tailed Pigeon | 57 |
| Barrow's Goldeneye | 3 |
| Black Scoter | 6 |
| Brown Pelican | 27 |
| Burrowing Owl | 60 |
| Cinnamon Teal | 7 |
| Clark's Grebe | 29 |
| Columbian Sharp-tailed Grouse | 18 |
| Common Loon | 30 |
| Dusky Canada Goose | 9 |
| Ferruginous Hawk | 43 |
| Flammulated Owl | 61 |
| Golden Eagle | 45 |
| Great Gray Owl | 63 |
| Greater Sage-grouse | 19 |
| Harlequin Duck | 10 |
| Lewis' Woodpecker | 69 |
| Loggerhead Shrike | 72 |
| Long-tailed Duck | 12 |
| Marbled Godwit | 49 |
| Marbled Murrelet | 33 |
| Mountain Quail | 26 |
| Northern Spotted Owl | 64 |
| Oregon Vesper Sparrow | 74 |
| Peregrine Falcon | 46 |
| Purple Martin | 76 |
| Pygmy Nuthatch | 77 |
| Red Knot | 51 |
| Red-necked Grebe | 35 |
| Rock Sandpiper | 52 |
| Sage Thrasher | 79 |
| Sagebrush Sparrow | 81 |
| Sandhill Crane (Greater) | 48 |
| Short-eared Owl | 66 |
| Short-tailed Albatross | 36 |
| Slender-billed White-breasted Nuthatch | 83 |
| Spruce Grouse | 23 |
| Streaked Horned Lark | 85 |
| Surf Scoter | 13 |
| Tufted Puffin | 38 |
| Upland Sandpiper | 54 |
| Western Bluebird (W. Wash) | 86 |
| Western Grebe | 40 |
| Western High Arctic Brant | 16 |
| Western Screech Owl | 67 |
| Western Snowy Plover | 55 |
| White-headed Woodpecker | 71 |
| White-tailed Ptarmigan | 24 |
| White-winged Scoter | 15 |
| Yellow-billed Cuckoo | 59 |

## SECTION B: Explanation of Terms

### Conservation Status Table

**Federal Status**
Refers to legal designations under the Federal Endangered Species Act (listed as Endangered, Threatened, or Candidate species, or designated as a Sensitive species.

**State Status**
The Washington Fish and Wildlife Commission has classified 46 species as Endangered, Threatened or Sensitive, under WAC 232-12-014 and WAC 232-12-011. Other designations include Candidate and Monitor.

**PHS (Priority Habitats and Species Program)**
A species listed under the PHS program is considered to be a priority for conservation and management and requires protective measures for survival due to population status, sensitivity to habitat alteration and/or tribal, recreational or commercial importance. Management recommendations have been developed for PHS species and habitats, and can assist landowners, managers and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife.

**Global (G) and State (S) Rankings:** Refers to NatureServe status rankings provided by the Natural Heritage Program. These conservation status ranks complement legal status designations and are based on a one to five scale, ranging from critically imperiled (1) to demonstrably secure (5). The global (G) and state (S) geographic scales were used for the SGCN species fact sheets. For more on the methodology used for these assessments, please see: Methodology for Assigning Ranks - NatureServe.

**State Rank:** characterizes the relative rarity or endangerment within the state of Washington.
**S1** = Critically imperiled
**S2** = Imperiled
**S3** = Rare or uncommon in the state – vulnerable
**S4** = Widespread, abundant, and apparently secure i
**S5** = Demonstrably widespread, abundant, and secure in the State
**SA** = Accidental in the state.
**SE** = An exotic species that has become established in the state.
**SH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist in the state.
**SNR** or **S?** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**SP** = Potential for occurrence of the taxon in the state but no occurrences have been documented.
**SR** = Reported in the state but without persuasive documentation which would provide a basis for either accepting or rejecting the report (e.g., misidentified specimen).
**SRF** = Reported falsely in the state but the error persists in the literature.
**SU**= Unrankable. Possibly in peril in the state, but status is uncertain. More information is need.
**SX** = Believed to be extirpated from the state with little likelihood that it will be rediscovered.
**SZ** = Not of conservation concern in the state.

Qualifiers are sometimes used in conjunction with the State Ranks described above:

**B** - Rank of the breeding population in the state.
**N** - Rank of the non-breeding population in the state.

**Global Rank:** characterizes the relative rarity or endangerment of the element world-wide.
**G1** = Critically imperiled globally
**G2** = Imperiled globally
**G3** = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range - vulnerable
**G4** = Widespread, abundant, and apparently secure globally
**G5** = Demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range
**GH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist somewhere in its former range.
**GNR** or **G?** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**GU** = Unrankable. Possibly in peril range-wide but status uncertain. More information is needed.
**GX** = Believed to be extinct and there is little likelihood that it will be rediscovered.

Qualifiers are used in conjunction with the Global Ranks described above:
**Tn** Where n is a number or letter similar to those for Gn ranks, above, but indicating subspecies or variety rank. For example, G3TH indicates a species that is ranked G3 with this subspecies ranked as historic.

1. Key Conservation Threats (Stressor) and Actions Table

The **"Level of Investment"** column is meant to be a coarse assessment of whether the action referenced is sufficient (stay the course), insufficient (invest more resources when available), or "new action needed" (nothing is currently underway and new action needs to be initiated).

The **"Lead"** column refers to whether WDFW has the lead for that particular action (WDFW), or whether external conservation partners have the lead (external), or whether WDFW shares the lead with one or more organizations (Both).

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# State Wildlife Action Plan Update

# Appendix A-3

# Species of Greatest Conservation Need

# Fact Sheets

# AMPHIBIANS AND REPTILES

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**Biology and Life History**

**Distribution and Abundance**

**Habitat Needs**

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**Conservation Actions Needed**

Washington Department of Fish and Wildlife
2015

# Appendix A-3
# SGCN Amphibians and Reptiles – Fact Sheets

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# What is Included in Appendix A-3

**Introduction**
Appendix A-3 is one component of the State Wildlife Action Plan (SWAP) Update, and contains information about amphibians and reptiles included in our Species of Greatest Conservation Need (SGCN) list for 2015. Included are fact sheets for each of the amphibians and reptiles identified as SGCN in the 2015 SWAP. The information provided includes a summary of the conservation concern and conservation status, description distribution and habitat, climate change sensitivity and an overview of key threats and conservation actions needed.

**What it means to be an SGCN**
The SGCN list includes both amphibians and reptiles that have some form of official protection status and those which may be in decline, but are not yet listed as part of either the Federal or State Endangered Species program. One of the purposes of the SWAP is to direct conservation attention to species and habitats *before* they become imperiled and recovery becomes more difficult and costly. Presence on this list does not necessarily mean that conservation attention will be directed towards these species; rather, that conservation actions for the species are *eligible* for State Wildlife Grants funding, and may be more competitive for other grant programs. It also raises the profile of a species to a wide audience of conservation partners and may encourage other organizations to initiate projects that may benefit the species.

**Climate Vulnerability**
Please see Chapter 5 for an explanation of the methodology used to assess climate vulnerability. For a full list of all the SGCN ranks, including a narrative description of sensitivity and references, please see Appendix C.

**Explanation of terms used in the document**
Please see Section B (page 57) for a description of terms and abbreviations used in this document.

**Alphabetical List of Species**
For an alphabetical list of all the amphibians and reptiles included, please see Section A (page 56).

**References**
References are provided separately with each fact sheet, and also collectively for all SGCN amphibians and reptiles in the REFERENCES section at the end of this document.

## SALAMANDERS

## TIGER SALAMANDER (*Ambystoma tigrinum*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington status is based on the small number of populations, a range that is restricted to a region that has been heavily altered, and a lack of information about this species. Of greatest concern is the drastic decline in stream flows and water body volume in much of Lincoln County and adjacent portions of Grant and Adams Counties caused by water withdrawal for agriculture. Larger remaining water bodies may not be suitable habitat because they may contain introduced predatory fish that eat larval salamanders.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3 | Medium/unknown | Moderate-high |

**Biology and Life History**


Photo: L. Hallock

This is a large, stocky, blotched salamander (to 6.4 inches snout to vent length). Metamorphosed forms spend most of their lives in the subterranean environment. Surface activity is nocturnal. They migrate to breeding ponds in the spring. Eggs are laid in mid-March to early April in the Columbia Basin. Whether or not the larval salamanders metamorphose depends on a combination of genetic and environmental factors. Larvae are capable of transforming in the fall of their first year but in permanent water bodies delay for two or more years. They can also become sexually mature in the larval form. The gilled adults (or neotenes) can grow to larger sizes than the metamorphosed forms. Ponds often contain many different size classes of larvae. All forms are gape-limited, opportunistic predators with invertebrates making up majority of the diet. Large terrestrial adults may also take small vertebrates. They are important predators in ponds and can influence both the vertebrate and invertebrate communities. They are long-lived (16 to 25 years) although the lifespan of wild individuals is likely less.

**Distribution and Abundance**

Tiger Salamanders are the most widely distributed of all North American salamanders. In Washington, they occur primarily within the Columbia Plateau Ecoregion. Occurrences in the Okanogan and Eastern Cascades Ecoregions are limited to the steppe and ponderosa pine vegetation zones. An isolated record for Klickitat County is documented through a specimen collected in the 1930s but no populations are currently known in this county.

**Habitat**

Occurrence is primarily in arid areas that support shrub-steppe vegetation. They tolerate some habitat disturbance and alteration. In the Colville area, they occupy lower elevations in dry habitat types characterized by ponderosa pine/Douglas-fir forest. They are habitat generalist but they do require fishless water bodies for breeding. Soil types suitable for burrowing are also important because they are active burrowers and also use mammal burrows. Breeding takes place primarily in perennial ponds, although seasonal water bodies are also used. Gilled adults occur only in perennial ponds; their ability to metamorphose is lost with increasing age. Mass mortality events of the larvae can occur if ponds dry.

**References**

Hallock, L. A. and McAllister, K. R. 2005. Tiger Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

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### Tiger Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat that this species relies upon in WA. | Protect native shrub-steppe habitat from further degradation or conversion to agriculture. | Current insufficient | Both |
| 3 | Agriculture and aquaculture side effects | Drying of water bodies and streams due to withdrawals of irrigation water at rates faster than the aquifers can naturally replenish. Surface water declines in the Lincoln County region since the 1980s are likely related to ground water withdrawals and declines in the Columbia River aquifer. | Protect Tiger Salamander habitat by preventing the drying of wetlands, ponds, lakes and streams. Protect the aquatic habitat that remains. | Current insufficient | Both |
| 4 | Invasive and other problematic species | Stocking of non-native predatory fish in Tiger Salamander habitat. Tiger Salamanders avoid water bodies with fish. | Identify important areas for Tiger Salamanders and prohibit fish stocking in occupied water bodies. | Current insufficient | WDFW |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 5 | Climate change and severe weather | Drying of water bodies and streams. Loss of aquatic habitat is already an issue in parts of the Columbia Basin (see previous entry). Periods of drought would exacerbate the situation. | Maintain robust populations and suitable aquatic habitats across the range. | Nothing current - new action needed | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COPE'S GIANT SALAMANDER (*Dicamptodon copei*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The main concerns for this species have to do with protection of stream integrity. Activities that alter the integrity of small and medium-sized forested streams are of concern, especially those actions that increase water temperature and sedimentation. Sedimentation is particularly problematic in low-gradient streams, as increased silt deposition may fill crucial microhabitats such as the spaces between rocks and logs that are used as sheltering, hiding and nesting sites.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G3G4 | S3S4 | Unknown/stable | Moderate-high |

**Biology and Life History**

Photo: W. Leonard

This is a medium-sized, marbled gold and brown salamander with a rounded snout, indistinct costal grooves and a laterally compressed tail. Metamorphosed forms are rare. Rather, most become sexually mature in the larval stage. Average size at maturity is 2.6 to 3 inches snout to vent length. Similar to other giant salamander species, most activity is probably nocturnal and much time is spent in subterranean microhabitats. Larval forms tend to be common. Larvae can be observed year round in flowing water bodies and may also be present in higher elevation still-water habitats connected to flowing water bodies. Breeding takes place in the spring, summer and fall with peak activity in the spring and fall. The female guards the eggs for 200 days or more until they hatch.

**Distribution and Abundance**

This species is found in western Washington and extreme northwestern Oregon. In Washington, Cope's Giant Salamanders occur primarily west of the Cascade Crest in the Pacific Coast, southern Puget Trough and West Cascades ecoregions.  They are the only giant salamander documented north of the Chehalis River in the Olympic Peninsula.

**Habitat**

Cope's Giant Salamanders are primarily associated with small to medium-sized mountain streams in moist coniferous forests.  Giant salamanders are often the dominant vertebrate within streams.  During the day, they are typically concealed under rocks or woody debris.  Occasionally they can be observed moving about in the stream.  As mentioned above, activities that alter the integrity of small and medium-sized forested streams are of concern, especially those actions that increase water temperature and sedimentation.  Sedimentation is particularly problematic in low-gradient streams, as increased silt deposition may fill crucial microhabitats such as the spaces between rocks and logs that are used as sheltering, hiding and nesting sites.

**Reference**

Hallock, L. A. and K. R. McAllister. 2009. Cope's Giant Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

### Cope's Giant Salamander:  Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource management needs | Lack of information.  Local declines and extirpations may have occurred but lack of documentation available. | Assess population. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss of riparian vegetation that results in elevated stream temperatures, erosion and increased sedimentation.  This species requires cool water temperatures and microhabitats such as the spaces between rocks and logs that are used as sheltering, hiding and nesting sites. | Protect riparian buffers around occupied streams. | Current insufficient | Both |

NOTE:  Numbers are for reference only and do not reflect priority.

## CASCADE TORRENT SALAMANDER (*Rhyacotriton cascadae*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

This species is sensitive to temperature variation and increased sedimentation that may be caused by disturbances such as logging and road construction. Some populations are isolated by surrounding areas of unsuitable habitat and are vulnerable to extirpation through stochastic events exacerbated by habitat loss. Temperature sensitivity and limited dispersal ability makes this species potentially sensitive to climate change.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G3 | S3 | Medium/unknown | High |

**Biology and Life History**

Photo: W. Leonard

Cascade torrent salamanders may be active year-round at lower elevations. Larval torrent salamanders have tiny external gills. Adults have very reduced lungs and breathe mostly through their skin. Breeding phenology is unknown, but may occur during most of the warmer months of the year. Eggs are most likely laid in the spring. The first described Cascade torrent salamander nest was found on 14 August 2003 in a second-order headwater stream on the west slope of the Cascade Mountains in Skamania County under a cobble-sized rock in the middle of a calm stretch of the stream channel 4 inches deep by 24 inches wide by 28 inches long. This differs from other *Rhyacotriton* species that are described as laying eggs in deep cracks and crevices of springs and seeps. The nest contained five eggs that were not attached to the substrate or each other. The larval period is thought to be long; a Columbia Gorge population was estimated to require four to five years before metamorphosis.

**Distribution and Abundance**

In Washington, this species ranges from the west slopes of the Cascade Mountains south of Nisqually River to the Columbia River. Distribution is patchy. They can reach high densities in optimal habitat.

**Habitat**

This species is generally found in high-gradient, cold streams, seepages and waterfall splash zones, typically in areas with a thick canopy cover. Interestingly however, this species survived in many sites that were completely deforested by the 1980 eruption of Mount St. Helens. They usually occur in stream segments or off-channel habitats, such as seeps and waterfall splash zones, that are shallow, slow flowing and that have gravel or rock rubble that is silt-free. Adults are strongly associated with water and individuals are almost always found in contact with either free water or saturated substrates. During rainy wet periods individuals may be found in wet terrestrial forest settings away from streams or seepages.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Cascade Torrent Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Jones, L. L. C., W. P. Leonard, and D. H. Olson, editors. 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. xii + 227pp.

## Cascade Torrent Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Increase in water temperatures and sedimentation. This species is closely associated with cool forested streams. | Leave suitable forested buffers on occupied streams to prevent water temperature increases and sedimentation. | Current insufficient | Both |
| 3 | Climate change and severe weather | Direct mortality and loss of micro-habitat features due to stream flooding, erosion and scouring. | Leave refuge areas of intact habitat. Buffered streams in clear cuts are more likely to be impacted by extreme precipitation and wind events. | Current insufficient | Both |
| 4 | Climate change and severe weather | Stream and seep drying. This species is closely associated with cool forested streams. | Minimize habitat fragmentation and maintain robust populations across landscape. | Current insufficient | Both |
| 5 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Minimize habitat fragmentation and maintain robust populations across landscape. | Current insufficient | Both |
| 6 | Climate change and severe weather | Warming and drying of streams. This species is closely associated with cool forested streams. | Minimize habitat fragmentation and maintain robust populations across landscape. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COLUMBIA TORRENT SALAMANDER (*Rhyacotriton kezeri*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington status is based on the small global range, narrow environmental specificity and the potential concern that the species' headwater habitat may not be fully protected. In Washington, some occurrences are in protected areas (e.g., Natural Area Preserves) and some riparian habitat protections occur through forest practices rules and Habitat Conservation Plans. The temperature sensitivity and limited dispersal ability makes this species potentially sensitive to climate change.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G3 | S3 | Medium/unknown | Moderate-high |

**Biology and Life History**


Photo: W. Leonard

This is a small, aquatic, stream-adapted salamander (less than 2.4 inches snout to vent length). They are active year-round. The reproductive ecology is poorly known. The mating season is probably prolonged similar to other torrent salamander species. Only five nests have been found, presumably because the eggs are laid in inaccessible recesses in head-water streams and seeps. The situation regarding parental care and communal nesting are unclear; both have been observed but neither was consistent at the five described nests. The incubation period is long (seven to nine months). The larval period is also long (more than two years). Metamorphosed forms eat a variety of aquatic and semiaquatic invertebrates and larval forms eat aquatic invertebrates. Torrent salamanders are desiccation intolerant, have highly reduced lungs and consequently depend on skin surfaces for oxygen uptake. Individuals are highly sedentary with movements limited to 10 feet or less.

**Distribution and Abundance**

This species is endemic to the coastal ranges of southwestern Washington and northwestern Oregon. Distribution in Washington is restricted to the Willapa Hills. Distribution within the range is patchy and they can be locally common in suitable habitat.

**Habitat**

Columbia Torrent Salamanders occur in mature, coastal, coniferous forests where they inhabit relatively cold, permanent streams, seepages and waterfall splash zones Stream segments tend to be shallow, slow flowing and have gravel or rock rubble with low levels of silt. They tend to be more abundant in streams with northerly aspects and steep gradients. During rainy wet periods, metamorphosed individuals may occasionally be found in wet terrestrial forest settings away from streams or seepages.

**References**

Hayes, M. and T. Quinn. 2014. Columbia Torrent Salamander (*Rhyacotriton kezeri*). AmphibiaWeb: Information on amphibian biology and conservation. [web application]. Berkeley, California: AmphibiaWeb. Available: http://amphibiaweb.org/. (Accessed: Nov 12, 2014).

O'Donnell, R., C. Richart. 2012. Diet of the Columbia Torrent Salamander, *Rhyacotriton kezeri* (Caudata: Rhyacotritonidae): Linkages between Aquatic and Terrestrial Ecosystems *In* Forested Headwaters. Northwestern Naturalist 93(1):17-22. 2012
Russell, K. and A. Gonyaw, J. Strom, K. Diemer and K. Murk. 2002. Three new nests of the Columbia Torrent Salamander, *Rhyacotriton kezeri*, in Oregon with observations of nesting behavior. Northwestern Naturalist 83:19-22.

### Columbia Torrent Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Increase in water temperatures and sedimentation. | Leave suitable forested buffers on occupied streams to prevent water temperature increases and sedimentation. | Current Sufficient | Both |
| 3 | Climate change and severe weather | Stream flooding, erosion and scouring. Stream flooding, erosion and scouring could result in direct mortality and/or loss of suitable microhabitat. | Leave refuge areas of intact habitat. Buffered streams in clear cuts are more likely to be impacted by extreme precipitation and wind events. | Unknown | Both |
| 4 | Climate change and severe weather | Loss of suitable habitat. These are small, salamanders that are closely associated with cool streams and seeps; they do not move long distances. | Minimize habitat fragmentation and maintain robust populations across landscape. | Unknown | Both |
| 5 | Climate change and severe weather | Drying of streams may result from unusually low rainfall for a prolonged period. | Minimize habitat fragmentation and maintain robust populations across landscape. | Unknown | Both |
| 6 | Climate change and severe weather | Warming and drying of streams. Columbia Torrent Salamanders are closely associated with cool, forested streams and cannot tolerate warm waters. | Minimize habitat fragmentation and maintain robust populations across landscape. | | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## OLYMPIC TORRENT SALAMANDER (*Rhyacotriton olympicus*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The status is based on the small global range (Washington endemic) and narrow environmental specificity. Most known occurrences (77 percent) are within Olympic National Park with an additional 15 percent of locations on the Olympic National Forest. National Forest occurrences are within Late-Successional Reserves and Adaptive Management Areas that provide some level of riparian habitat protection. Occurrence in landscapes with more intact, mature habitat with legacy structures (e.g., coarse woody debris) will likely buffer some impacts of climate change for this temperature-sensitive species with limited dispersal ability.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G3 | S3 | Medium/unknown | High |

**Biology and Life History**

This is a small, aquatic, stream-adapted salamander (less than 2.4 inches snout to vent length). They are active year-round. The mating season is probably prolonged. No nests have been found presumably because the eggs are laid in inaccessible recesses in head-water streams and seeps. Clutch number is also unknown but is likely small (eight or less eggs). The incubation and larval periods are long (seven to nine months and more than two years respectively). They are opportunistic predators on invertebrates. They are desiccation intolerant, have highly reduced lungs and depend on skin surfaces for oxygen uptake. Individuals are sedentary with movements limited to several meters or less.


Photo: W. Leonard

**Distribution and Abundance**

This species is endemic to the Olympic Peninsula. Distribution within the range is patchy. The species was found to be widespread within Olympic National Park where it was found in 41 percent of 168 streams and 47 percent of 235 seeps surveyed.

**Habitat**

They occur in mature coniferous forests where they inhabit cold, permanent streams, seepages and waterfall splash zones. Stream segments tend to be shallow, slow flowing and have gravel or rock rubble with low levels of silt. They tend to be more abundant in streams with north aspects, steep gradients and cobble substrates. Spaces between rocks are used for cover. Occupied streams need to be protected with forested riparian buffers that provide stream shading, near-stream terrestrial ambient moisture regimes, large wood recruitment and dispersal habitat.

**References**

Adams, M. J. and R. B. Bury. 2002. The endemic headwater stream amphibians of the American Northwest: associations with environmental gradients in a large forested preserve. Global Ecology and Biogeography 11:169–178

Howell, B. and Roberts, C. 2008. A Conservation Assessment for the Olympic Torrent Salamander (*Rhyacotriton olympicus*). Submitted to the Interagency Special Status and Sensitive Species Program, USDA Forest Service Region 6 and USDI Bureau of Land Management, Washington and Oregon.

### Olympic Torrent Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Increased water temperatures and sedimentation. This species is closely associated with cool, forested streams and cannot tolerate warm waters. Also, sediment can fill the interstitial spaces between rocks where this species shelters. | Leave suitable forested buffers on streams occupied by torrent salamanders to prevent water temperature increases and sedimentation. | Current sufficient | Both |
| 3 | Climate change and severe weather | Direct mortality and loss of micro-habitat features due to stream flooding, erosion and scouring. | Leave refuge areas of intact habitat. Buffered streams in clear cuts are more likely to be impacted by extreme precipitation and wind events. | Unknown | Both |
| 4 | Climate change and severe weather | Changes to macro- and micro- habitat. These are small, salamanders that are closely associated with streams and they do not move long distances. | Minimize habitat fragmentation and maintain robust populations across landscape. | Unknown | Both |
| 5 | Climate change and severe weather | Streams and seeps drying. This species is closely associated with cool, forested streams and moist conditions and they do not move long distances. | Minimize habitat fragmentation and maintain robust populations across landscape. | Unknown | Both |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 6 | Climate change and severe weather | Unusually warm water. This species is closely associated with cool, forested streams and cannot tolerate warm waters. | Minimize habitat fragmentation and maintain robust populations across landscape. | | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## DUNN'S SALAMANDER (*Plethodon dunni*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The Washington status is based on the small state range, narrow environmental specificity and concern that riparian habitats the species relies upon may not be fully protected. The need for retention of large woody debris is also of concern.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S3 | Low/stable | Moderate-high |

**Biology and Life History**

Dunn's salamander is the largest of the northwestern Plethodontids (lungless salamanders). All life stages are terrestrial. They require moist conditions and, therefore, most surface activity takes place in the spring and fall when temperatures are above freezing. Dunn's salamanders lay their eggs in clusters on dry land within moist areas of cover such as in rotted logs or in crevices within wet, rocky areas. A clutch of eggs may range from four to fifteen. One nest was found in a decayed log next to a stream, with the female curled around nine eggs. There is no free-living larval stage. Hatchlings emerge as juvenile salamanders.

Photo: W. Leonard

**Distribution and Abundance**

This species is relatively rare in Washington. It occurs only in the Willapa Hills of the Olympic Physiographic Province. The range extends north to the Chehalis River and east to the Cowlitz River. This is the northern extreme of this species' range.

**Habitat**

Dunn's salamanders live in the shaded rocky edges of highly humid forested streams and moist talus (rock fragment piles). They prefer areas that are permanently moist but not in flowing water. Adults often hide under rocks, in splash zones near streams and occasionally under woody debris. This species has also been found upslope, away from stream channels.  They may wander on the forest floor during rainy nights in the wet season, seeking cover in moist microhabitats such as forest duff or downed wood during the day.

**References**


Hallock, L. A. and K. R. McAllister. 2005. Dunn's Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Jones, L. L. C., W. P. Leonard, and D. H. Olson, editors. 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. xii + 227pp.


### Dunn's Salamander:  Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Prevent habitat modification at occupied sites. | Current insufficient | Both |
| 3 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Minimize habitat fragmentation and maintain robust populations across landscape. | Current insufficient | Both |

NOTE:  Numbers are for reference only and do not reflect priority.

# LARCH MOUNTAIN SALAMANDER (*Plethodon larselli*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The status is based on the small global range, narrow environmental specificity and concern that there is not adequate protection for this species' specialized habitat of rocky accumulations and talus. Any ground-disturbing activity or land use that changes the moisture regimes and permeability of inhabited rocky substrates, such as over-story tree removal and gravel removal, may threaten populations. In addition, the sedentary habits and specific habitat requirements likely hinder dispersal and colonization to new areas as well as limiting gene flow between populations.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Sensitive | Yes | G3 | S3 | Low/unknown | Moderate-high |

**Biology and Life History**

Photo: W. Leonard

This is a small, striped salamander (less than two inches snout to vent length). Most of its life is spent in the subterranean environment and it is surface-active only about 20 to 90 days a year. Surface activity is triggered whenever moisture and temperature regimes are appropriate, primarily in the spring and fall. Breeding takes place in the autumn and spring months. No nests have been found. Development of larvae takes place in the egg; there is no free-living aquatic larval stage. Sexual maturity is reached at 3 to 3.5 years and 4 to 4.5 years for males and females respectively. They are predators on a variety of invertebrates. The movements are poorly documented, but it is clear that home ranges tend to be only 10 to 100 feet in diameter. These salamanders are lungless and depend on moist skin surfaces for oxygen uptake.

**Distribution and Abundance**

This species is endemic to Washington and northern Oregon. The main distribution is along a 34 mile stretch of the Columbia River Gorge in southern Washington and northern Oregon and discontinuously northward in the Cascades in the Snoqualmie Pass-Kachess Lake area.

**Habitat**

Larch Mountain Salamanders are associated with talus, scree, gravelly soils and other areas of accumulated rock where interstitial spaces exist between the rock and soil. Steep slopes are also an important habitat feature. They inhabit a diverse range of forested and non-forested habitats. Occupied rocky substrates in non-forested areas are usually north facing and nonvascular plants, especially mosses, dominate the ground cover. In some areas of the Cascade Mountains, they inhabit old-growth coniferous forests without significant exposed rocky areas. They also inhabit lava tubes in the Mount St. Helens vicinity. In all of these habitats, important microhabitats include woody debris, leaf litter and rocks.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Larch Mountain Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/
NatureServe. 2014. Larch Mountain Salamander. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available http://explorer.natureserve.org. (Accessed: November 13, 2014).
Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institutional Press, Washington. 587pp.

### Larch Mountain Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Removal of trees. This small, non-vagile species needs cool, moist conditions. | Prevent habitat modification at sites occupied by Larch Mountain Salamanders. | Current insufficient | Both |
| 3 | Energy development and distribution | Mining of rock and boulders. This small, non-vagile species is closely associated with rock features such as talus. | Prevent habitat modification at sites occupied by Larch Mountain Salamanders. | Current insufficient | Both |
| 4 | Climate change and severe weather | Loss of suitable habitat. This small, non-vagile species needs moist conditions and is closely associated with rock features such as talus. Surface activity is limited by moisture and temperature. | Prevent habitat modification at sites occupied by Larch Mountain Salamanders. | Current insufficient | Both |
| 5 | Climate change and severe weather | Drying of habitat. Surface activity is limited by moisture and temperature (fall and spring). These salamanders are lungless and depend on moist skin surfaces for oxygen uptake. | Prevent habitat modification at sites occupied by Larch Mountain Salamanders. | Current insufficient | Both |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 6 | Climate change and severe weather | Warming and drying of habitat. This small, non-vagile species needs moist conditions. Surface activity is limited by moisture and temperature. These salamanders are lungless and depend on moist skin surfaces for oxygen uptake. | Prevent habitat modification at sites occupied by Larch Mountain Salamanders. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## VAN DYKE'S SALAMANDER (*Plethodon vandykei*)

**Conservation Status and Concern**

Van Dyke's Salamander is one of relatively few vertebrate species endemic to Washington. It is at risk due to its limited distribution and apparently small, isolated populations.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G3 | S3 | Low/unknown | Moderate-high |

**Biology and Life History**

Photo: W. Leonard

Most surface activity takes place in the spring after snowmelt and before summer drought and in the fall after the onset of fall rains and before temperatures approach freezing. More specifically, most surface activity occurs when soil moisture is high (moist or wet) and soil temperatures are between 39 to 57˚F. Because this species may occupy wet habitats, it is sometimes active on the surface even in the summer. Nests found on the Olympic Peninsula (elevations below 2300 feet) were laid in early May and development was completed by early October. Females brood and guard the eggs during the summer. One nest was under a moss covered stone; a grape-like cluster of eggs were attached to the stone by a single gelatinous thread. Another clutch was found in a moist, partially rotted log along a stream in old-growth forest (western red-cedar/Douglas-fir/western hemlock/grand fir) in Washington. There is no larval stage; hatchlings emerge as juvenile salamanders. These salamanders are lungless and depend on moist skin surfaces for oxygen uptake.

**Distribution and Abundance**

This species is endemic to Washington State. They occur in three disjunct areas in the Willapa Hills, on the Olympic Peninsula, and in the southern Cascade Ranges. These areas are separated by glacial and alluvial deposits that may limit regional distribution. They generally occur in small isolated populations.

**Habitat**

Van Dyke's Salamander is usually associated with streams, seepages, and rock outcrops. It has been associated with habitats that maintain cool temperature and moist conditions. In coastal areas, it is often most abundant in old forest stands that have complex stand structure and moderate to high levels of woody debris and colluvial rock present. It has also been reported from forested talus, upland sites, and in cave entrances. Interestingly, small populations survived in the Mount Saint Helens' blast zone; these were probably protected by their subterranean refugia and heavy snowpack. Large decaying conifer logs near streams appear to be important habitat for nests.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Van Dyke's Salamander. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Jones, L. L. C., W. P. Leonard, and D. H. Olson, editors. 2005. Amphibians of the Pacific Northwest. Seattle Audubon Society, Seattle, Washington. xii + 227pp.

Washington Department of Fish & Wildlife (WDFW). 2014. WDFW Wildlife Survey and Management Database.

### Van Dyke's Salamander: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. Species occurs in small, scattered populations throughout its range. Vulnerable to stochastic events. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Prevent habitat modification at occupied sites. | Insufficient | Both |
| 3 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Minimize habitat fragmentation and maintain robust populations across landscape. | Insufficient | Both |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 4 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Minimize habitat fragmentation and maintain robust populations across landscape. | Insufficient | Both |
| 5 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and dependent on specific microhabitat features. | Minimize habitat fragmentation and maintain robust populations across landscape. | Insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## TOADS

## WESTERN TOAD (*Anaxyrus boreas*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

In Washington, Western Toad declines have been documented in the Puget Trough and the lower Columbia River below Bonneville Dam. Of about 107 historical sites in those areas, only about 19 are thought to still be extant. Elsewhere in the state, toads are locally common in many areas.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S3S4 | In lowland Puget Sound: Low/unknown | Moderate-high |

**Biology and Life History**


Photo: K. McAllister

In general, breeding starts in mid-April at low elevation sites in western Washington and in late April or early May at low elevation sites in eastern Washington. Toads at higher elevations tend to breed later. Onset of egg laying at each location varies from one to three weeks each year depending on site conditions such as snow melt. Tadpole development to metamorphosis takes approximately two months depending on temperature and food availability. The newly metamorphosed toads disperse from the breeding sites *en masse* for one to two weeks. Informal observations indicate that many populations return to the same breeding location each year. Transformed toads are primarily terrestrial, but often occur near water bodies, especially in drier climates. Overwintering habitat has not been described for Washington. In lowland western Washington, individual toads have been found in mid-February within duff under sword ferns suggesting that some individuals overwinter terrestrially in areas with mild winters or at least occur terrestrially during the mild portions of winters.

**Distribution and Abundance**

Western Toads occur in all Washington ecoregions. Within the Washington portion of the Columbia Plateau, their distribution is limited to the edges of the ecoregion except in the southeast corner of the state. They are locally abundant in some areas, but local declines have been documented in others.

**Habitat**

This species occurs in a variety of terrestrial habitats including prairies, forests, canyon grasslands and ponderosa pine-Oregon oak habitat. They appear absent from most of the shrub-steppe and steppe zones with the exception of the canyon grasslands in southeast Washington. Breeding waters are usually permanent and include wetlands, ponds, lakes, reservoir coves and the still-water off-channel habitats of rivers, as well as river edges.

**References**
Hallock, L.A. and K.R. McAllister. 2005. Western Toad. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/speciesmain.html

### Western Toad: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Road mortality when moving to and from breeding sites. Newly metamorphosed toads disperse *en masse* and gather in piles. When this happens on roads, thousands of toads can be killed by a single vehicle. Adults are also killed as they move to and from breeding sites. | 1. Identify and map known crossings.<br>2. Avoid road building near breeding sites.<br>3. When possible, close roads to vehicles during dispersal periods (e.g., ATV use on gated dirt roads).<br>4. Create passage structures to circumvent roads. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Loss of upland habitat through the development on shorelines and aroundwaterbodies used for breeding. | Protect known pockets of abundance and breeding areas. | Current insufficient | External |
| 3 | Fish and wildlife habitat loss and degradation | Habitat alteration and degradation. | Protect known pockets of abundance and breeding areas. | Current insufficient | External |
| 4 | Resource information collection needs | Lack of information on status and distribution. | Research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 5 | Resource information collection needs | Taxonomic uncertainty may mean one or more taxa are in greater decline; causes of decline not understood. | Conduct genetic studies. | Nothing current - new action needed | External |
| 6 | Invasive and other problematic species | Chytrids and other fungi, and parasites have contributed to declines throughout the species' range; however, chytrids have not yet been detected in WA toads. | Include testing for chytrids, fungal infections, and trematode infections in survey and monitoring protocols | Nothing current - new action needed | Both |
| 7 | Fish and wildlife habitat loss or degradation | Transportation and service corridors - roads and railroads. | Avoid road building near breeding sites, or provide crossings. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## WOODHOUSE'S TOAD (*Anaxyrus woodhousii*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington State status is based on the small number of populations, a limited distribution restricted to shrub-steppe habitat in a region heavily altered for agriculture and urban development (e.g., Tri-Cities area), and a lack of information about the species.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3 | Unknown/unknown | Moderate-high |

**Biology and Life History**

Photo: W. Leonard

This is a medium to large (two to five inches snout to vent length) terrestrial toad with a stout body, broad waist, short legs, a round head and short snout. Activity starts in late April to early May and continues into October. Adult activity is crepuscular and nocturnal; smaller toads can occasionally be found during the day, as can newly metamorphosed "toadlets" on shorelines. Male chorusing and breeding in Franklin, Benton and Grant Counties occurs from May to July depending on conditions at each breeding site. Egg development to hatching is rapid (less than 10 days). Tadpole development is completed in approximately two months and metamorphosis occurs in the summer or fall of the first year. The toads are opportunistic predators that primarily eat invertebrates such as insects. The adult toads are terrestrial but burrow below the surface during the day. Information about overwintering behavior is not known for Washington but likely is terrestrial and in the vicinity of the breeding pond.

**Distribution and Abundance**

In Washington, Woodhouse's Toads occur in a small area of the Columbia Plateau Ecoregion along the Snake River and along the Columbia River between the Priest Rapids Dam and John Day Dam. Occurrences have also been documented in the Eltopia and Wahluke Branch irrigation canal systems in Franklin County on the Hanford Site and Juniper Dunes.

**Habitat**

Occurrences are found in shrub-steppe habitat near the Columbia and Snake Rivers. Breeding takes place in a variety of still-water habitats, including shallow temporarily flooded sites, ponds and sloughs. They will also lay eggs in stagnant areas of small, slow-flowing streams. Transformed toads are terrestrial. Soil types suitable for burrowing are important because they spend the day burrowed below the surface. Habitats include riparian areas, shrub-steppe and grassland.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Woodhouse's Toad. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Jones, L. L. C., W. P. Leonard and D. H. Olson (Eds.). 2005. *Amphibians of the Pacific Northwest*. Seattle Audubon Society. 227 pp.

### Woodhouse's Toad: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat that this species relies upon in WA. | Protect native shrub-steppe habitat from conversion and degradation due to agriculture. | Current insufficient | Both |
| 3 | Resource information collection needs | This species has a limited distribution in WA. | Research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 4 | Resource information collection needs | Little is known about the habitat requirements of this species in WA. | More information is needed on this species to understand its status and habitat management. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# FROGS

## ROCKY MOUNTAIN TAILED FROG (*Ascaphus montanus*)

**Conservation Status and Concern**
This species is vulnerable to management practices that alter the riparian or aquatic zones of streams, especially those practices that change the moisture regime, increase sediment load, reduce woody debris input and change stream bank integrity. Protection of headwater streams is particularly important.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | SNR | Low/unknown | Moderate-high |

**Biology and Life History**
Rocky Mountain Tailed Frogs are present year-round in and near perennial streams. They are generally active at night, but tadpoles and frogs can also be observed during the day. They are most active from April to October, but this varies by site and conditions. Mating occurs typically in fall; females retain sperm and lay eggs in early summer. Eggs hatch usually in late summer, but larvae may remain in nest site until the following summer. The larval period lasts a few years. Metamorphosis usually takes place in late summer, and metamorphs require several additional years to attain sexual maturity. All life stages are adapted for life in fast-flowing streams. The male's "tail" is used for internal fertilization, which prevents sperm from being washed away. Eggs are attached to the undersides of rocks to keep them in place. The tadpoles have a large sucker-like mouth that allows them to feed and move in high-energy streams without losing contact and unintentionally drifting.

Photo: B.Moon

**Distribution and Abundance**
In Washington, populations are found only in the Blue Mountains. The Washington Department of Fish and Wildlife database contains 229 observation records reported from 1997 to 2010. The occupied area is small and little is known about population size, habitat conditions or threats.

**Habitat**
This species is restricted to perennial streams found in or associated with cold, clear, rocky streams in mature forests. During wet weather, adults and juveniles may move into upland habitat adjacent to the stream. A recent study in Idaho found tailed frogs persisted in streams that occurred in burned forest and post-burn regenerated forest showing that under certain conditions, tailed frogs can be resilient to physical stream changes resulting from natural disturbance. This included persisting in water much warmer than previously reported in the field.

**References**

Dunham, J. B., A. E. Rosenberger, C. H. Luce, and B. E. Rieman. 2007. Influences of wildfire and channel reorganization on spatial and temporal variation in stream temperature and the distribution of fish and amphibians. Ecosystems 10(2):335-346

Hallock, L. A. and K. R. McAllister. 2005. Rocky Mountain Tailed Frog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

WDFW. 2014. WDFW Wildlife Survey and Management Database.

## Rocky Mountain Tailed Frog: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Inventory is needed in the Blue Mountains. | Continue research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | This species is closely associated with cool forested streams. Protection of headwater streams is particularly important. | Prevent habitat modification at occupied sites. | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss and degradation | Degradation of riparian areas from livestock. This species occurs on livestock rangeland and livestock impacts, well known to influence riparian systems, are currently not being paid attention to as potentially significant to this species. | Survey rangeland locations where Rocky Mountain Tailed Frogs are known to occur and assess habitat impacts. | Current insufficient | Both |
| 4 | Climate change and severe weather | Loss of suitable habitat. This species is closely associated with cool forested streams and adapted for a life history in swiftly flowing water. | Minimize habitat fragmentation and maintain robust populations across landscape. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COLUMBIA SPOTTED FROG (*Rana luteiventris)*

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

Populations of this species in the Columbia Basin are declining, likely due primarily to habitat loss and alteration, although other factors such as fish stocking may also cause declines. This species is aquatic, so drying of ponds and creeks related to agricultural water withdrawals is a threat in the region.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4 | S4 | In Columbia Basin: Low/unknown | Moderate-high |

**Biology and Life History**

Photo: W. Leonard

Breeding in the Columbia Basin begins in late March to early April. In the Okanogan Highlands breeding starts in late April to early May at mid-elevation sites between 2,000 to 3,500 feet and late May to early June at elevation sites greater than 4,500 feet. Typically the egg masses are deposited in communal clusters. Embryos take approximately three to five weeks to develop, depending on the temperature regime and elevation. Metamorphosis typically occurs in late summer but may be delayed at higher elevation sites. They become sexually mature in two to six years, depending on location and elevation. Though movements of up to four miles have been recorded, the species generally stays in wetlands along streams within .6 miles of their breeding pond. Frogs in isolated ponds may not leave those sites.

**Distribution and Abundance**

In Washington, the Columbia Spotted Frog occurs east of the Cascade Mountain crest in the East Cascades, Okanogan, Canadian Rocky Mountain, Columbia Basin, and Blue Mountain Ecoregions, and spilling over the Cascade crest to the west slope in the north Cascades near Harts and Rainy Passes. Small, scattered populations occur in the shrub-steppe vegetation zones of the Columbia Basin.

**Habitat**

This species is relatively aquatic and is rarely found far from water. It occupies a variety of still-water habitats and can also be found in streams and creeks. It is common to see these frogs basking on the shore or on floating debris. Breeding habitat is the seasonally flooded margins of wetlands, ponds and lakes. Flooded pools and still water edges of creeks may also be used in some areas. Egg masses are laid in shallow water where they receive little or no shading from vegetation. Waters that remain aerobic and do not freeze to the sediments (such as springs and creeks) are most likely necessary for winter survival in areas subject to freezing.

**References**

Bull, E. L. and M. P. Hayes. 2001. Post-breeding season movements of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. Western North American Naturalist 61:119-123.

Hallock, L. A. and K. R. McAllister. 2005. Columbia Spotted Frog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

## Columbia Spotted Frog: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species | Introduced, non-native, predatory species such as American Bullfrog and warm-water game fish. | Better understand overlap of species range and fish, then minimize impacts from fish in lakes and ponds. If possible, exterminate bullfrogs where found. | Current insufficient | Both |
| 2 | Resource information collection needs | Successional changes in vegetation may threaten this species, but are unstudied and poorly understood. | Research, surveys and habitat monitoring to understand successional changes in vegetation. | Nothing current—new action needed | Both |
| 3 | Fish and wildlife habitat loss and degradation | Altered hydrology, agricultural water withdrawal and other factors (e.g., salmon restoration projects) can eliminate suitable aquatic habitat. | Protect known sites; identify and protect potential habitat. | Nothing current – new action needed | Both |
| 4 | Resource information collection needs | Lack of information on status and distribution. | Research, surveys and monitoring to understand species distribution and status. | Current insufficient | Both |
| 5 | Resource information collection needs | Loss of beaver and beaver ponds. | Conserve beaver populations and dynamic stream processes. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## OREGON SPOTTED FROG (*Rana pretiosa*)

**Conservation Status and Concern**

The Washington status is based on the rarity of the species. Human-caused stressors include wetland loss and alteration, loss of disturbance processes that set back succession, introduction of non-native/invasive flora and fauna and alteration of creek and river channels. Only six watersheds are currently known to be occupied in Washington. Within a watershed, most breeding populations are small and many are isolated from other breeding populations. They require breeding sites in shallow water with short vegetation and full sun exposure. This habitat type is rapidly lost to invasive grasses without management such as grazing, haying, mowing or restoration to native flora.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Endangered | Yes | G2 | S1 | Low/declining | Moderate-high |

**Biology and Life History**


Photo: W. Leonard

This is a medium to large (adults from two to four inches snout to vent length) aquatic frog. The dorsal color is olive-brown to brick red with black spots. They are communal breeders that return to the same breeding areas each year. Breeding takes place in February and March. Breeding times differ depending on location and elevation and vary annually depending on water temperatures. Embryos take approximately three weeks to develop to hatching. Tadpoles transform in mid-summer of their first year. Radio-telemetry and mark-recapture studies have revealed that Oregon Spotted Frogs are relatively sedentary during the summer (driest period) and remain active underwater during the winter. The longest movement between captures in Washington was 1.5 miles and in Oregon was 1.7 miles.

**Distribution and Abundance**

The historical range in Washington is the Puget Trough Ecoregion and the southern extent of the Eastern Cascades Ecoregion in Whatcom, Skagit, Thurston, Skamania and Klickitat Counties. Current occurrences are in the Sumas River, Black Slough, Samish River, upper Black River drainage, lower Trout Lake Creek drainage and at Conboy Lake and Camas Prairie in the Outlet Creek drainage.

**Habitat**

This species is highly aquatic and rarely found away from water. Extant populations occur in large shallow wetland systems associated with a stream or stream network. Breeding habitat is in seasonally flooded margins of wetlands and areas of extensive shallows (approximately six to eight inches deep). Egg masses are placed in areas where they receive little or no shading from vegetation. Waters that remain aerobic and do not freeze to the sediments are necessary for winter survival in areas subject to freezing. Beaver impounded systems appear to provide many of the habitat requirements of this species.

**References**


Hallock, L. A. 2013. Draft State of Washington Oregon Spotted Frog Recovery Plan. Washington Department of Fish and Wildlife, Olympia. 93 pp.

Hallock, L. A. and K. R. McAllister. 2005. Oregon Spotted Frog. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

### Oregon Spotted Frog: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Inventory areas that might still support this species and monitor known populations. | Current insufficient | Both |
| 2 | Invasive and other problematic species | Invasive reed canarygrass. Oregon Spotted Frogs oviposition habitat is located in seasonally flooded, shallow water (less than six inches), with short vegetation and full sun exposure. Reed canarygrass is invasive, has a dense growth pattern and grows to over five feet tall. | Manage reed canarygrass either by keeping it short (mowing, haying, livestock grazing) or remove it. | Current insufficient | Both |
| 3 | Invasive and other problematic species | Lack of disturbance to wetlands. Oregon Spotted Frogs oviposition habitat is located in seasonally flooded, shallow water (less than six inches), with short vegetation and full sun exposure. This is typical of early successional wetland plant growth. | Create or mimic disturbance processes at sites occupied by Oregon Spotted Frogs. Examples include introducing beaver, use of fire, mowing, haying and/or grazing. | Current insufficient | Both |
| 4 | Invasive and other problematic species | Non-native predatory fish and American Bullfrogs. These species prey on Oregon Spotted Frogs. | Prevent non-native predatory fish and American Bullfrogs from establishing populations at Oregon Spotted Frog occupied sites. | Current insufficient | Both |
| 5 | Climate change and severe weather | Drying of aquatic habitats occupied by Oregon Spotted Frog and subsequent changes to vegetation (expansion of trees, shrubs, and reed canarygrass etc.) | Prevent drying of wetlands and streams occupied by Oregon Spotted Frogs. Remove and manage trees, shrubs and reed canarygrass in breeding habitat. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## NORTHERN LEOPARD FROG (*Lithobates pipiens*)

**Conservation Status and Concern**

Only one known population remains in Washington; there is limited information about population status and trends; efforts are underway to determine the feasibility of translocations to portions of the former range.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Endangered | Yes | G5 | S1 | Low/declining | Moderate-high |

**Biology and Life History**


Photo: J. Wisniewski

Northern Leopard Frogs are semi-aquatic, requiring aquatic and terrestrial habitats. They typically overwinter underwater, but are primarily terrestrial during summer months, and forage predominately for insects in moist areas. During late spring, males attract females to breeding ponds by vocalizing. A grapefruit-sized egg mass is deposited just below the water surface and attached to vegetation in warm, shallow, open, lentic areas. Eggs may hatch within a few days or weeks depending on conditions. Tadpoles forage mainly on algae and detritus and complete metamorphosis in 60 to 90 days; newly metamorphosed frogs emerge from ponds in mid-July through September. Northern Leopard Frogs may be preyed on by many species throughout their life history, but the most common are likely mustelids, bullfrogs, and fish.

**Distribution and Abundance**

The last known population of Northern Leopard Frog in Washington occupies the North Potholes Reservoir Unit of the Columbia Basin Wildlife Area in the Crab Creek drainage; this area has been designated the Northern Leopard Frog Management Area (NLFMA). This species has experienced range-wide declines throughout the western states and Canada. Historically, Northern Leopard Frogs were found throughout eastern Washington, and 17 occupied sites were recognized throughout the Columbia, Crab Creek, Pend Oreille, Snake, Spokane, and Walla Walla River drainages.

**Habitat**

Northern Leopard Frogs require unique breeding, foraging, and overwintering habitats in close proximity due to their limited dispersal ability. Breeding occurs in shallow, lentic areas exposed to sunlight with short emergent vegetation for attachment of egg masses. In summer, Northern Leopard Frogs forage throughout moist areas including meadows, fields, irrigation ditches and scrublands. Northern Leopard Frogs require deep, well-oxygenated water that does not freeze solid for hibernation. Invasion by non-native vegetation and tall emergent encroachment through wetland succession reduces exposed shoreline, limiting the availability of suitable habitat for breeding and foraging. Bullfrog colonization and fish entry to the NLFMA by surface water connections during spring flooding increases predation vulnerability; ideal Northern Leopard Frog habitat would be bullfrog and fish-free.

**References**
Alberta Northern Leopard Frog Recovery Team. 2005. Alberta Northern Leopard Frog Recovery Plan, 2005-2010. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan no. 7. Edmonton, AB. 26pp.
Germaine, S., and D. Hays. 2007. Distribution and post-breeding environmental relationships of northern leopard frogs (Rana pipiens) in Grant County, Washington. Final Report. Washington Department of Fish and Wildlife, Wildlife Program, Olympia.
Hallock, L. A. and K. R. McAllister. 2005. Northern Leopard Frog. Washington Herp Atlas. http://www.1dnr.wa.gov/nhp/refdesk/herp/

### Northern Leopard Frog: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Invasive and other problematic species | Non-native aquatic species including American Bullfrogs, mosquito fish and other non-native fish. Bullfrogs are predatory for all life stages of Northern Leopard Frogs, mosquito fish prey on amphibian egg masses and tadpoles. | 1. Remove mosquito fish from ponds previously occupied by Northern Leopard Frogs.<br>2. Prevent introduction of non-native fish to ponds occupied by this species.<br>3. Manage habitat to favor this species but not favor bullfrogs and fish (e.g., create seasonal ponds).<br>4. Create and maintain barriers such as dikes that prevent non-native fish from entering ponds occupied by this species. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss and degradation | Loss of suitable breeding habitat due to water management in the reservoir (drawdowns, backups). | Create and restore breeding habitat (seasonal ponds). | Nothing current – new action needed | Both |
| 3 | Agriculture and aquaculture side effects | The upcoming Odessa Supplemental Feed Route will influence water levels in Potholes Reservoir and may impact the amount of suitable habitat in the NLFMA. | 1. Maintain suitable habitat to allow for dispersal and movement.<br>2. Monitor population.<br>3. Pursue opportunities to establish new populations.<br>4. Use adaptive management to deal with the high level of uncertainty regarding potential habitat changes. | Current insufficient | Both |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 4 | Invasive and other problematic species | Unknown impacts to population from disease. | Additional disease monitoring is necessary to determine the extent of the disease threat in the NLFMA. | Current insufficient | WDFW |
| 5 | Invasive and other problematic species | Wetland succession and tall emergent vegetation encroachment (e. g. Reed Canary Grass, phragmites, and non-native cattails) reduces suitability of habitat. | Set back succession; reduce tall emergent vegetation and encourage short emergent cover through chemical and mechanical treatments. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority

# TURTLES

## GREEN SEA TURTLE (*Chelonia mydas*)

**Conservation Status and Concern**

A rare visitor off the outer Washington coast, this declining species is threatened by a number of factors occurring primarily outside of the state. However, issues related to consumption of plastic pollution could be addressed in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Threatened | No | G3 | SNA | Low/unknown | Moderate |

**Biology and Life History**

Green sea turtles are unique among sea turtles in that adults are herbivorous, feeding primarily on seagrass and algae. Sexual maturity occurs at 20 to 50 years. Adult females return every two to four years to lay eggs at the same beaches where they were born. Females nest at two-week intervals, laying an average of five clutches of eggs per nesting season. In Florida, green turtle nests contain an average of 135 eggs; incubation lasts about two months. Hatchlings swim to the open ocean, where they feed on pelagic plants and animals. At three to five years of age, juveniles travel to nearshore foraging sites. Adult females migrate hundreds or thousands of kilometers between foraging areas and nesting beaches.

Photo: B. Inaglory

**Distribution and Abundance**

The species is most widely distributed in tropical and subtropical waters near islands and along continental coasts between 30°N and 30°S worldwide. Along western North America, it occurs primarily south of California, but rarely extends northward to southern Alaska. It is rare in Washington, with four individuals stranded on outer coast beaches from 2002 to 2012.

**Habitat**

Feeding occurs in shallow, low-energy marine waters with abundant submerged vegetation, and also in convergence zones in open ocean. Coral reefs and rocky outcrops near feeding areas are often used for resting. Nesting occurs on sandy beaches, usually on islands but also on the mainland.

**References**

NatureServe Explorer. http://explorer.natureserve.org/servlet/NatureServe?init=Species K. Wilkinson and L. Todd, unpublished data

## Green Sea Turtle: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Improve documentation of green sea turtles recorded in Washington. | Work with National Marine Fisheries Service, stranding organizations, vessel operators, and others to better document presence of green sea turtles in Washington. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Oceanic pollution. Plastics such as plastic bags, balloons, and other debris are eaten, which can result in mortality. | Support efforts to reduce plastic pollution in oceans. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## LEATHERBACK SEA TURTLE (*Dermochelys coriacea*)

**Conservation Status and Concern**

This declining species, which may occur more regularly off the outer Washington coast than previously known, is threatened by numerous factors happening primarily outside of the state. However, issues related to oil spills and fishing gear entanglement as well as consumption of plastic pollution could be addressed in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Endangered | No | G2 | SNA | Low/unknown | Moderate |

**Biology and Life History**

This species, which is the world's largest sea turtle, moves hundreds or thousands of kilometers between nesting beaches and distant marine waters; transequatorial migrations have been documented. Gravid females go directly from temperate latitudes to preferred nesting beaches. Individual females may nest on multiple beaches within a region. The principal food is jellyfish, although other invertebrates, fishes, and seaweed are sometimes eaten. The species dives almost continuously, sometimes to several thousand meters, but may linger at the surface at midday.

Photo: C. Lombard

**Distribution and Abundance**

Leatherback turtles occur in tropical, temperate, and subpolar oceans worldwide. Some of the turtles foraging off the west coast of North America, including Washington, nest in western New Guinea. Most populations in the Pacific are in steep decline. Numbers of turtles visiting Washington's waters are unknown, but telemetry suggests abundance may be higher than indicated by the few sightings.

**Habitat**

The species inhabits open ocean, often near the edges of continental shelves. Inshore waters (e.g., bays and estuaries) are occasionally used; higher latitude waters are visited in summer. Nests are placed on sloping sandy beaches backed by vegetation, often near deep water and rough seas. The largest colonies occur on continental, rather than island, beaches. Absence of a fringing reef appears to be important for nesting sites. Newly formed nesting habitat may be rapidly utilized.

**References**


Benson, S. R., T. Eguchi, D. G. Foley, K. A. Forney, H. Bailey, C. Hitipeuw, B. P. Samber, R. F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7):art84. doi:10.1890/ES11-00053.1.

NatureServe Explorer. http://explorer.natureserve.org/servlet/NatureServe?init=Species

### Leatherback Sea Turtle: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Improve documentation of leatherback sea turtles recorded in Washington. | Work with National Marine Fisheries Service stranding organizations, vessel operators, and others to better document presence of leatherbacks in Washington. | Current insufficient | Both |
| 2 | Overharvesting of biological resources | Incidental capture in fishing gear. | Support efforts to reduce fisheries bycatch, including turtle exclusion devices in trawl fisheries, large circle hooks in longline fisheries, and time and area closures for gillnets. | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Oceanic pollution. Plastics such as plastic bags, balloons, and other debris are commonly eaten, which can result in mortality. | Support efforts to reduce plastic pollution in oceans. | Current insufficient | Both |
| 4 | Energy development and distribution | Mortality from oil spills. | Expand safeguards to prevent oil spills. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## LOGGERHEAD SEA TURTLE (*Caretta caretta*)

**Conservation Status and Concern**

A very rare visitor off the outer Washington coast, this declining species is threatened by factors occurring primarily outside of the state. However, issues related to consumption of plastic pollution could be addressed in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Threatened | No | G3 | SNA | Low/unknown | Moderate-high |

**Biology and Life History**

Diet of all life stages is mostly benthic invertebrates (crabs, other crustaceans, and mollusks) and occasionally jellyfish. Sexual maturity is reached at about 45 years of age. Nesting occurs mainly at night, often at high tide. Females lay eggs in three to five nests per nesting season, with 80 to 120 eggs per clutch. In the eastern U.S., nesting takes place in late April to early September. Incubation lasts about two months. The species is known to make long migrations; some Pacific loggerheads migrate over 7460 miles between nesting beaches in Japan and feeding grounds off Mexico.

Photo: B. Gratewicke

**Distribution and Abundance**

The species occurs throughout the tropical and temperate regions of the Atlantic, Pacific, and Indian Oceans. Most records along the U.S. west coast are of juveniles along the coast of California, with very few sightings reported off Washington, Oregon, and northward to Alaska. The west coast of Mexico, including the Baja Peninsula, provides critically important habitat for juveniles. Loggerheads nest in tropical and subtropical regions; the only known nesting areas in the North Pacific are in southern Japan. The species is very rare in Washington, with none stranded on outer coast beaches from 2002 to 2012.

**Habitat**

Loggerhead sea turtles mostly inhabit continental shelf and nearshore marine waters, but occur pelagically during migration. Hatchlings move to masses of sargassum at sea, where they remain for perhaps three to five years. Nesting occurs on open sandy beaches in warm temperate and subtropical regions, generally at high energy, relatively narrow, steeply sloped, coarse-grained beaches.

**References**

NatureServe Explorer. http://explorer.natureserve.org/servlet/NatureServe?init=Species K. Wilkinson and L. Todd, unpublished data

### Loggerhead Sea Turtle: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Improve documentation of Loggerhead Sea Turtles recorded in Washington. | Work with National Marine Fisheries Service, stranding organizations, vessel operators, and others to better document presence of Loggerhead Sea Turtles in Washington. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Oceanic pollution. Plastics such as plastic bags, balloons, and other debris are eaten, which can result in mortality. | Support efforts to reduce plastic pollution in oceans. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## WESTERN POND TURTLE (*Actinemys [Clemmys] marmorata*)

**Conservation Status and Concern**

In the 1990s, only two populations remained in the Columbia River Gorge with estimates of less than 200 individuals. Because of recovery efforts, currently there are six populations with approximately 800 turtles. Many issues remain for the recovery of this species. Habitat must be managed to prevent invasive weeds from overgrowing the nesting areas. Predation by non-native American Bullfrogs on hatchlings, as well as mammalian predation on nests, prevents natural recruitment of hatchlings at many sites. Disease has emerged as a major concern in recent years due to the discovery that a substantial number of turtles have diseased shells (ulcerative shell disease). The cause of the disease is under investigation but is not yet known.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| In review | Endangered | Yes | G3G4 | S1 | Low/increasing | Moderate |

**Biology and Life History**

Photo: OR Dept. Fish & Wildlife

This species is primarily aquatic, but strays from water to lay eggs, to disperse to new water bodies, to overwinter and to aestivate during periods of drought. Western Pond Turtles are active as soon as water temperatures are warm enough and basking is possible, usually in late March or early April. Adult activity continues until late September or October depending on weather conditions and location. Western Pond Turtles spend a great deal of time basking on logs at the surface of ponds. A recent telemetry study of juvenile turtles found that some turtles were still active in December at a site in the Columbia River Gorge. Western Pond Turtles are omnivorous.

**Distribution and Abundance**

The range of the Western Pond Turtle extends from the Puget Sound Lowlands in Washington through western Oregon and California, and south to Baja California. Western Pond Turtles disappeared from the Puget lowlands by the 1980s, with only a few isolated adult turtles remaining. By 1990, the Western Pond Turtle population in Washington had declined to an estimated 150 animals remaining in the wild at only two sites in the Columbia River Gorge. Because of recovery efforts, currently six populations occur in Washington with approximately 800 turtles. Two sites are in South Puget Sound and four occur in the Columbia River Gorge.

**Habitat**

Western Pond Turtles utilize a variety of flowing and still water habitats in other parts of their range, but in Washington they are only known from ponds and lakes. They nest in grasslands and open woodland around ponds.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Western Pond Turtle. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp

Pramuk, J. F. Koontz, M. Tirhi, S. Zeigler, K. Schwartz, and P. Miller (eds.) 2013. The Western Pond Turtle in Washington: A Population and Habitat Viability Assessment. IUCN/SSC Conservation Breeding Specialist Group, Apple Valley, M. N. Schmidt, T, and M. Tirhi. 2014.

## Western Pond Turtle: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat loss, degradation and fragmentation. Lack of suitable habitat for reintroduction sites. | Conserve suitable habitat; protect significant areas; Protect or restore nesting habitat at existing and potential sites. Establish new sites to meet reintroduction plan goals. | Current sufficient | Both |
| 2 | Invasive and other problematic species | American Bullfrogs and introduced warm-water fish. | Implement bullfrog and fish control as needed. | Current insufficient | Both |
| 3 | Invasive and other problematic species | Invasive tall vegetation overgrowing the nesting habitats and uplands. | Continue to remove and control vegetation in areas significant for Western Pond Turtles such as nesting sites. | Current insufficient | WDFW |

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 4 | Resource information collection needs | Continue to monitor populations to trigger intervention if necessary to avoid massive declines. | Study mortality rates & nature/intensity of threats acting on key demographic stages (i.e. hatchlings reared in the wild and adults). | Current sufficient | WDFW |
| 5 | Resource information collection needs | Understand shell disease epidemiology, survival rate of affected individuals, and effects on reproduction. | Study shell disease and make management decisions from the science. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# LIZARDS

## PYGMY HORNED LIZARD (*Phrynosoma douglasii*)

*See Appendix B for a potential range and habitat distribution map

### Conservation Status and Concern

The conservation concern for this species is because its distribution is primarily restricted to the highly altered and fragmented shrub-steppe in Eastern Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3 | Medium/unknown | Moderate |

### Biology and Life History


Photo: W. Siegmund

This is a medium-sized lizard, rather toad-like in appearance with a blunt snout, round flattened body, short legs and a short triangular tail. They are cryptic and their coloration tends to match the substrate. The females are significantly larger than the males. Activity starts in late March in the Columbia Basin. Adults are active mid-day during spring and fall but in summer are inactive during the middle of the day when temperatures are at their maximum. Mating takes place soon after emergence in the spring. Young are born live in late summer approximately two months after mating. Surface activity continues into October. A study in Washington found that neonates feed almost exclusively on ants (89 percent), while ants made up about 72 percent of the adult diet.

**Distribution and Abundance**

They reach the northern extent of their range in Washington and occur primarily in the Columbia Plateau Ecoregion. Abundance varies from site to site. The statewide trend for this specie is unknown.

**Habitat**

In Washington, they occupy shrub-steppe habitat. They require soil conditions that allow them to burrow below the surface and substrate that is well-drained. Field research in Kittitas County found Pygmy Horned Lizards to have a disproportionate preference for lithosol terrain. Females in the final month of gestation, however, tended to use loamy and ecotone terrains. Other findings of this study suggest populations may need a variety of substrate types to meet all their needs. In addition to these terrain types, Pygmy Horned Lizards in Washington are also known to occur in loamy terrain without lithosols, on vegetated sand dunes, and even in some agricultural settings where patches of native habitat are present.

**References**


Hallock, L. A. and K. R. McAllister. 2005. Pygmy Short-horned Lizard. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Lahti, M. 2005. Ecology of the Pygmy Short Horned Lizard (*Phrynosoma douglasii*) in Washington. Master's Thesis. Central Washington University, Ellensburg, Washington. 73 pp.

Lahti, M. and D. Beck. 2010. Ecology of the Pygmy short-horned lizard (*Phyrnosoma douglasii*). Northwestern Naturalist. 91(2):134-144.

Lahti, M. and D. Beck. 2007. Ecology and ontogenetic variation of diet in the pygmy short-horned lizard (*Phyrnosoma douglasii*). American Midland Naturalist 159:327-339.


### Pygmy Horned Lizard: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, survey and monitoring are needed to understand the status, distribution and habitat needs of this species. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat due to conversion to agriculture. | A strategy needs to be developed to make sure that enough suitable shrub-steppe habitat is maintained to support viable populations of this lizard. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SAGEBRUSH LIZARD (*Sceloporus graciosus*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington status is based on the species' obligate association with sand dunes in the Columbia Basin where greater than 70 percent of this habitat type has been lost since the 1970s.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3 | Low/declining | Moderate-high |

**Biology and Life History**


Photo: T. Thompson

This is a small (less than 2.4 inches snout to vent length) gray or brown lizard with a mid-dorsal stripe, two light colored dorsolateral stripes, and a series of dark chevron-shaped blotches between the stripes. They are primarily ground dwelling lizards. In Washington, they are active on warm, sunny days from early April through October. They are gregarious and interact with other lizards, often under the canopy of shrubs. They prey on small insects and arachnids. Eggs are laid in early summer. Hatchlings appear in early August.

**Distribution and Abundance**

In Washington, Sagebrush Lizards occur in the Columbia Plateau and Okanogan ecoregions where they occur on sand dunes. Sagebrush Lizards tend to be common where they occur but their habitat is being fragmented by various factors.

**Habitat**

In Washington, Sagebrush Lizards are associated with vegetated sand dunes and associated sandy habitats that support shrubs and have large areas of bare ground. Typically, they can be seen on the ground at the edge of shrubs and other vegetation that provide cover from predators and relief from mid-day heat. They will also climb into the lower branches of shrubs to shelter from the mid-day heat. At night, on rainy days and on cool, cloudy days they move underground or shelter under cover objects such as rocks and woody debris. Habitat for these lizards is degraded by invasive plants, such as cheatgrass, that grow densely between shrubs and eliminate bare ground. Excessive livestock grazing can also degrade habitat by removing too much vegetation and damaging the lower limbs of shrubs. Without the lower limbs, shrubs do not provide retreats for Sagebrush Lizards. Overwintering habitat has not been studied in Washington but is likely within sand dune habitat.

**References**

Green, G. A., K. B. Livezey, and R. L. Morgan. 2001. Habitat selection by Northern Sagebrush Lizards (Sceloporus graciosus graciosus) in the Columbia Basin, Oregon. Northwestern Naturalist 82(3): 111-115.

Hallock, L. A., R. D. Haugo and R. Crawford. 2007. Conservation Strategy for Washington Inland Sand Dunes. Unpublished report from Washington Department of Natural Resources' Natural Heritage Program (Olympia), Report 2007-05.

Hallock, L. A. and K. R. McAllister. 2005. Sagebrush Lizard. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

### Sagebrush Lizard: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information about status. This species is associated with sand dunes. Loss and alteration of sand dune habitat continues to occur throughout the Columbia Basin. Therefore, Sagebrush Lizard populations must be monitored to make sure they are persisting. | Monitor populations to make sure their habitat remains suitable and the populations persist. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Sand dune conversion to agriculture. | Protect sand dune habitat. | Current insufficient | Both |
| 3 | Invasive and other problematic species | Stabilization of sand dunes and loss of bare soils interspersed with vegetation. Non-native invasive species, especially cheatgrass, are stabilizing sand dunes and altering the habitat so that it is not suitable for Sagebrush Lizards. | Prevent land use practices that increase non-native invasive species. Where these plants already occur, find ways to remove and/or prevent expansion. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SIDE-BLOTCHED LIZARD (*Uta stansburiana*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington State status is based on the small number of populations and a distribution that is restricted to the heavily altered shrub-steppe vegetation of Eastern Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | G5 | S3 | Medium/unknown | Moderate |

**Biology and Life History**

Photo: W. Flaxington

This is a small (maximum size 2.2 inches snout to vent length) brown or gray lizard with a mottling of black, brown and light colored markings on the dorsal surface. They are very cryptic and blend into their surroundings. In Washington, activity typically starts in early to mid-March and continues through October. They are ground dwelling lizards that do not climb in vegetation although they will climb on rocks and basalt outcrops. They are gregarious and interact with other lizards, often under the canopy of shrubs. They are active mid-day during spring and fall but in summer are inactive during the middle of the day when temperatures are at their maximum. They are not surface active on rainy days or cool cloudy days. Eggs are probably laid in May and hatchlings start to appear in mid-July. Both adults and juveniles prey on insects and arachnids.

**Distribution and Abundance**

In Washington, Side-blotched Lizards are shrub-steppe obligates that occur primarily in the driest areas of the central Columbia Basin. Most documented occurrences are in Grant and Benton Counties with additional occurrences in adjacent counties. Side-blotched Lizards are gregarious and tend to be common to abundant where they occur.

**Habitat**

Side-blotched Lizards are associated with arid areas that support shrub-steppe habitat. They are most common in areas with bare ground interspersed with shrubs and other vegetation (*e.g.*, shrubland with grasses). They also occupy dry washes, rocky canyons, sand dunes and road edges. Typically, individuals can be seen on the ground at the edge or under shrubs or other vegetation that provides cover from predators. During the heat of the day and during rainy and/or cool periods, they retreat underground or move under cover objects such as rocks and woody debris. Habitat for these lizards is degraded by invasive plants such as cheatgrass and knapweed that grow densely between shrubs and eliminate bare ground. Excessive livestock grazing can also degrade habitat by removing too much vegetation and damaging the lower limbs of shrubs. Without the lower limbs, shrubs do not provide retreats for Side-blotched Lizards.

**References**


Hallock, L. A. and K. R. McAllister. 2005. Side-blotched Lizard. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

### Side-blotched Lizard: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, survey and monitoring are needed to understand the status, distribution and habitat needs of this species. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat that this species relies upon in WA. | Protect native shrub-steppe habitat from conversion and degradation due to agriculture. | Current insufficient | Both |
| 3 | Invasive and other problematic species | Changes to vegetation/habitat from non-native invasive plant species. This species requires habitat with bare ground between plants. Non-native, invasive species, such as cheatgrass, create dense ground cover that is not suitable for this species. | Prevent land use practices that increase non-native invasive species. Where these plants already occur, find ways to remove and/or prevent expansion. | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss and degradation | Changes in vegetation due to livestock grazing. Livestock grazing can result in removal of too much vegetation, introduction of invasive weeds, crushing of burrows and changes to the structure of shrubs (e.g., cattle can damage/destroy the lower branches of shrubs as they graze under the shrubs). | Prevent livestock use and grazing practices that remove excessive amounts of vegetation (change the character of the habitat), introduce invasive weeds, and change the structure of shrubs (e.g., cattle can damage/destroy the lower branches of shrubs as they graze under the shrubs). | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SNAKES

## CALIFORNIA MOUNTAIN KINGSNAKE (*Lampropeltis zonata*)

**Conservation Status and Concern**

In Washington, occurs at the northern extreme of its range and the population is isolated from the rest of its range by approximately 200 miles. The species' range in Washington is small with few individuals documented. They occur in the Columbia River Gorge in an area of the state that is likely to see increased development and vehicular traffic over the next decade.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G4G5 | S2? | Low/unknown | Low-moderate |

**Biology and Life History**

Little is known about this species in Washington. It is chiefly diurnal, but may be nocturnal during warm weather. Similar to other snake species occupying the same area, it most likely becomes active in late March or April and remains active until October. Mating probably takes place in May with three to nine eggs laid in June or July. The incubation period is approximately 60 days.

Photo: A.P. Summers

**Distribution and Abundance**

The Washington range is limited to the southernmost areas of eastern Skamania County and western Klickitat County. The Washington range is isolated from the rest of the species' range by approximately 200 miles. Unsubstantiated reports exist for the Blue Mountains and Yakima County. Nothing is known about their abundance in Washington.

**Habitat**

The species occurs in moist microhabitats in Oregon white oak-ponderosa pine forest, where individuals are usually found under woody debris and rocks.

**References**

Hallock, L. A. and K. R. McAllister. 2005. California Mountain Kingsnake. Washington Herp Atlas. http://www.1dnr.wa.gov/nhp/refdesk/herp/

### California Mountain Kingsnake:  Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Conduct comprehensive surveys to determine distribution and population numbers. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss or degradation | Loss, degradation and fragmentation of habitat and well as an increase in vehicle traffic.  They occur in the Columbia River Gorge - an area of the state that is highly desirable and is likely to see increased development and vehicular traffic over the next decade. | Determine where populations occur and how to protect those populations from development and road mortality. | Current insufficient | WDFW |
| 3 | Overharvesting of Biological Resources | Removal from the wild. These are attractive snakes with docile temperaments that can be easily tamed and kept in captivity. This makes them vulnerable to collecting as pets. | Public outreach and education.  Make sure that laws protecting this species are enforced. | Current insufficient | WDFW |

NOTE:  Numbers are for reference only and do not reflect priority.

## DESERT NIGHTSNAKE (*Hypsiglena chlorophaea*)

**Conservation Status and Concern**
The Washington State status is based on a distribution that is primarily restricted to the shrub-steppe vegetation that has been heavily altered in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3 | Medium/unknown | N/A |

**Biology and Life History**
This is a small, (less than 18 inches in total length) spotted snake with dark brown blotches in the neck region. In Washington, Desert Nightsnakes are active from April to October. As their common name suggests, they are primarily nocturnal. Mating takes place in the spring. Three to nine eggs are laid in June or July each year. Little else is known regarding Desert Nightsnake reproduction in Washington. Similarly, survival rate, growth rates, and longevity are largely unknown. Nightsnakes eat small lizards and smaller snakes, as well as lizard eggs, frogs, and other small prey.


Photo: B. Hughes

**Distribution and Abundance**
In Washington, Desert Nightsnakes have been documented in the Columbia Plateau, Eastern Cascades, and Okanogan Ecoregions. Distribution may be limited by the occurrence of certain lizard prey species. From 2003 to 2004, 66 new observations were made from seven Washington counties by a student as part of his graduate studies. This suggested that the species was more common than was previously known.

**Habitat**
Most Desert Nightsnake occurrences in Washington are from arid areas that support shrub-steppe vegetation, but occurrences in the Leavenworth area are in ponderosa pine forests. Individuals are usually found in rocky areas, but have also been found in sagebrush flats that are not rocky. During the day, individuals can be found sheltering under surface objects, generally rocks. However, during prolonged periods of hot weather, they may move deep into talus, rock fissures or rodent burrows.

**References**
Hallock, L. A. and K. R. McAllister. 2005. Night Snake. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp
Nussbaum, R. A., E. D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 332 pp.
Weaver, R. E. 2008. Distribution, abundance, and habitat associations of the Night Snake (*Hypsiglena torquata*) in Washington State. Northwestern Naturalist 89: 164-170.

### Desert Nightsnake: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, survey and monitoring are needed to understand the status, distribution and habitat needs of this species. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat that this species relies upon in WA. | A strategy needs to be developed to make sure that enough suitable shrub-steppe habitat is maintained to support viable populations of this snake. | Current insufficient | Both |
| 3 | Overharvesting of Biological Resources | Destruction of rattlesnake hibernacula also negatively affects nightsnakes because they often share hibernacula with rattlesnakes. | Environmental education and outreach. Protect snake dens on public lands. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## RING-NECKED SNAKE (*Diadophis punctatus*)

*See Appendix B for a potential range and habitat distribution map

**Conservation Status and Concern**

The Washington State status is based on the small number of observations, patchy distribution and lack of information. Some of the distribution is in the Columbia Basin, a heavily altered region of the state heavily impacted by agriculture.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | No | G5 | S3S4 | Unknown/unknown | Low-moderate |

**Biology and Life History**

This is a small, dark snake with shiny scales and an orange band or "ring" around the neck. The underside is bright orange. They are secretive and rarely surface active during the day. Little is known about them in Washington. Similar to other snake species in Washington, they are likely active from March through October varying somewhat from year to year and by location. Females deposit about three eggs per year in early in July. They feed primarily on salamanders and lizards, but may also eat earthworms, frogs, insects and smaller snakes.

Photo: W. Flaxington

**Distribution and Abundance**

The main distribution in Washington follows the east slope of the Cascade Mountains from the Ellensburg area south to the Columbia Gorge and west to Longview. They also occur along the eastern portion of the Snake River. Distribution is likely continuous between the Klickitat and Yakima Counties but there are no records in WDFW's database to support this. Isolated records of individual snakes were collected in Whitman County in 1937 and 1938; Walla Walla County in 1975; and two locations in Cowlitz County (Kalama and confluence of Mill Creek and the Columbia River) in 1959 and 1982 respectively. Observations for this species are rarely submitted to the WDFW database and no studies have been conducted in Washington. Consequently, nothing is known about the status or abundance of this species.

**Habitat**

Based on collection and observation records, Ring-necked Snakes occur in ponderosa pine-Oregon white oak, mixed forest and shrub-steppe. Occurrences in shrub-steppe are often associated with riparian areas. Ring-necked Snakes are usually found under woody debris, rocks or on roads at night. Eggs are deposited in stabilized talus and rotting logs.

**References**

Hallock, L. A. and K. R. McAllister. 2005. Ring-necked Snake. Washington Herp Atlas. http://www1.dnr.wa.gov/nhp/refdesk/herp/

Nussbaum, R. A., E. D. Brodie, Jr., and R.M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University of Idaho Press, Moscow, Idaho. 332 pp.

### Ring-necked Snake:  Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, survey and monitoring are needed to understand the status, distribution and habitat needs of this species. | Current insufficient | Both |

## SHARP-TAILED SNAKE   (*Contia tenuis*)

*See Appendix B for a range and potential habitat distribution map

**Conservation Status and Concern**

The Washington status and concern is based on the small number of populations, patchy distribution and lack of information.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S3 | Low/unknown | Moderate |

**Biology and Life History**


Photo:  W. Leonard

This is a diminutive, semi-fossorial species with a distinct ventral pattern of alternative black and cream colored bands and a short tail that terminates with a small spike-like scale.  These snakes are rarely encountered and little studied.  Most surface activity occurs when the surface is cool and moist in the spring and fall although observations have been made in most months of the year.  The snakes are typically found under cover objects.  Aggregations are often observed. Breeding takes place in April or May.  Eggs are laid in late June or July and hatching occurs in the fall.  Activity is confined to relatively small areas.  The greatest distance moved by two study snakes in Canada was 128 and 305 feet.  Snakes also show evidence of site tenacity, with some snakes found repeatedly under the same cover objects.  The long, re-curved teeth appear to be a specialization for grasping and holding mollusks, the primarily prey of this snake.

**Distribution and Abundance**

Sharp-tailed Snakes occur from British Columbia, Canada into southern California.  In Washington, Common Sharp-tailed Snakes are known from thirteen disjunct areas.  West of the Cascade Crest there is an historical record for Pierce County and two recently discovered sites on Orcas and San Juan Islands.  East of the Cascade Crest observations are from Chelan, Kittitas, Yakima, Klickitat and Skamania Counties.  Almost nothing is known about abundance and some occurrences are based on a single observation.

**Habitat**

In the Pacific Northwest, they are found on the edges of coniferous or open hardwood forest. In Washington, the snakes have been found in 1) forest openings dominated by Garry Oak often with rock accumulations; 2) riparian/river floodplain with deciduous trees, shrubs and accumulations of decaying down woody logs; 3) shrub-steppe uplands with riparian areas that support deciduous trees and have accumulations of woody debris and rocks. The snakes are usually found in moist rotting logs or stable talus, often near streams or in other damp habitats. Small canopy gaps with rocky substrates, especially those that are south-facing, may be important for thermoregulation, egg development and growth of young.

**References**

Hallock, L. 2009. Conservation Assessment for the Sharp-tailed Snake (Contia tenuis) In Washington and Oregon. Unpublished Report. Washington Natural Heritage Program, Department of Natural Resources, Olympia. Submitted to the Interagency Special Status/Sensitive Species Program, Washington and Oregon. USDS Forest Service and Bureau of Land Management.

Ovaska, K. E. and C. Engelstoft. 2008. Conservation of the Sharp-tailed Snake (*Contia tenuis*) in urban areas in the Gulf Islands, British Columbia, Canada. In Mitchell, J., R. Jung Brown and B. Bartholomew Editors. 2008. Urban Herpetology. Herpetological Conservation 3:557-564. Society for the Study of Amphibians and Reptiles. Salt Lake City.

### Sharp-tailed Snake: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Research, survey and monitoring are needed to understand the status, distribution and habitat needs of this species. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Loss of prairie and oak habitat. With the exception of recent observations on San Juan Island, no extant occurrences are known from western Washington. This species is thought to have been associated with prairie habitat in western Washington and most of this habitat type was converted to agriculture or developed for housing. | Inventory and outreach to determine if this small, secretive snake still occurs in areas of western Washington other than the San Juan Islands. | Nothing current - new action needed | WDFW |
| 3 | Fish and wildlife habitat loss and degradation | Loss of suitable habitat due to harvest of trees. Little is known about threats to this species from habitat alteration but forestry practices likely impact local populations because the loss of canopy changes the moisture regime, increases temperature and removes down woody debris and leaf litter. | Identify where this species occurs and work with landowners to conserve habitat features important for the persistence of this species such as downed woody debris and rock features. | Nothing current - new action needed | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## STRIPED WHIPSNAKE (*Coluber taeniatus*)

**Conservation Status and Concern**

The Washington status is based on the small number of populations. Currently only two populations are verified extant. Threats include conversion of habitat to agriculture, degradation of native shrub-steppe habitat from irrigation water and invasive weeds, basalt mining, single home construction and increasing vehicular traffic on roads and highways that bisect the occupied areas.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | G5 | S1 | Low/declining | Low-moderate |

**Biology and Life History**


Photo: D. Hagin

They are long, slender, striped snakes that are alert, visual and fast-moving. Adults can grow to six feet total length but are typically shorter in Washington. They are diurnal. Spring emergence starts in late-March in Washington. Females lay eggs in July. Clutch sizes range from three to seven. The incubation period is 44 to 58 days. Lizards are the predominant prey; small mammals, snakes, young birds and insects are also taken occasionally. Maximum recorded dispersal distance from a den at Tooele Valley, Utah was 2.2 miles. They return to the vicinity of the hibernaculum in September. They overwinter communally with other snake species and use the same hibernaculum every year. Striped Whipsnakes may live as long as 20 years.

**Distribution and Abundance**

Striped Whipsnakes reach the northern extent of their range in Washington. They were probably never common in Washington. Only 15 museum specimens are known and until 2004, only 11 sight observations had been submitted to the WDFW database. Together these represent 16 unique locations in Yakima, Kittitas, Grant, Benton, Franklin, Lincoln and Walla Walla counties. Concern about the species' status was triggered by lack of observations during large scale herpetological inventories in the 1990s that included inventory at historically occupied areas. Only two areas located 4.4 miles apart are verified extant currently. The population size is unknown.

**Habitat**

In Washington, Striped Whipsnakes are shrub-steppe obligates and occur primarily in the driest areas of the central Columbia Basin. The habitat of the extant populations included basalt outcrops and relatively undisturbed shrubland with grasses and a low cover of invasive cheatgrass. Soils surrounding the basalt outcrops are sandy and supported larger shrubs including big sage and spiny hop sage. The snakes shelter during the active season in basalt outcrops and mammal burrows. The hibernacula are also in basalt outcrops. The snakes show strong site fidelity to sheltering and overwintering locations. Mammal burrows may be important for egg laying.

**References**

Hallock, L. 2006. Summary Report on the Striped Whipsnake (*Masticophis taeniatus*) in Washington. Natural Heritage Report 2006-05. Prepared for the Bureau of Land Management, Wenatchee.

Parker, W. S and W. S. Brown. 1972. Telemetric study of movements and oviposition of two female *Masticophis t. taeniatus*. Copeia 1972 (4): 892-895.

### Striped Whipsnake: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Lack of information on status and distribution. | Currently, only two extant populations are known in Washington. Inventory efforts and outreach must continue to determine if other populations occur in the state. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss and degradation | Loss and degradation of suitable shrub-steppe habitat that this species relies upon in WA. | Because of the apparent rarity of this species, lands where it occurs need to be protected from agricultural conversion. | Current insufficient | Both |
| 3 | Fish and wildlife habitat loss and degradation | Shrub-steppe habitat degraded by irrigation water. | Protect habitat at risk for conversion to irrigated cropland that could provide suitable habitat within or between occupied areas. | Current insufficient | Both |
| 4 | Invasive and other problematic species | Changes to vegetation/ habitat. This species, and its lizard prey, requires habitat with bare ground between plants. Non-native, invasive species such as cheatgrass create dense ground cover. | Prevent land use practices that increase non-native invasive plant species. Where these plants already occur, find ways to remove and/or prevent expansion. | Current insufficient | Both |
| 5 | Fish and wildlife habitat loss and degradation | Changes in vegetation may result from unsustainable livestock grazing through the removal of too much vegetation, the introduction of invasive weeds, crushing of mammal burrows (used by the snakes) and damage to the lower branches of shrubs from grazing under the shrubs. | Provide technical assistance to producers grazing within vicinity of known Striped Whipsnake hibernacula. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# REFERENCES

## SECTION A: Alphabetical list of species


| | |
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| Columbia Spotted Frog | 27 |
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## SECTION B: Explanation of Terms

# Conservation Status Table

Federal Status
Refers to legal designations under the Federal ESA (listed as Endangered or Threatened or recognized as a Candidate species for listing), or designated as a Sensitive species.

State Status
The Washington Fish and Wildlife Commission has classified 46 species as Endangered, Threatened or Sensitive, under WAC 232-12-014 and WAC 232-12-011. Species can also be designated Candidate Species for state listing by WDFW policy.

PHS (Priority Habitats and Species Program)
A species listed under the PHS program is considered to be a priority for conservation and management and requires protective measures for survival due to population status, sensitivity to habitat alteration and/or tribal, recreational or commercial importance. Management recommendations have been developed for PHS species and habitats, and can assist landowners, managers and others in conducting land use activities in a manner that incorporates the needs of fish and wildlife.

**Global (G) and State (S) Rankings:** Refers to NatureServe status rankings provided by the Natural Heritage Program. These conservation status ranks complement legal status designations and are based on a one to five scale, ranging from critically imperiled (1) to demonstrably secure (5). The global (G) and state (S) geographic scales were used for the SGCN species fact sheets. For more on the methodology used for these assessments, please see: Methodology for Assigning Ranks - NatureServe.

**State Rank:** characterizes the relative rarity or endangerment within the state of Washington.
**S1** = Critically imperiled
**S2** = Imperiled
**S3** = Rare or uncommon in the state – vulnerable
**S4** = Widespread, abundant, and apparently secure i
**S5** = Demonstrably widespread, abundant, and secure in the State
**SA** = Accidental in the state.
**SE** = An exotic species that has become established in the state.
**SH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist in the state.
**SNR** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**SP** = Potential for occurrence of the taxon in the state but no occurrences have been documented.
**SR** = Reported in the state but without persuasive documentation which would provide a basis for either accepting or rejecting the report (e.g., misidentified specimen).
**SRF** = Reported falsely in the state but the error persists in the literature.
**SU**= Unrankable. Possibly in peril in the state, but status is uncertain. More information is need.
**SX** = Believed to be extirpated from the state with little likelihood that it will be rediscovered.
**SZ** = Not of conservation concern in the state.

Qualifiers are sometimes used in conjunction with the State Ranks described above:

**B** - Rank of the breeding population in the state.
**N** - Rank of the non-breeding population in the state.

**Global Rank:** characterizes the relative rarity or endangerment of the element world-wide.
**G1** = Critically imperiled globally
**G2** = Imperiled globally
**G3** = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range - vulnerable
**G4** = Widespread, abundant, and apparently secure globally
**G5** = Demonstrably widespread, abundant, and secure globally, though it may be quite rare in parts of its range
**GH** = Historical occurrences only are known, perhaps not verified in the past 20 years, but the taxon is suspected to still exist somewhere in its former range.
**GNR** = Not yet ranked. Sufficient time and effort have not yet been devoted to ranking of this taxon.
**GU** = Unrankable. Possibly in peril range-wide but status uncertain. More information is needed.
**GX** = Believed to be extinct and there is little likelihood that it will be rediscovered.

Qualifiers are used in conjunction with the Global Ranks described above:
**Tn** Where n is a number or letter similar to those for Gn ranks, above, but indicating subspecies or variety rank. For example, G3TH indicates a species that is ranked G3 with this subspecies ranked as historic.

## SECTION C: Full List of References


Alberta Northern Leopard Frog Recovery Team. 2005. Alberta Northern Leopard Frog Recovery Plan, 2005-2010. Alberta Sustainable Resource Development, Fish and Wildlife Division, Alberta Species at Risk Recovery Plan no. 7. Edmonton, Alberta 26 pp.

Benson, S. R., T. Eguchi, D. G. Foley, K. A. Forney, H. Bailey, C. Hitipeuw, B. P. Samber, R. F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7):art84. doi:10.1890/ES11-00053.1.

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State Wildlife Action Plan Update

# Appendix A-4

## Species of Greatest Conservation Need

## Fact Sheets

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# FISH

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**Conservation Status and Concern**

**Biology and Life History**

**Distribution and Abundance**

**Habitat Needs**

**Stressors**

**Conservation Actions Needed**

Washington Department of Fish and Wildlife
2015

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## SGCN Fish – Fact Sheets

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# What is Included in Appendix A-4

**Introduction**
Appendix A-4 is one component of the State Wildlife Action Plan (SWAP) Update, and contains information about fish included in our Species of Greatest Conservation Need (SGCN) list for 2015. Included are fact sheets for each of the fish identified as Species of Greatest Conservation Need in the 2015 SWAP. The information provided includes a summary of the conservation concern and conservation status, description distribution and habitat, climate change sensitivity and an overview of key threats and conservation actions needed.

**What it means to be an SGCN**
The SGCN list includes both fish that have some form of official protection status and those which may be in decline, but are not yet listed as part of either the Federal or State Endangered Species program. One of the purposes of the SWAP is to direct conservation attention to species and habitats *before* they become imperiled and recovery becomes more difficult and costly. Presence on this list does not necessarily mean that conservation attention will be directed towards the fish; rather, that conservation actions for the species are *eligible* for State Wildlife Grants funding, and may be more competitive for other grant programs. It also raises the profile of a fish to a wide audience of conservation partners and may encourage other organizations to initiate projects that may benefit the species.

**Climate Vulnerability**
Please see Chapter 5 for an explanation of the methodology used to assess climate vulnerability. For a full list of all the SGCN ranks, including a narrative description of sensitivity and references, please see Appendix C.

**Explanation of terms used in the document**
Please see Section B (page 114) for a description of terms and abbreviations used in this document.

**Alphabetical List of Species**
For an alphabetical list of all the fish included, please see Section A (page 112).

**References**
References are provided separately with each fact sheet, and also collectively for all SGCN fish in the REFERENCES section at the end of this document.

# SUMMARY OF THE FISH SGCN

### Overview
There are 51 fish species or species units included on Washington's Species of Greatest Conservation Need list. A species unit is an "evolutionarily significant unit" (ESU) or a "distinct population segment" (DPS) as designated by NOAA-National Marine Fisheries Service and U.S. Fish and Wildlife Service, respectively, as units of a taxonomic species for ESA-listing purposes, or is a geographically designated population grouping (e.g., Bull Trout – Coastal Recovery Unit). The 18 exclusively marine species represent about 7.5 percent of Puget Sound area marine fishes or about 4.5 percent of marine fishes in all of Washington's marine waters. Of about 50 native freshwater and anadromous (freshwater and marine phases) fishes in Washington, the number of taxonomic species (22; species rather than species units are counted) in SGCN group represent 44 percent of these. Rockfish (genus *Sebastes*) and Pacific salmon and steelhead (genus *Oncorhynchus*) form about half of SGCN list, but species diversity ranges from the Olympic Mudminnow (a Washington freshwater endemic) to the Bluntnose Sixgill Shark. Distribution of these fishes ranges from Pacific coastal waters to mountain streams of the interior Columbia Basin. Threats in common across a broad diversity of SGCN fishes include habitat loss and degradation from land and water uses, lack of abundance trend data, unintentional overharvesting, and passage barriers due to dams, road crossings, diking, and other artificial structures.

### Distribution
Of the 18 SGCN species that live exclusively in marine environments, seven occur within the confined marine waters of the Salish Sea (Puget Sound, Strait of Juan de Fuca, and Strait of Georgia). The other marine fishes and the anadromous fishes occur in these waters and in the Pacific Ocean. Most of the anadromous salmonids have a large Pacific Ocean range during marine phases of their life histories. In freshwater, anadromous fishes generally have well-defined spawning distributions, but rearing distributions may range more widely. Migration corridors between marine and freshwater habitats are essential elements of anadromous fishes' natural distributions, and include vital estuarine habitats. Due to their varied life histories, anadromous fishes are present year-round in freshwater habitats. Of the 13 exclusively freshwater SGCN species (including three non-anadromous salmonid species), eight occur only in eastern (east of Cascades Mountains crest) Washington in Columbia Basin streams and lakes. Only two of the exclusively freshwater fishes (Olympic Mudminnow and Salish Sucker) do not occur in the Columbia Basin. Several freshwater species have relatively small or limited distributions in Washington.

### Abundance Status - Size and Trends
Quantitative abundance and trend data for many SGCN fish species are lacking. Current population or unit size was unknown for 49 percent of the species, and abundance trend was unknown for 59 percent of the species. In many cases, information used to judge abundance status is qualitative, based on fishery-dependent data, or based on few, short-term surveys. Data insufficiency is considered a conservation threat for many SGCN fishes. Of the seven marine fish with status ratings, five were rated at critical and two were rated at low abundances, and trends were rated as stable. All of the ESA-listed anadromous salmonids have long-term abundance data to rate status. For abundance ratings, 11 were low and three were medium; for trend ratings, two were declining, seven were stable, four were increasing and one was unknown. Only one of the freshwater salmonid species (Westslope Cutthroat Trout) was rated, and it had medium abundance and stable trend. Acquiring quantitative data for SGCN species is an action that will clearly benefit the design and evaluation of conservation actions.

### Conservation Concerns

To effectively conserve SGCN fish species we must attend to multiple sources of habitat degradation and loss. For many of the marine species, we need to curtail the loss of and restore degraded nearshore breeding and rearing habitats, such as spawning beaches for Pacific Herring, Sand Lance, and Surf Smelt, and eelgrass and algal habitats. In Puget Sound, residential and industrial shoreline uses and development that reduce and degrade marine habitats and water quality require management by multiple jurisdictions. In freshwater environments, we need to continue mitigation and elimination of impacts from dams, culverts, road crossings, and other instream modifications. Dams pose threats to all anadromous and some freshwater species by reducing, fragmenting, and modifying river habitats and by altering natural flow regimes and water quality. Dams may still impede juvenile and adult passage even where artificial passage has been constructed. Agricultural, urban, residential and commercial land-uses have removed, modified, or degraded estuarine, floodplain, riverine, riparian, and wetland habitats essential to anadromous and freshwater fishes. Restoration of these habitats must continue in order to improve abundance, productivity and persistence of numerous SGCN species. Threats from habitat loss and degradation are intensified for species with small or restricted ranges such as Olympic Mudminnow, Margined Sculpin, Salish Sucker, and Burbot. For anadromous salmonid SGCN species, hatchery production and hatchery-origin fish pose several kinds of threats to natural populations. Management of these risks is on-going and must continue in order to meet ESA-related recovery goals. For many SGCN fish species, mortality due to fishery-related impacts (unintentional or incidental catch, illegal harvest) is a threat that continues to need direct management and public education. The freshwater salmonid species continue to face threats from interbreeding with hatchery bred and released non-native salmonids. Invasive non-native freshwater fishes pose competition and predation threats to various SGCN species, especially those with limited native ranges (e.g., Pygmy Whitefish). Lack of data, such as on abundance, distribution, breeding habitats and/or viability status, is considered a threat for many SGCN species and will require significant investment to rectify.

### Conservation Success

The status of Hood Canal Summer Chum Salmon ESU has improved considerably since ESA-listing in 1999. Threat reduction actions, such as eliminating excessive harvest, and supplementing natural production by short-term hatchery propagation, both of which began prior to ESA-listing, have led to large increases in abundance for the ESU's two independent populations. Re-introductions of summer-run chum salmon to rivers that historically had sub-populations have occurred and continue to be monitored. Improvements to spawning and rearing habitats also have been made. Overall viability conditions are at a relatively high level.

# MARINE FISH

## BLUNTNOSE SIXGILL SHARK *(Hexanchus griseus)*

**Conservation Status and Concern**

This large and long-lived species uses Puget Sound as a nursery/pupping ground. Relatively little is known about their life history, population structure, or abundance trend.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | GNR | SNR | Unknown/unknown | Moderate |

**Biology and Life History**


Photo: Seattle Aquarium

The Bluntnose Sixgill Shark is a benthic species that is widely distributed over continental and insular shelves in temperate and tropical seas throughout the world. They are large and heavy-bodied with males reaching 11.5 feet and females reaching up to 15.8 feet or larger. Acoustic monitoring data suggest that Sixgill Sharks inhabit Puget Sound waters for several years as juveniles, making small seasonal migrations between a couple of core areas before leaving Puget Sound for the open coast. Their movement patterns suggest relatively small home ranges and site fidelity until they are documented leaving Puget Sound. There is documentation of one sixgill moving from Puget Sound to Point Reyes, California during a seven-month period. They are a powerful predator that feeds on a variety of prey species including sharks, rays, fish, and mammals. Predators on Bluntnose Sixgill Sharks primarily consist of other sharks, including their own species. Sixgills are viviparous and produce litters up to 108 pups, which may be sired by nine or more males.

**Distribution and Abundance**

In the absence of specific information about population structure, Sixgill Sharks are treated as a single population throughout Washington waters for assessment purposes. The present population size and abundance trends are not known, though anecdotal evidence suggests populations have declined in some areas of the Sound. Genotypic data collected from Puget Sound samples suggest one intermixing population. Evidence suggests that Puget Sound serves as a pupping and nursery grounds for this population, which is broadly distributed. This species was regularly caught by anglers in Puget Sound in the early 2000s, however all fisheries for Sixgill Sharks, including catch and release, are now closed in Washington.

**Habitat**

In Canadian Pacific waters, sixgills are found in inlets and along the continental shelf and slope typically at depths greater than 300 feet (range 0-8200 feet). They have been observed in shallower waters (less than 65 feet) in Puget Sound and near Hornby Island, B.C. by SCUBA divers, generally at night. Utilization of shallow water habitat observed in Puget Sound may increase exposure to polluted effluents

**References**


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**Bluntnose Sixgill Shark: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Population, life history, and movements in WA state waters are data deficient. | Conduct extensive distribution and relative abundance surveys. Tagging studies produced successful results. | Current insufficient | WDFW |
| 2 | Overharvesting of biological resources | Illegal fishing and/or harvest of species. In all WA state waters, Sixgill Shark fisheries are closed. | Ensure no illegal fishing and/or harvest. | Current sufficient | WDFW |
| 3 | Education needs | Educate recreational anglers about shark conservation, catch/release stress on sharks during mating season. | Offer reports or detailed descriptions of reason to close shark fishery. | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Because of their longevity and utilization of shallow waters near urban settings, they may accumulate a variety of chemicals. Potential effects on the fish include impacts on both growth and reproduction. | Assess burdens of toxic compounds throughout Puget Sound. Determine effects on populations and life histories, including reproduction using field studies, epidemiological information and/or laboratory studies. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## BROADNOSE SEVENGILL SHARK (*Notorynchus cepedianus*)

Abundance estimates are data deficient for the population known to occur in Washington waters. Willapa Bay may be critical habitat for breeding and seasonal feeding grounds.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | No | GNR | SNR | Unknown/unknown | Moderate |

**Biology and Life History**

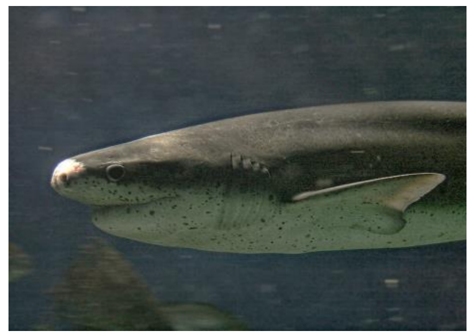

Photo: J.M. Nuñez

The Broadnose Sevengill Shark is one of only two shark species that have seven gill slits. Recent tagging studies in Willapa Bay have shown consistent seasonal patterns of estuary use during the summer and dispersing into nearshore coastal habitats during autumn. They are generally observed swimming slowly near the bottom; however they are capable of bursts of speed to capture prey including sharks, skates, rays, fish, cetaceans, and pinnipeds. Predators of this species primarily consist of other sharks, including their own species, and great white sharks. Maximum length has been observed at 9.5 feet while common length is 5 to 6.6 feet. They are viviparous and produce litters of up to 82 pups. Reproductive cycles may occur biennially with a gestation period of 12 months. The recreational fishery for this shark was closed in 2013, though both catch/release and retention fisheries previously occurred in Willapa Bay and Grays Harbor.

**Distribution and Abundance**

This species occurs in temperate nearshore waters around the world including bays and estuaries, and is known to migrate great distances. Recent tagging studies have detected them over the continental shelf near Oregon and Washington, which also move further south into California, suggesting the feasibility of broad-scale coastal movements to birthing, nursery and mating grounds. Although rarely observed in Puget Sound other than in vicinity of the Nisqually River Delta, Willapa Bay has a consistently returning population in spring and summer. Abundance estimates are data deficient for the population known to occur in Washington.

**Habitat**

Willapa Bay is the best known habitat for this species in Washington, which is likely critical for breeding and/or seasonal feeding grounds during spring and summer. Segregation by size and sex have been observed in Willapa Bay, with males and small females using the peripheral southern estuary channels before joining large females who remain in the central estuary channels. Some individuals consistently returned to specific areas within the estuary year after year.

**References**

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**Broadnose Sevengill Shark: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Population, life history, and movements in WA state waters are data deficient. | Conduct extensive distribution and relative abundance surveys. Tagging studies produced successful results. | Current insufficient | Both |
| 2 | Overharvesting of biological resources | Illegal fishing and/or harvest of species. In all WA state waters, Broadnose Sevengill Shark fisheries are closed. | Ensure no illegal fishing and/or harvest. | Current sufficient | WDFW |
| 3 | Education needs | Educate recreational anglers about shark conservation, catch/release stress on sharks during mating season. | Offer reports or detailed descriptions of reason to close shark fishery. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority

## BOCACCIO – PUGET SOUND/GEORGIA BASIN DPS (*Sebastes paucispinis*)

**Conservation Status and Concern**

Bocaccio once supported a commercial set-net fishery in south Puget Sound but catches declined precipitously in the 1990s. Bocaccio are now rarely encountered, and abundance is considered at a critical level.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**

Photo: NOAA

Bocaccio are a pelagic, long-bodied rockfish with few head spines and a very large mouth. The lower jaw is much longer than the upper jaw and has a small, distinct knob at the end. They are a large rockfish, measuring up to 36 inches and weighing up to 15 pounds. Coloration ranges from pink to gray with some individuals being dark red or golden orange. Black spots (melanistic blotches), a form of skin cancer, are common in adults. Aging for these fish has not been considered reliable, but they may live to be 50 years or more. Off of Oregon, females begin to mature at 21 inches and reach maturity at 24 inches. Spawning peaks in February in central and northern California, with females producing between 20,000 and 2.3 million eggs. Larval and juvenile Bocaccio are opportunistic feeders, consuming a range of micro- and macro-zooplankton, fish larvae, copepods and krill. Large juveniles and adults feed on squid and a range of fishes, including other rockfish, hake, anchovy, herring, and sablefish.

**Distribution and Abundance**

Bocaccio range from southeast Alaska to central Baja California and were once relatively common in localized habitats in south and central Puget Sound. Bocaccio have never been observed in WDFW dive surveys in Puget Sound and only one Bocaccio has ever been captured in WDFW trawl surveys (approximately 2,200 trawls). Several Bocaccio were observed with a remotely-operated vehicle at one location in the San Juan Islands in 2008, and a single individual was observed at that same location in 2012 with the same remotely operated vehicle (ROV). In south Puget Sound, Bocaccio made up 1.4 percent of the recreational catch in the 1960s then declined to 0.2 percent in the 1980s, and have not been recorded since 1996. The most recent abundance estimate for Bocaccio is from 2008 and only for the San Juan Islands. Bocaccio were formally designated as “overfished” in Federal waters. A recovery plan is currently under development.

**Habitat**

In coastal waters and Alaska, juvenile Bocaccio live in nearshore habitats and move deeper with age. Larvae and small juveniles are pelagic and commonly occur in the upper 295 feet of the water column, while juveniles sometimes form dense schools under drifting kelp mats. Adults occur at depths of 39 to 1578 feet (most abundant at 164 to 824 feet) and are often associated with steep slopes consisting of sand or rocky substrate, but also inhabit high relief boulder fields and areas with drop offs. The species forms pelagic schools as both juveniles and adults and may be mixed with Widow, Yellowtail, and

Vermilion Rockfish. Large Bocaccio may be sedentary, living in caves and crevices. Bocaccio observed during WDFW ROV surveys were associated with boulders at the base of a steep rocky pinnacle.

**References**

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfish of the Northeast Pacific. Univ. of California Press. Berkeley, CA. 405pp.

National Marine Fisheries Service (NMFS). 2010. Endangered and threatened wildlife and plants: threatened status for the Puget Sound/Georgia Basin Distinct Population Segments of yelloweye and canary rockfish and endangered status for the Puget Sound/Georgia Basin Distinct Population Segment of bocaccio rockfish. Federal Register. pp. 22276-22290.

Palsson, W. A., T. S. Tsou, G.G. Bargmann, R. M. Buckley, J. E. West, M. L. Mills, Y. W. Cheng, and R. E. Pacunski. 2009. The biology and assessment of Rockfishes in Puget Sound. Washington Department of Fish and Wildlife Report FPT-09-04.

**Bocaccio - Puget Sound/Georgia Basin DPS: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (e.g., ROV). Catch Per Unit Effort (CPUE) is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Bocaccio are closed for retention. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority

## BROWN ROCKFISH (*Sebastes auriculatus*)

**Conservation Status and Concern**
A complete population assessment for this species is limited due to their wide distribution in Puget Sound and nearshore coastal habitats. They have been encountered rarely during WDFW Remotely Operated Vehicle (ROV)-based surveys (approximately 25 individuals between 2004 and 2014).

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Species of Concern | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**


Photo: S. Axtell, WDFW

Brown Rockfish are a light brown fish with dark- to red-brown mottling, often with a prominent brown blotch on each gill cover. Juveniles appear similar to adults. Like all rockfishes, they reproduce through internal fertilization and are viviparous. Approximately 50 percent of the population is mature between 9.5 to 12 inches and all the population is mature at 15 inches. Parturition of larval young generally occurs between April and June in Puget Sound. This species can reach 22 inches and live to at least 34 years of age. Adults are often solitary but may be found in small groups or in association with Quillback and Copper Rockfish. Prey items include small invertebrates and fishes. Depending upon the life history stage, predators may include larger rockfish, salmon, and marine mammals. This species is known to hybridize with Copper and Quillback Rockfishes in Puget Sound.

**Distribution and Abundance**
Brown Rockfish occur between Prince William Sound and southern Baja California and are found throughout Puget Sound, often occurring in bays and areas of low current velocity. Despite reduced population sizes of all rockfish species, the most recent surveys indicate brown rockfish densities are higher in south and central Puget Sound compared to the Strait of Juan de Fuca, the San Juan Islands, and Gulf of Georgia.

**Habitat**
Young-of-the-year Brown Rockfish are found in the water column for the first 2.5 to 3 months then settle in shallow water (to approximately 118 feet) onto rock and other hard substrates. Adults live between the nearshore to 443 feet and are most common above 394 feet on low- to high-relief habitats.

**References**

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the Northeast Pacific. University of California Press, Berkeley.

Matthews, K. R. 1990. A comparative study of habitat use by young-of-the-year, subadult, and adult rockfish on four habitat types in Central Puget Sound. Fishery Bulletin 88: 223-239.

Seeb, L. W. 1998. Gene flow and introgression within and among three species of rockfishes, *Sebastes auriculatus, S. caurinus,* and *S. maliger*. Journal of Heredity 89:393-403.

Washington Department of Fish and Wildlife (WDFW), unpublished data

**Brown Rockfish: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Need to identify degraded habitats, including those impacted by derelict gear, poor water quality, and alteration/ development. | Assess levels of toxic compounds and habitat degradation/ loss throughout Puget Sound. Determine effects on population size, ontogeny, and reproduction through field, epidemiological, and/or laboratory studies. | Current insufficient | Both |
| 2 | Overharvesting of biological resources | Closed to harvest but are subject to poaching and bycatch (salmon/other bottomfish fisheries). | Enforce existing regulations. | Current insufficient | WDFW |
| 3 | Education needs | Need to increase public knowledge of species identification, life history, and vulnerability to pressure-related injuries. Also need to increase awareness of descending devices. | Develop materials and techniques for education and outreach to stakeholders (e.g., anglers, divers). | Current insufficient | Both |
| 4 | Resource information collection needs | Need to increase knowledge of distribution, abundance, and life history. | Research and surveys to detect species and their habitat associations for population estimates. | Current insufficient | Both |
| 5 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and/or not known. | Survey to detect habitat preferences of all rockfish life stages using diverse methods (e.g., ROV, SCUBA, trawl). | Current insufficient | Both |

## CANARY ROCKFISH – PUGET SOUND/GEORGIA BASIN DPS (*Sebastes pinniger*)

**Conservation Status and Concern**

The species has been declared overfished along the entire West Coast of North America and this DPS's Threatened status is due to severely reduced populations in Puget Sound and Georgia Basin.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | GNR | SNR | Low/unknown | Moderate-high |

**Biology and Life History**


Photo: S. Axtell and V. Okimura, WDFW

Canary Rockfish are typically distinguishable by their bright orange and white coloration, and juveniles have a distinct black spot on their dorsal fin. Larval release occurs primarily in spring and summer. Larvae and juveniles spend several months in the water column before moving to kelp beds and shallow water. After the juveniles descend to the bottom and become adults they are less vulnerable to predators. Prey typically consists of small crustaceans, such as krill and copepods, but they are also known to prey on small fish. Predators include larger rockfish, lingcod, pinnipeds, and sharks. Like most rockfish, Canary Rockfish are highly susceptible to pressure-related injuries caused by displacement to the water's surface when caught by anglers. Canary Rockfish can grow to 29 inches long and at least 84 years old.

**Distribution and Abundance**

Canary Rockfish occur from southeast Alaska to southern California. Populations have been declining along the entire West Coast since the 1970s and the species was declared overfished in 1999. Trawl fisheries in the past were the likely cause for this significant decline, as they would target large schools. Because of their increased rarity, their overfished condition in coastal waters, and a lack of assessment information in Puget Sound, Canary Rockfish were federally listed as Threatened in Puget Sound and Georgia Basin in 2010.

**Habitat**

A deeper living rockfish associated with a variety of rocky and coarse habitats, adults collect in large numbers around pinnacles and high relief rock, often in high current areas and deeper water (264 to 660 feet). Adults also have been encountered over low-relief habitat, including mud flats and concentrations of shell hash. Some adults tagged in the ocean have moved long distances. Juveniles are known to be pelagic in large schools within depths of 100 feet.

**References**

Kramer, D. E., and V.M. O'Connell. 1995. Guide to northeast Pacific rockfishes: genera *Sebastes* and *Sebastolobus*. Alaska Sea Grant College Program, University of Alaska.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press.

NMFS. 2010. Endangered and threatened wildlife and plants: threatened status for the Puget Sound/Georgia Basin Distinct Population Segments of yelloweye and canary rockfish and endangered status for the Puget Sound/Georgia Basin Distinct Population Segment of bocaccio rockfish. Federal Register. pp. 22276-22290.

### Canary Rockfish - Puget Sound/Georgia Basin DPS: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers). Tagging studies yield few returns. CPUE is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Canary Rockfish are closed for retention. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## CHINA ROCKFISH (*Sebastes nebulosus*)

### Conservation Status and Concern

China rockfish population status is unknown, early life history is especially poorly understood, and relatively few are landed in the coastal recreational fishery.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

### Biology and Life History

China Rockfish are a solitary bottomfish species that reside on rocky reefs and are rarely observed off the bottom. Their cryptic coloration and behavior allow them to be obscured by their surroundings. They reach a maximum size of 45 cm and live to at least age 79 years. Larval release occurs primarily in spring and summer. Prey typically consists of small crustaceans. Predators may include other rockfish, lingcod, sharks, seals, sea lions, and humans. Like most rockfish, they are highly susceptible to pressure related injuries caused by displacement to the surface when caught by anglers.

Photo: S. Axtell, WDFW

### Distribution and Abundance

China Rockfish are considered a nearshore species and live at depths from 10 to 420 feet, and are distributed from the Gulf of Alaska to Southern California. They are occasionally caught by recreational anglers off the northern Washington coast. Recreational harvest within Puget Sound has been closed, however they are uncommon throughout the Sound. Reportedly China Rockfish were an important commercial species in Puget Sound during the nineteenth century but have been reported in catch statistics at very low levels since at least the 1970s. The population of China Rockfish is unknown, and their early life stage history is poorly understood.

### Habitat

Adults prefer high energy, high-relief rocky habitat with numerous cavities and crevices for resting. The species appears to be very territorial with small home ranges, moving less than 33 feet for lengthy periods. This distinct habitat preference is a limited area along the Washington coast.

#### References


Kramer, D. E., and V. M. O'Connell. 1995. Guide to northeast Pacific rockfishes: genera *Sebastes* and *Sebastolobus*. Alaska Sea Grant College Program, University of Alaska.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press.

**China Rockfish: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers). Tagging studies yield few returns. CPUE is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Habitat for this species is distinct and limited area. | Establish Marine Protected Areas or area-gear restrictions. | Current insufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COPPER ROCKFISH (*Sebastes caurinus*)

**Conservation Status and Concern**

A complete assessment for this species is limited due to their wide distribution in Puget Sound and nearshore coastal habitats. In a 2008 San Juan Islands survey, they were most abundant rockfish species encountered, other than Puget Sound rockfish. Overall, populations have declined recently.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Critical/stable | Moderate-high |

**Biology and Life History**

Copper Rockfish is an important species of the nearshore, benthic rockfish assemblage in Puget Sound. Adults are relatively sedentary and have well defined home ranges. Maximum size is 26 inches and maximum age is 50 years. Larval release occurs primarily in spring and summer. Prey typically consists of small crustaceans. Predators include larger rockfish, lingcod, pinnipeds, and sharks. Like most rockfish, they are highly susceptible to pressure related injuries caused by displacement to the surface when caught by anglers.

Photo: S. Axtell and V. Okimura, WDFW

**Distribution and Abundance**

Copper Rockfish are found throughout Puget Sound and nearshore coastal marine waters from the Gulf of Alaska to southern California. They are occasionally caught by recreational anglers off the northern Washington coast. Recreational harvest within Puget Sound has been closed, however they are common throughout the Sound. Historically they have been the most commonly encountered rockfish species in Puget Sound, and in an ROV-based study of the San Juan Archipelago in 2008 they were the second most common rockfish species encountered, after Puget Sound rockfish. Their populations in both North and South Sound have precipitously declined to low levels in recent years.

**Habitat**

Copper Rockfish live predominantly in rocky areas as adults, shoaling with other rockfish species. They inhabit depths less than 200 feet and associate with high-relief rocky habitats throughout the inland marine waters of Washington. Juveniles settle fairly rapidly and inhabit upper layers of the kelp canopy, moving to deeper layers before occupying adult habitat.

**References**


Kramer, D. E., and V. M. O'Connell. 1995. Guide to northeast Pacific rockfishes: genera *Sebastes* and *Sebastolobus*. Alaska Sea Grant College Program, University of Alaska.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press.

Matthews, Kathleen R. 1990. "An experimental study of the habitat preferences and movement patterns of copper, quillback, and brown rockfishes (Sebastes spp.)." *Environmental Biology of Fishes* 29.3 (1990): 161-178.

Pacunski R. E., W. Palsson, and H. G. Greene. 2013. Estimating fish abundance and community composition on rocky habitats in the San Juan Islands using a small remotely operated vehicle. Olympia, WA: Washington Department of Fish and Wildlife. FPT 13-02 FPT 13-02. 57pp.

**Copper Rockfish: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers). Tagging studies yield few returns. CPUE is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Fish and wildlife habitat loss or degradation | Copper Rockfish are long lived, commonly occurring in urbanized basins of Puget Sound. They accumulate and concentrate persistent organic pollutants and heavy metals. | Determine effects on populations, life histories, reproduction, and epidemiological information in laboratory studies. | Current insufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## GREENSTRIPED ROCKFISH (*Sebastes elongatus*)

**Conservation Status and Concern**

Abundance and distribution of this species are poorly known. A status assessment of Greenstriped Rockfish in Puget Sound concluded that federal Endangered Species Act (ESA) listing was not warranted.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**

Photo: WDFW

Greenstriped Rockfish are slender with four distinctive horizontal green stripes over a background body coloration of white to pinkish, and both juveniles and adults are colored similarly. The species reaches a maximum size of 43 cm, with females growing slightly larger than males, and lives to about 54 years. Off of Oregon and Washington, 50 percent of males matured by 9.5 inches or 10 years, while 50 percent of females matured by 8.7 inches or 7 years. Like all rockfishes, they reproduce through internal fertilization and are viviparous. Larvae are released January-July off Oregon but after June in British Columbia; timing of larval release in Washington waters is unknown. At a length of about 1.2 inches, juveniles settle to depths 131 feet or deeper; they grow at a mean rate of 0.2 inches per month, and move to deeper water as they mature. Both juveniles and adults tend to be solitary. Depending on life history stage, they prey on krill, shrimp, copepods, amphipods and small fish and squid, and are preyed upon by larger rockfish, lingcod, salmon, birds, and marine mammals.

**Distribution and Abundance**

Greenstriped Rockfish are found in coastal waters from the Eastern Aleutian Islands (Alaska) to northern Baja California (Mexico). Within Puget Sound, WDFW has occasionally encountered the species during fishery-independent trawl and remotely-operated-vehicle surveys in relatively low densities (typically less than 4 fish per 2.5 acres) in the Strait of Juan de Fuca, Whidbey Basin, and Hood Canal.

**Habitat**

Greenstriped Rockfish are primarily found at depths of 328 to 984 feet, although they have been found as shallow as 40 feet and as deep as 3,757 feet. While most rockfish species inhabit rocky habitats, they tend to occur more frequently on less-complex substrates such as sand, mud, and low-relief cobble patches. Due to their substrate preferences, this species was regularly caught as bycatch in commercial trawl fisheries in Puget Sound until closure of these fisheries in 2010.

**References**

Butler, J. L., M. S. Love, and T. E. Laidig. 2012. A guide to the rockfishes, thornyheads, and scorpionfishes of the northeast Pacific. University of California Press. Berkeley and Los Angeles, CA. 185pp.

Drake J. S., E. A. Berntson, J. M. Cope, R. G. Gustafson, and E. E. Holmes. 2010. Status review of five rockfish species in Puget Sound, Washington: bocaccio (*Sebastes paucispinis*), canary rockfish (*S. pinniger*), yelloweye rockfish (*S. ruberrimus*), greenstriped rockfish (*S. elongatus*), and redstripe rockfish (*S. proriger*). Seattle, WA: NOAA Fisheries. 234pp.

Lamb, A. and P. Edgell. 2010. Coastal fishes of the Pacific Northwest. Harbour Publishing Co. Ltd. Madeira Park, BC. 335pp.

Love, M. S., M. Yoklavich, and L. Thorsteinson. 2002. The rockfishes of the northeast Pacific. University of California Press. Berkeley and Los Angeles, CA. 404pp.

Pacunski R. E., W. Palsson, and H. G. Greene. 2013. Estimating fish abundance and community composition on rocky habitats in the San Juan Islands using a small remotely operated vehicle. Olympia, WA: Washington Department of Fish and Wildlife. FPT 13-02 FPT 13-02. 57pp.

### Greenstriped Rockfish: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers) because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, particularly trawls. | Offer information on avoiding fishing in rockfish areas and methods to avoid by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Habitat for this species is distinct and limited area. | Establish Marine Protected Areas or area-gear restrictions. | Current insufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## QUILLBACK ROCKFISH (*Sebastes maliger*)

### Conservation Status and Concern

This species is currently considered depleted in both North and South Puget Sound, though increased fishery regulations and reductions in harvest have produced an increasing abundance trend in some areas.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Critical/stable | Moderate-high |

### Biology and Life History

Photo: S. Axtell, WDFW

Quillback Rockfish are distinguished by their strong head spines and deeply notched dorsal fin spines, which are mildly venomous. Adults exhibit limited movements away from the bottom and often have a small home range, and have been observed returning to the same site seasonally. Larval release occurs primarily in spring and summer. Their primary source of prey is small crustaceans and fishes. Predators include larger rockfish, lingcod, pinnipeds, and sharks. They reach a maximum size of 24 inches and live to age 95 years (73 is the oldest age from Puget Sound). Like most rockfish, they are highly susceptible to pressure related injuries caused by displacement to the surface when caught by anglers.

### Distribution and Abundance

Quillback Rockfish are found throughout Puget Sound and nearshore coastal marine waters from the Gulf of Alaska to southern California. They are occasionally caught by recreational anglers off the northern Washington coast. Recreational harvest within Puget Sound has been closed, however they are common throughout the Sound. Historically, Quillback Rockfish was the second most common rockfish species in Puget Sound. This species is currently considered depleted in both North and South Puget Sound, though increased fishery regulations and reductions in harvest have produced an increasing abundance trend in some areas.

### Habitat

Inhabits nearshore and deep waters to 700 feet in Puget Sound and commonly prefers crevices within low and high relief rocky reef, as well as sponges or mud substrate. It is one of the few rockfish species that is observed nearly as often over soft substrate as over hard bottoms. Surveys for post-larval Quillback Rockfish found them in similar but fewer places as settling Copper Rockfish.

#### References


Kramer, D. E., and V. M. O'Connell. 1995. Guide to northeast Pacific rockfishes: genera *Sebastes* and *Sebastolobus*. Alaska Sea Grant College Program, University of Alaska.

Love, M. S., M. Yoklavich, and L. Thorsteinson, 2002. The rockfishes of the northeast Pacific. University of California Press.

Matthews, K. R. 1990. "An experimental study of the habitat preferences and movement patterns of copper, quillback, and brown rockfishes (Sebastes spp.)." *Environmental Biology of Fishes* 29.3 (1990): 161-178.

**Quillback Rockfish: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers). Tagging studies yield few returns. CPUE is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Habitat for this species is a distinct and limited area. | Establish Marine Protected Areas or area-gear restrictions. | Current insufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## REDSTRIPE ROCKFISH (*Sebastes proriger*)

**Conservation Status and Concern**
Abundance and distribution of this species is poorly known. A 2010 status assessment of Redstripe Rockfish in Puget Sound concluded that federal ESA listing was not warranted.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**

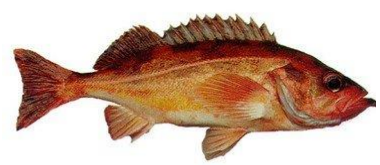

Photo: WDFW

Redstripe Rockfish are streamlined with reduced spines relative to other rockfishes and a strong, dark symphyseal knob on their lower jaw. Both juveniles and adults are colored similarly, with red/pink/yellowish bodies (sometimes with tan dorsal saddles) and a clear lateral line that forms a distinctive, lighter-color stripe. The species reaches a maximum size of 20 inches, with females becoming slightly larger than males, and lives to about 55 years. Off of Oregon and Washington, 50 percent of males matured by 10 inches or 7 years, while 50 percent of females matured by 11 inches or 7 years. Like all rockfishes, they reproduce through internal fertilization and are viviparous. Larvae are released April-July throughout their coastal distribution, but little else is known about their settlement patterns. Adults can be solitary or exist in small groups or schools. In British Columbia, the species has been noted to form near-bottom schools during the day but disperse into the water column at night. Depending on life history stage, they prey on krill, shrimp, and small fishes, and are preyed upon by larger rockfish, lingcod, salmon, birds, and marine mammals.

**Distribution and Abundance**
Redstripe Rockfish are found in coastal waters extending from the southeastern Bering Sea (Alaska) to southern Baja California (Mexico), while being most abundant from southeastern Alaska to central Oregon. Within Puget Sound, WDFW has occasionally encountered the species during fishery-independent trawl and remotely-operated-vehicle surveys in relatively low densities (typically less than four fish per 2.5 acres) in the eastern Strait of Juan de Fuca, central San Juan Channel, and South Sound basin.

**Habitat**
Redstripe Rockfish are primarily found at depths of 492 to 902 feet, although adults have been found as shallow as 121 feet (juveniles, 16 feet) and as deep as 1677 feet. Like many rockfish species, they tend to occur on or slightly above high-relief, complex habitats, and can be solitary or exist in small groups or schools. The species is commonly targeted in mid-water trawls and sometimes caught in bottom trawls and hook-and-line fisheries, though retention of all rockfish species in Puget Sound was made illegal in 2010.

**References**


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### Redstripe Rockfish: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers) because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries. | Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Habitat for this species is distinct and limited area. | Establish Marine Protected Areas or area-gear restrictions. | Current insufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## TIGER ROCKFISH (*Sebastes nigrocinctus*)

**Conservation Status and Concern**

Tiger Rockfish population size and structure in Washington waters are unknown, early life history is poorly understood, individuals of all life history stages are rare in WDFW ROV surveys, and none have been captured in WDFW trawl surveys.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**


Photo: V. Okimura and S. Axtell, WDFW

Tiger Rockfish are red, pink or white with five vertical red, brown or black bars and two bars radiating from each eye. Juveniles appear similar to adults and may have spots between the bars that disappear with age. Like all rockfishes, they reproduce through internal fertilization and are viviparous. Age at maturity is unknown for this species, though most rockfishes mature at approximately 50 percent of their maximum length. Parturition of larval young occurs from at least February to June. This species can reach 24 inches and live to at least 116 years of age. Adults are often solitary and territorial but may be found in association with other rockfishes, especially Yelloweye Rockfish. Studies indicate high site fidelity and little vertical movement. Prey items include small benthic invertebrates, especially crab. Depending upon life history stage, predators may include larger rockfish, lingcod, birds, and marine mammals.

**Distribution and Abundance**

Tiger Rockfish occur between the Aleutian Islands and Southern California. This species has apparently always appeared in limited numbers in Puget Sound fisheries due to their solitary nature and the limited gear types (e.g., set line, bottomfish jig) that would be able to access them on their preferred habitat. The rockfish fishery was closed in 2010 following ESA listing of Bocaccio, Canary Rockfish, and Yelloweye Rockfish. Fishery independent surveys have subsequently found limited numbers of Tiger Rockfish, with no individuals encountered during annual WDFW bottomfish trawls and few encountered in the San Juan Islands during WDFW ROV survey operations since 2004.

**Habitat**

Post-larval Tiger Rockfish have been observed in drift kelp and in association with other floating debris. Juveniles have been observed on shallow rock piles, though little is known about their settlement patterns. Adults live between 30 to 980 feet, with most individuals found in or near crevices on high-relief, complex rock formations below 100 feet.

**References**
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### Tiger Rockfish: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Need to identify degraded habitats, including those impacted by derelict gear, poor water quality, and alteration/development. | Use land acquisitions, conservation easements and landowner agreements to protect significant colonies. | Current insufficient | Both |
| 2 | Overharvesting of biological resources | Closed to harvest but are subject to poaching and bycatch (salmon/other bottomfish fisheries). | Enforce existing regulations. | Current insufficient | WDFW |
| 3 | Education needs | Need to increase public knowledge of species identification, life history, and vulnerability to pressure-related injuries. Also need to increase awareness of descending devices. | Develop materials and techniques for education and outreach to stakeholders (e.g., anglers, divers). | Current insufficient | Both |
| 4 | Resource information collection needs | Need to increase knowledge of distribution, abundance, and life history. | Research and surveys to detect species and their habitat associations for population estimates. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## YELLOWEYE ROCKFISH – PUGET SOUND/GEORGIA BASIN DPS (*Sebastes ruberrimus*)

**Conservation Status and Concern**

The species is declared overfished along the entire West Coast and has ESA Threatened status due to severely declining populations in Puget Sound and Georgia Basin.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | GNR | SNR | Critical/unknown | Moderate-high |

**Biology and Life History**


Photo: S. Axtell, WDFW

Yelloweye Rockfish are one of the largest rockfish species and typically distinguished by their bright yellow eyes and red-orange color. They are a solitary fish that rarely leaves the rocky reef, wall, or crevices on the bottom. Larval release occurs primarily in spring and summer. Little is known about their first year of life. Prey typically consists of small fish and crustaceans. Predators include larger rockfish, lingcod, pinnipeds, and sharks. These rockfish can reach 36 inches in length and a weight of 25 pounds, and can live to an age of 118 years (the oldest aged in Puget Sound to date was 73). They are known to mature relatively late in life, with about one half of the fish reaching sexually maturity at age 22 for males and 19 for females. Like most rockfish, they are highly susceptible to pressure related injuries caused by displacement to the surface when caught by anglers.

**Distribution and Abundance**

Yelloweye Rockfish occur from the Aleutian Islands to southern California. This ESA-listed DPS includes Yelloweye Rockfish in Puget Sound and Strait of Georgia areas. They may be found in the rocky reefs of northern coastal Washington, Strait of Juan de Fuca, San Juan Islands, and Hood Canal. Although uncommon in Puget Sound, fishers who targeted very specific locations and habitat types would catch them. Where abundance has been assessed, current population levels are well below historic reference levels. Assessments are ongoing.

**Habitat**

Juveniles occupy shallow to deep water with the more common rockfish species (e.g., Copper and Quillback Rockfishes) and move into deeper water as they age. Adults are relatively sedentary, living in association with high-relief rocky habitats and often near steep slopes. Adults are most common at depths from 300 to 600 feet.

**References**


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**Yelloweye Rockfish - Puget Sound/Georgia Basin DPS: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Fish survey required using diverse methods (i.e. ROV, divers). Tagging studies yield few returns. CPUE is low because they are hard to target. | Current insufficient | Both |
| 2 | Resource information collection needs | Need to update existing information. Insufficient information to conduct population assessments. | Annual fish surveys would provide more accurate results for population assessments. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | Both |
| 4 | Overharvesting of biological resources | Yelloweye Rockfish are closed for retention. May be caught along with legal bottomfish species. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | Both |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## PACIFIC COD – SALISH SEA POPULATION (*Gadus macrocephalus*)

### Conservation Status and Concern
Abundance and distribution patterns of Pacific Cod in Washington waters are incompletely known. Historic overharvest has led to dramatic declines in encounter rate and the curtailment of both commercial and recreational fisheries.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Species of Concern | Candidate | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

### Biology and Life History

Photo: S. Axtell, E. Wright, WDFW

Pacific Cod are a large-bodied fish typically colored brown or gray with brown spots or mottling on back and sides, with three dorsal fins, two anal fins, and a long chin barbel. The species mainly occurs at depths up to 1,640 feet over sand, mud, and clay substrates. They are moderately fast growing and relatively short-lived, reaching a maximum total length of 4 feet and maximum weight of 44 pounds. Average size observed in WDFW trawl surveys since 1987 is 1.4 feet and largest captured fish was 2.8 feet. Maximum age reported In Alaska was about 18 years. Preferred water temperatures appear to be between 32 to 50°F. Spawning occurs in winter and may be associated with onshore-offshore migrations depending on stock and local water temperatures. Females grow larger than males, reaching 50 percent maturity between 4 and 5 years of age, and produce from 225,000 to 6.4 million eggs annually. They are opportunistic feeders, consuming worms, crustaceans, fish, and fishery offal, and are prey for seabirds, fishes, and many marine mammals.

### Distribution and Abundance
Pacific Cod occur throughout the coastal North Pacific Ocean. In Puget Sound, they are categorized into three components: North Sound (U.S. waters north of Deception Pass, including San Juan Islands, Strait of Georgia, and Bellingham Bay); West Sound (west of Admiralty Inlet and Whidbey Island, and U.S. Strait of Juan de Fuca); South Sound (south of Admiralty Inlet). Although they have been observed in all Puget Sound sub-basins during WDFW trawl surveys, they are uncommon in South Sound and only rarely encountered in Hood Canal and Whidbey Basin. Pacific Cod once supported large recreational and commercial fisheries in Puget Sound. Catch rates were highest in the 1970s then declined in the late 1980s, reaching a low point in the early 1990s, and showing no signs of recovery since. No Puget Sound abundance estimates have been made in over a decade.

### Habitat
In Puget Sound, Pacific Cod are most commonly associated with soft bottom and low-relief habitats, including mud, sand, and gravel, but larger individuals may occasionally inhabit rock and boulder habitats. They can be found at most depths but are most commonly encountered at depths greater than 240 feet (WDFW trawl survey data). Puget Sound water temperatures are at high end of species' normal range and have been hypothesized as one factor limiting population size/recovery in the region.

**References**
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Palsson, W. A. 1990. Pacific cod (*Gadus macrocephalus*) in Puget Sound and adjacent waters: Biology and stock assessment. Wash. Dept. Fish. Tech. Rep. No. 112. 137pp.

### Pacific Cod - Salish Sea Population: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Need for research on larval distribution. | Current insufficient | WDFW |
| 2 | Resource information collection needs | Need to update existing information. Information from annual trawl survey can be used to conduct population assessments. This information could be augmented with ROV collected data (e.g., 2012 survey). | Continue annual trawl surveys. | Current sufficient | WDFW |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | WDFW |
| 4 | Overharvesting of biological resources | Pacific Cod are closed for retention in Marine Areas 8-1 to 13. Need to conduct updated population assessment to assess viability of fishery in currently open areas. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | WDFW |
| 5 | Climate change and severe weather | Puget Sound temperatures are at the upper end of the species normal range. Increasing sea-surface temperatures may preclude recovery. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | WDFW |
| 6 | Education needs | Recreational anglers unable to identify species. | Educate anglers on species identification. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## PACIFIC HAKE – GEORGIA BASIN DPS (*Merluccius productus*)

**Conservation Status and Concern**

Pacific Hake populations in Puget Sound have not been assessed in over a decade, but prior to this time a marked decline was observed, resulting in cessation of commercial fisheries.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Species of Concern | Candidate | Yes | GNR | SNR | Unknown/stable | Low-moderate |

**Biology and Life History**

Photo: S. Axtell and V. Okimura, WDFW

Pacific Hake is a cod-like fish with deeply notched second dorsal and anal fins. Both males and females mature between ages 3 to 4 years and release planktonic eggs in spawning aggregations located in several geographically segregated areas from late winter to spring. Planktonic larvae metamorphose at age 3 to 4 months. Individuals can grow to 36 inches and to live up to 20 years. The average size of Pacific Hake in WDFW trawl surveys since 1987 is 10 inches and the largest captured fish measured 30 inches. Juveniles and adults generally live in separate mid-water schools and both groups complete diurnal migrations from the bottom during the day and move up to feed at night. They also exhibit seasonal movements from deeper waters in fall and winter to more shallow waters during spring and summer. Prey include krill, copepods, shrimp, squid and small fishes, including other hake. Predators include Dogfish Sharks, other fishes, birds, marine mammals, and Humboldt Squid. Hake in this DPS are not affected by the parasite *Kudoa paniformis,* which is present in more than 50 percent of fish in Pacific coastal population and weakens muscle tissue.

**Distribution and Abundance**

There are three known populations of Pacific Hake in Washington: a migratory Pacific coastal population, a Strait of Georgia population, and a Puget Sound population. These last two form the Georgia Basin DPS. In Puget Sound, spawning aggregations are known in Port Susan and Dabob Bay. WDFW's Puget Sound assessments found a decline in biomass and size-at-age through 1999 after closure of a long-term fishery in 1991. In 2009 NOAA described Puget Sound Hake as severely depressed. A recent study found the Puget Sound population to be generally self-sustaining, with few immigrants, while relatively higher numbers of emigrants to Strait of Georgia population were observed. No abundance estimates have been made for Puget Sound population in over a decade.

**Habitat**

Juveniles are often found in mid-water schools above 650 feet. They also have been observed resting on soft substrates during visual studies, including WDFW remotely operated vehicle (ROV) surveys. In the Georgia Basin DPS, fish are restricted to depths of approximately 1,150 feet. Adults in the Pacific coastal population are found at depths between 40 to 4,600 feet.

**References**

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**Pacific Hake - Georgia Basin DPS: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Need for research on larval distribution. | Current insufficient | WDFW |
| 2 | Resource information collection needs | Need to update existing information. Information from annual trawl survey can be used to conduct population assessments. This information could be augmented with ROV collected data (e.g., 2012 survey) | Continue annual trawl surveys. | Current sufficient | WDFW |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on avoiding fishing in rockfish areas and methods to minimize by-catch when fishing. | Current insufficient | WDFW |
| 4 | Overharvesting of biological resources | Pacific Hake are closed for retention in Marine Areas 8-1 to 13. Need to conduct updated population assessment to assess viability of fishery in currently open areas within the DPS. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | WDFW |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on species identification. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## PACIFIC HERRING – GEORGIA BASIN DPS (*Clupea pallasii*)

**Conservation Status and Concern**

A 2006 status assessment determined that ESA listing was not warranted. However, the Cherry Point stock is at critically low abundance, the Squaxin Pass stock is stable, and abundance of all other stocks has fluctuated substantially since the 1970s but exhibits a slight downward trend.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Monitor | Yes | GNR | SNR | Critical/stable | Moderate |

**Biology and Life History**

Photo: WDFW

Pacific Herring spawn by depositing eggs on vegetation or other shallow water substrate in lower intertidal and shallow sub-tidal marine zones. Most herring in Washington spawn between mid-January and early April. The Cherry Point stock spawns from April to June. Eggs hatch in 10 to 14 days, depending on water temperature and larvae drift in ocean currents. After metamorphosis to juvenile stage about 3 months after hatching, juveniles of Puget Sound stocks spend at least their first year in Puget Sound. Some Puget Sound stocks are thought to be migratory between continental shelf feeding grounds and Puget Sound spawning grounds. Other stocks are non-migratory, spending entire lives in Puget Sound/Georgia Basin, and some are likely a mix of migratory and non-migratory individuals. Pacific Herring reach sexual maturity at age two or three, can spawn repeatedly and can live 9 or more years. In recent years the majority of Puget Sound spawning herring were 2 to 4 years old, indicating an increase in natural mortality that prevents individuals from recruiting to older age classes. Among sampled stocks, the Cherry Point stock and Squaxin Pass stock were genetically distinct, while all other stocks were indistinguishable from each other. This suggests that, with exception of Cherry Point and Squaxin Pass stocks, sufficient gene flow occurs among Puget Sound herring stocks to suppress meaningful genetic divergence.

**Distribution and Abundance**

Pacific Herring are found throughout Washington's marine waters and typically spawn annually at approximately 20 spawning grounds: 2 Pacific coastal locations and 18 locations east of Cape Flattery. The Georgia Basin DPS contains Puget Sound, Strait of Georgia, and Strait of Juan de Fuca stocks. Trends in herring abundance based on results of genetic studies indicate that Washington's Cherry Point stock (southern Strait of Georgia) is critically low, the Squaxin Pass stock (south Puget Sound) is stable, and abundance of all other Puget Sound stocks has declined since the 1970s but is fairly stable. In recent years the Quilcene Bay herring stock has offset losses in some other stocks in the 'other stocks complex' and is currently the largest Pacific Herring spawning population in Puget Sound.

**Habitat**

Pacific Herring in this DPS live in Puget Sound and Strait of Georgia and often occur in Pacific coast waters. Prior to spawning, adults form concentrations near their spawning grounds and then move to nearshore areas to deposit their eggs primarily on marine vegetation. Eggs are adhesive and stick to whatever substrate is present, including eelgrass, numerous algal species, and other objects. Juveniles congregate in bays, inlets, and channels in summer, and typically spend at least their first year in Puget

Sound/Strait of Georgia. Juveniles from migratory stocks then move to offshore feeding areas spending late spring, summer and fall months off Washington's west coast and off Vancouver Island, B.C.

**References**


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### Pacific Herring - Georgia Basin DPS: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Maintaining viable spawning grounds and water quality in Puget Sound is a challenge to herring management in Washington. | Enforcement of shoreline management regulations; control and monitor pollution in aquatic habitat; minimize risk of oil spills; overall protection of herring spawning grounds. | Current sufficient | Both |
| 2 | Resource information collection needs | An observed increase in non-fishing mortality. | Investigate and evaluate potential sources of adult herring mortality such as disease patterns, predator/prey abundance changes, pollution. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## PACIFIC SAND LANCE (*Ammodytes personatus*)

**Conservation Status and Concern**

Pacific Sand Lance abundance and distribution in Washington are almost completely unknown. The species is ubiquitous in beach seining surveys but difficult to capture with most traditional sampling methods.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | GNR | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**


Photo: WDFW

Although Pacific Sand Lance is common and widespread in Washington nearshore marine waters, very little is known about its life history or biology. Spawning sites appear to be used year-after-year during the November to February spawning season. Adhesive eggs are deposited on upper intertidal beaches consisting of sand and gravel. Incubating eggs may occur in the same substrate as eggs of surf smelt during winter when the two species' spawning seasons overlap. However, Pacific Sand Lance spawn deposition can be found lower on beach than that of Surf Smelt, between about 5 feet and mean higher high water. Incubation time is approximately one month. Pacific Sand Lance is a key prey species for many predators including birds (especially seabirds), fishes (including halibut, rockfishes, and salmon) and marine mammals because of its high energy content. Its ecological importance in local marine food webs is high. Defense tactics used against predation include burrowing into soft, wet sand in intertidal/subtidal zones and contraction of the fish school into a ball of closely packed fish.

**Distribution and Abundance**

Pacific Sand Lance occur in nearshore marine waters throughout Washington. Currently, about 10 percent of the Puget Sound shoreline has been documented as sand lance spawning habitat. Abundance in Washington is not known. A recent analysis of sand lances resulted in a species name change for Pacific Sand Lance (from *hexapterus* to *personatus*), and this species was found to occur from California to Alaska.

**Habitat**

Pacific Sand Lance use nearshore and intertidal marine habitats. Upper intertidal sand and sand/gravel spawning sites on Puget Sound beaches are documented as important breeding areas throughout Puget Sound. Spawning substrate is typically finer grained (0.007-0.012 inch diameter range) sand. Burrowing habitat is typically well washed fine sand and fine gravel, free of mud, usually with a strong bottom current keeping oxygen levels high. They prefer well-lighted habitat and are most common at depths less than 165 feet, but may be found at depths to 900 feet. Feeding schools occur in littoral waters within proximity of burrowing habitat. In Alaska, highest abundance was found in burrowing habitat sheltered from onshore wave action and disturbance by winter storms.

**References**

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### Pacific Sand Lance: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Need for initial baseline survey to estimate abundance or index of abundance. | Development of techniques to understand species biology and to estimate species abundance. | Nothing current - new action needed | WDFW |
| 2 | Resource information collection needs | Need to evaluate species status. | Development of techniques to evaluate species status. | Nothing current - new action needed | WDFW |
| 3 | Fish and wildlife habitat loss or degradation | Lack of erosional sediment inputs due to shoreline armoring. | Develop appropriate land use planning that adequately protects spawning beaches. | Current insufficient | WDFW |
| 4 | Outreach needs | Lack of erosional sediment inputs due to shoreline armoring. | Partner with/educate other regulatory agencies to support protection of sand lance spawning beaches. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## SURF SMELT (*Hypomesus pretiosus*)

**Conservation Status and Concern**

Surf Smelt abundance and distribution in Washington are almost completely unknown. The species is ubiquitous in beach seining surveys but has not been sampled comprehensively due to lack of funding and personnel.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G5 | SNR | Unknown/unknown | Moderate-high |

**Biology and Life History**

Photo: WDFW

Little is known about the life history of Surf Smelt, other than the location of spawning activity. Most spawning Surf Smelt are one or two years old, with few older than age four. They do not appear to form large open-water pelagic schools and there is no evidence that they migrate significant distances from their spawning sites. Depending on location, Surf Smelt spawning activity occurs year-round in Washington. Spawning regions are commonly used during summer, fall-winter, or year-round (spawning every month with a seasonal peak). Surf Smelt eggs adhere tightly to beach surface substrates. The thickness of the spawn-bearing substrate layer varies depending on local wave-action and sediment-supply regimes, ranging from 0.4 to 4 inches. Incubation times vary depending on temperature; during the summer, incubation times are about 2 weeks, while during winter it may be 4 to 8 weeks. Larvae are planktonic drifters. Young-of-the-year occur throughout Puget Sound nearshore. Although the occurrence of spawning activity on a spawning beach is generally predictable each year, the degree to which surf smelt may "home" back to their natal beaches is unknown. Genetic studies to date have not shown any significant genetic distinctions among Washington stocks.

**Distribution and Abundance**

Surf Smelt are widespread in Washington marine waters, occurring in the outer coastal estuaries, Olympic Peninsula shorelines, and most of Puget Sound basin from Olympia to US-Canada border. Spawning activity is distributed from southernmost Puget Sound to Olympic Peninsula Pacific coast. Their spawning/spawn incubation zone primarily includes the upper one third of the tidal range, from about 7 feet up to extreme high water. Although not measured, surf smelt spawning distribution and fishery activity suggest that their abundance is stable, or at least not dramatically decreasing.

**Habitat**

Surf Smelt are a common and widespread species found throughout Washington nearshore marine waters. Spawning occurs around high tides on mixed sand-gravel substrates in the upper intertidal zone in a wide variety of wave-exposure regimes, from very sheltered beaches to fully exposed pebble beaches. Spawning substrate grain size is generally a sand-gravel mix, with most material in the 0.04 to 0.28 inches diameter range.

**References**
Fradkin, S. C. 2001. Rialto Beach Surf Smelt Habitat Monitoring: Quillayute River Navigation Project. Olympic National Park. 16pp.
Langness, M., P. Dionne, E. Dilworth, and D. Lowry. 2014. Summary of coastal intertidal forage fish spawning surveys: October 2012-September 2013. Washington Department of Fish and Wildlife, Olympia, WA. FPA 14-01 FPA 14-01. 51pp.
Penttila, D. 2005. WDFW Priority Habitat and Species Management Recommendations: Forage fish spawning habitat. Washington Department of Fish and Wildlife. 19pp.
Penttila, D. 2000. Documented spawning seasons of populations of the surf smelt, *Hypomesus*, in the Puget Sound basin. Washington Department of Fish and Wildlife, Olympia, WA. 36pp.
WDFW. Undated. Washington State Surf Smelt Fact Sheet http://wdfw.wa.gov/publications/01219/wdfw01219.pdf

### Surf Smelt: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Overharvesting of biological resources | A lack of fishery statistics relating to the recreational harvest of Surf Smelt. | Conduct recreational fishery monitoring and fishery-independent net sampling from a variety of surf smelt spawning stocks. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss or degradation | Widespread shoreline armoring practices on Surf Smelt spawning beaches. | A systematic complete inventory of all shoreline areas is needed to document all existing surf smelt spawning beaches in Washington marine waters to fully protect them from development effects. | Current insufficient | WDFW |
| 3 | Fish and wildlife habitat loss or degradation | Shoreline armoring practices. | Develop appropriate land use planning that adequately protects spawning beaches. | Current insufficient | WDFW |
| 4 | Outreach Needs | Shoreline armoring practices. | Partner with/educate other regulatory agencies to support protection of surf smelt spawning beaches. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## WALLEYE POLLOCK – SOUTH PUGET SOUND (*Gadus chalcogrammus*)

**Conservation Status and Concern**

Walleye Pollock abundance and distribution in South Puget Sound are incompletely known. Declines in encounter rate have led to increased fishery regulation and decreased harvest in recent years, especially in southern Puget Sound.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | Candidate | Yes | GNR | SNR | Low/unknown | Moderate |

**Biology and Life History**

Photo: S. Axtell, WDFW

Walleye Pollock is a fast-growing, relatively short-lived fish that lives throughout temperate and sub-arctic North Pacific Ocean. Puget Sound is near the southern limit of their range. They have three dorsal fins, two anal fins, and either no chin barbel or a very small one. Younger pollock form large schools in mid-water whereas older pollock are more common near the seafloor. Pollock have been recorded at depths up to 1,200 feet but are more commonly found in water from 330 to 990 feet deep. In Alaska, Walleye Pollock reach a maximum size of 3.4 feet and live up to 22 years, whereas Puget Sound Walleye Pollock are smaller and shorter-lived, reaching a maximum size of 3 feet and a maximum age of 10 years. Average size of Walleye Pollock in WDFW trawl surveys is 8.7 inches, with the largest captured fish measuring 25 inches. Approximately 50 percent of females are sexually mature at 4 years of age (approximately 16 inches). In Alaska, spawning aggregations form in late winter/early spring and larvae begin settling to the seafloor in late spring. WDFW trawl surveys have captured pollock in all stages of spawning condition during April and May. Larvae and young of the year fish feed on zooplankton such as krill, copepods, mysids and amphipods. Larger fish also utilize these prey and target shrimp, squid and other fish. Adult pollock are cannibalistic, often preying on juveniles.

**Distribution and Abundance**

WDFW trawl surveys have documented Walleye Pollock in every sub-basin of Puget Sound, with the lowest abundances in South Puget Sound, Hood Canal and Whidbey basin. Walleye Pollock once supported a recreational fishery in Puget Sound but catches are now so low that fishing is prohibited except in several small areas around San Juan Islands and in Strait of Juan de Fuca. No abundance estimates have been made for Puget Sound pollock in nearly a decade.

**Habitat**

Juveniles and adults usually occur over soft and unconsolidated substrate habitats although adults can also be found in high relief habitats near rocks. Young juveniles may use relatively shallow nearshore areas. In Puget Sound, most trawl-sampled Walleye Pollock were found at depths from 130 feet and greater.

**References**


Love, M. S. 2011. Certainly More than You Want to Know About the Fishes of the Pacific Coast. Really Big Press. Santa Barbara, CA. 649pp. http://www.adfg.alaska.gov/index.cfm?adfg=walleyepollock.main

Quinnell, S., and C. Schmitt. 1991. Abundance of Puget Sound demersal fishes: 1987 research trawl survey results. Washington Department of Fisheries Prog. Rep. No. 286, 267pp.

**Walleye Pollock – Southern Puget Sound: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Areas used by all life history stages and movement of juveniles before selection of adult habitat are poorly understood and not known. | Need for research on larval distribution. | Current insufficient | WDFW |
| 2 | Resource information collection needs | Need to update existing information. Information from annual trawl survey can be used to conduct population assessments. This information could be augmented with ROV collected data (e.g., 2012 survey) | Continue annual trawl surveys. | Current sufficient | WDFW |
| 3 | Overharvesting of biological resources | By-catch in other fisheries, injuries from barotrauma can be fatal. | Offer fish descender devices and information on how to use them. Offer information on methods to minimize by-catch when fishing. | Current insufficient | WDFW |
| 4 | Overharvesting of biological resources | Walleye Pollock are closed for retention in south Puget Sound. | Enforcement of law pertaining to fishery restrictions. | Current sufficient | WDFW |
| 5 | Education needs | Recreational anglers unable to identify species. | Educate anglers on rockfish identification. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

# ANADROMOUS FISH – NON-SALMONIDS

## EULACHON – SOUTHERN DPS (*Thaleichthys pacificus*)

A complete population assessment for this species is unavailable but precipitous declines in spawner abundance in the Fraser and Columbia rivers led to the Southern DPS being ESA-listed in 2010.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5 | S4 | Variable/ variable | Moderate-high |

**Biology and Life History**

Photo: WDFW

Eulachon are an anadromous smelt. Adults and juveniles spend most all of their lives in the ocean, returning after 2 to 5 years to freshwater river areas from late fall through winter to spawn. Peak spawning migration occurs during Feb. and March in Washington. Certain sites are utilized each year for spawning, while other sites/rivers are used more sporadically, with occasional heavy use, then less-so for several years. Adults die after spawning. Eggs attach to and incubate in coarse sand substrates. After hatching, larvae immediately wash out to the ocean. Larvae have been detected in the Columbia River from November through June.

**Distribution and Abundance**

Eulachon are endemic to northeastern Pacific Ocean. The Southern DPS extends from Mad River, northern California, northward to British Columbia. In Washington, they occur in lower Columbia River and its tributaries below Bonneville Dam, several Pacific coastal river systems, and Elwha River. Their ocean distribution includes nearshore and offshore areas. Abundance is variable in both time and space, with dramatic population swings depending on ocean conditions. However, since 1993 the species has had extended periods of extremely poor spawning runs coast-wide. Columbia River abundance was extremely low between 2005 and 2010. Moderately strong adult returns occurred from 2001 to 2003 and from 2011 to 2013, and a very large return occurred in 2014.

**Habitat**

Columbia Basin habitats (below Bonneville Dam) support the majority of spawning in Washington. Timing and locations of spawning appear to be highly influenced by river conditions, primarily water temperature and bottom substrate. Eggs incubate in coarse sand until hatching, and larvae drift downstream through freshwater and estuarine habitats and enter ocean waters. Juveniles disperse into continental shelf waters within first year of life. Eulachon have been captured in trawl fisheries targeting marine shrimp over muddy bottom within continental shelf waters.

**References**
Gustafson, R. G., M. J. Ford, D. Teel, and J. S. Drake. 2010. Status review of eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-105, 360pp.
NMFS. 2013. Federal Recovery Outline Pacific Eulachon Southern Distinct Population Segment. 24 pp.
NMFS. 2010. Endangered and threatened wildlife and plants: threatened status for Southern Distinct Population Segment of eulachon. Federal Register, 50 CFR Part 223. pp. 13012-13024.
Oregon Department of Fish and Wildlife (ODFW) and WDFW. 2014. Studies of Eulachon Smelt in Oregon and Washington. C. Mallette, editor. Oregon Dept. of Fish and Wildlife and Washington Dept. of Fish and Wildlife project completion report to NOAA Fisheries. 159pp.

### Eulachon – Southern DPS: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Climate change and severe weather | Natural climate variability and anthropogenic-forced climate change on ocean conditions have been identified as posing the greatest risk to Eulachon persistence. | Investigate the causal mechanisms and migration/behavior characteristics affecting survival of larval Eulachon during their first weeks in the Columbia River plume and nearshore ocean environments. | Current insufficient | Both |
| 2 | Climate change and severe weather | Natural climate variability and anthropogenic-forced climate change on ocean conditions have been identified as posing the greatest risk to Eulachon persistence. | Develop an oceanographic indicators ecosystem conditions model to determine the significance of plume and ocean conditions that affect Eulachon survival. | Current insufficient | Both |
| 3 | Overharvesting of biological resources | Bycatch in marine shrimp trawl fisheries has been identified as a major threat to Eulachon persistence. | Develop gear modifications that reduce Eulachon bycatch in pink shrimp fisheries. | Current insufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## PACIFIC LAMPREY (*Entosphenus tridentatus*)

**Conservation Status and Concern**

The declining status of Pacific Lamprey led to a west coast-wide joint tribal/federal/state "Pacific Lamprey Conservation Initiative". Limiting factors include passage obstruction and mortality at mainstem dams and tributary water diversion dams and intakes, and low abundance in upper Columbia.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Species of Concern | Monitor | Yes | G4 | S1 | Unknown/unknown | Moderate-high |

**Biology and Life History**

Photo: USFWS

Pacific Lamprey are anadromous. Juveniles spend 4 to 7 years as filter feeders in streams and rivers, and migrate to the ocean to mature. Adults are parasitic on fishes for 1 to 3 years and then migrate back to freshwater between February and June. Adults stop feeding during the return migration, overwinter in freshwater until they spawn the following year, and then die. The timing of migration to spawning streams varies geographically, and different runs may occur in a single river system. Upstream migrations may be as long as a few hundred miles. Degree of homing to natal streams is unknown. Spawning occurs from June to July in Washington. Eggs hatch in 2 or 3 weeks. Ammocoetes (larval filter-feeder life stage) burrow and rear in fine substrate stream beds for 4 to 6 years, then metamorphose into macropthalmia (juvenile parasitic life stage) and migrate to the ocean.

**Distribution and Abundance**

In Washington, Pacific Lamprey are distributed throughout streams and rivers of Columbia Basin up to Chief Joseph Dam, and throughout streams and rivers west of the Cascade Mountains. Population abundance data are limited, but the Columbia Basin's Pacific Lamprey appear to be on the decline according to dam counts and anecdotal information. Impassable dams and other made-made barriers have reduced historic distribution in Washington. Conservation actions have included translocation of adults trapped at lower Columbia River dams (Bonneville, The Dalles, John Day and McNary) to upper basin areas with low abundance.

**Habitat**

Spawning habitat is similar to that of Pacific salmon, such as gravel substrates at upstream ends of stream riffles. Ammocoetes use stream areas of low velocity and fine substrates (silt, mud). Free-swimming macropthalmia juveniles migrate downstream through freshwater and estuarine areas to enter the ocean. The predatory life stage occurs in marine areas, primarily near stream mouths in estuaries and in ocean coastal zones, but sometimes more offshore. Freshwater-resident populations exist in several areas in British Columbia and elsewhere.

**References**

US Fish and Wildlife Service (USFWS). 2012. Conservation Agreement for Pacific Lamprey (*Entosphenus tridentatus*) in the States of Alaska, Washington, Oregon, Idaho and California. 57pp.

**Pacific Lamprey: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Abundance data are limited and inadequate for trend assessment. | Research, survey or monitoring - fish and wildlife populations. | Current insufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Dams impede passage and alter natural flow regimes; culverts, road crossings, and other instream modifications impede passage. | Fish passage facilities. | Current insufficient | External |
| 3 | Fish and wildlife habitat loss or degradation | Further development of hydropower (energy) dams may block or impede passage. | Fish passage facilities. | | Both |
| 4 | Fish and wildlife habitat loss or degradation | Dams impede passage and alter natural flow regimes; culverts, road crossings, and other instream modifications impede passage. | Dam and barrier removal. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## RIVER LAMPREY (*Lampetra ayresii*)

**Conservation Status and Concern:**
Abundance and distribution information is inadequate for status assessment. Breeding and rearing freshwater habitats are likely at risk throughout much of distribution from land-use degradation; dams and other passage barriers (e.g., culverts) impede or prevent migration.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Species of Concern | Candidate | Yes | G4 | S2 | Unknown/unknown | Moderate-high |

**Biology and Life History**
River Lamprey are anadromous and have three distinct life stages: the ammocoete, an eyeless, filter-feeding, larval stage; the macropthalmia, an eyed, toothed, sub-adult; and adult. The ammocoete stage lasts several years, followed by metamorphosis to the macropthalmia stage. Macropthalmia were observed from February to August in Puget Sound rivers. Once transformation to the adult stage occurs, they migrate to saltwater in late spring/early summer and feed on a variety of fish species. It is likely that adults spend a year or less in saltwater, after which they migrate back to freshwater, spawn from April to June, and die. The degree of adult fidelity to natal streams is unknown.


Photo: USGS, Mike Hayes

**Distribution and Abundance**
Species range is Alaska to California. River Lamprey probably historically occurred in most major Washington rivers. Current Washington distribution is not well-known, but includes Pacific coast rivers from Columbia River northward, Puget Sound rivers, and within Columbia Basin, with documentation for the Yakima Basin. Quantitative abundance information for Washington occurrences is not available, and thus no abundance trend estimates exist.

**Habitat**
Ammocoetes (larvae) use fine silt and mud substrates in slow current areas of rivers and streams, feeding on algae and microscopic organisms. They burrow and are relatively immobile in these substrates and thus good water quality is required year-round. Adults use estuarine and marine habitats, and appear to use relatively shallow marine waters. Adults spawn in gravel substrates in riffle areas of clear, cool streams, constructing nests by moving substrate materials. Adults and juveniles use river mainstems as migration corridors, with some populations having very long migration distances to and from the sea.

**References**
Hayes, M. C., R. Hays, S. P. Rubin, D. M. Chase, M. Hallock, C. Cook-Tabor, C. W. Luzier and M. L. Moser. 2013. Distribution of Pacific lamprey *Entosphenus tridentatus* in watersheds of Puget Sound based on smolt monitoring data. Northwest Science 87(2): 95-105.

Wydoski, R. S., and R. R. Whitney. 2003. Inland fishes of Washington, 2nd edition. University of Washington Press. Seattle, WA. 322pp.

**River Lamprey: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Abundance and distribution information is inadequate for status assessment. | Research, survey or monitoring - fish and wildlife populations. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss or degradation | Dams, culverts, road crossings, and other instream modifications impede passage. | Dam and barrier removal. | Current insufficient | External |
| 3 | Fish and wildlife habitat loss or degradation | Dams impede passage and alter natural flow regimes; culverts, road crossings, and other instream modifications impede passage. | Fish passage facilities. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## GREEN STURGEON – SOUTHERN DPS (*Acipenser medirostris*)

**Conservation Status and Concern**

Green Sturgeon-Southern DPS has one spawning population with multiple habitat-related threats, and juvenile production may be declining. Harvest-related risks and estuarine degradation are threats in Washington.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | None | Yes | G3 | S2N | Medium/declining | Moderate |

**Biology and Life History**


Photo: B. James, WDFW

Green Sturgeon is an anadromous fish with long life-span (up to 70 years) that reaches maturity at around fifteen years or 5 to 6 feet in length. It spawns infrequently, approximately every 3 to 5 years, in natal streams. Southern DPS Green Sturgeon spawn in upper mainstem Sacramento River, California. Larvae and juveniles migrate downstream to river delta and estuaries where they rear for 1 to 4 years prior to migrating to ocean. Sub-adults and adults of this DPS live in coastal waters from Baja California, Mexico to British Columbia, Canada, and utilize coastal bays and estuaries of Washington, Oregon, and California during summer and fall. Adults/sub-adults feed on benthic fauna such as clams and crustaceans. Fish in spawning condition migrate from these areas and enter San Francisco Bay between mid-February and early-May, and spawn from April to early July. They re-enter ocean from November through January and resume coastal migrations.

**Distribution and Abundance**

The Green Sturgeon Southern DPS includes all spawning populations south and exclusive of Eel River, California, but principally includes the Sacramento River spawning population. Sub-adults and adults of this DPS are distributed in marine waters from Baja California to British Columbia, and in Washington occur in marine and estuarine areas, such as the lower Columbia River, Willapa Bay and Grays Harbor. Green Sturgeon from the northern DPS (federal species of concern) may also be present in these same Washington areas. Current total abundance for the Southern DPS is unknown. A genetic analysis estimated that between 10 to 28 spawners contributed to juvenile production between 2002 and 2006 in the Sacramento River upstream of Red Bluff Diversion Dam. Population modeling has suggested that sub-adults comprise the majority of the population and that annual spawner fish represent a small fraction of census population.

**Habitat**

No spawning habitat for this DPS occurs in Washington. Federally-designated critical habitat within marine waters includes areas within the 360 foot isobath from Monterey Bay to the U.S.-Canada border. Many coastal bays and estuaries are designated as critical habitat, including Willapa Bay and Grays Harbor (Washington) and the lower Columbia River estuary from the mouth to river-mile 46 (Washington and Oregon). Green Sturgeon forage in benthic substrates in marine and estuarine waters.

**References**
Israel, J. A., and B. May. 2010. Indirect genetic estimates of breeding population size in the polyploidy green sturgeon, *Acipenser medirostris*. Molecular Ecology 19:1058-1070.
NMFS, Southwest Region. 2010. Federal Recovery Outline - North American Green Sturgeon, Southern Distinct Population Segment. http://www.westcoast.fisheries.noaa.gov/publications/protected_species/other/green_sturgeon/green_sturgeon_sdps_recovery_outline2010.pdf

### Green Sturgeon-Southern DPS: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Resource information collection needs | Insufficient data on distribution, ecology and abundance for sturgeon in WA areas. | Research, survey or monitoring - fish and wildlife populations. | Current insufficient | WDFW |
| 2 | Fish and wildlife habitat loss or degradation | Coastal bays and estuaries habitat quality may be degraded relative to sturgeon needs. | Preserve estuarine habitat, restore lost estuarine habitat and restore natural functions (e.g. adequate flows and sediment delivery). | Current insufficient | External |
| 3 | Overharvesting of biological resources | Green Sturgeon may be incidentally harvested in various fisheries (bycatch). | Monitor catch and mortality of Green Sturgeon in fisheries targeting other species. | Current insufficient | WDFW |

NOTE: Numbers are for reference only and do not reflect priority.

## WHITE STURGEON – COLUMBIA RIVER (*Acipenser transmontanus pop. 2*)

**Conservation Status and Concern**

Although stable and numerous in lower Columbia River, they are increasingly rare upstream. Dams impede and prevent passage and have negatively impacted spawning habitat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| None | None | Yes | G4T3T4 | S3B,S4N | Low to abundant/ declining to stable | Moderate |

**Biology and Life History**

Photo: Wikimedia Commons

White Sturgeon is North America's largest freshwater fish, with maximum length about 20 feet, and a maximum mass of 1800 pounds. They are long-lived (over 100 years) and slow growing. They spawn exclusively in freshwater, typically during late spring to early summer when water temperatures reach 54 to 57°F. Spawning may occur later in year and over shorter time periods in upper basin. Males mature between 39 to 60 inches in length and at ages 12 to 25 years, while females typically mature at 47 to 71 inches and at ages 15 to 30 years. They spawn more than once during lifetime, with reproductive periodicity in lower Columbia River ranging between 3 to 5 years for males and females. Larvae hatch from eggs in 1 to 2 weeks. Juveniles typically feed on benthic invertebrates (amphipods, Chironomid larvae, isopods, mysids, snails, freshwater mussels and clams), while larger White Sturgeon are increasingly piscivorous. Inhabitants of lower river reaches can be amphidromous, with individuals moving between fresh and saltwater to feed.

**Distribution and Abundance**

The species ranges from Ensenada, Mexico to Aleutian Islands, Alaska, inhabiting large rivers, estuaries, and nearshore ocean. Riverine range of this Columbia River population includes spawning aggregations in the mainstem from its mouth to confluence with Kootenai River in British Columbia, including extreme lower reaches of its major tributaries except for Snake and Kootenai rivers. Fish in upstream areas may be freshwater-residents, and may be isolated between dams without passage facilities. Fish in lower river reaches utilize fresh and marine waters. Throughout its Columbia River range, population status and recruitment success vary widely. Currently, status is stable at high abundance in free-flowing lower Columbia River. In areas upstream of Bonneville Dam to Priest Rapids Dam, abundance is moderate and trend is stable. Abundance is low, with a declining trend, for wild fish residing in impoundments upstream of Priest Rapids Dam, an area where hatchery supplementation is underway.

**Habitat**

Large, cool rivers are primarily utilized. Sturgeon in spawning condition migrate to spawning sites comprised of a combination of moderate to high water velocities and turbulence over cobble or rock substrate, often in close proximity to deeper, slower-moving staging and resting areas. Such sites are limited to dam tailraces for impounded sub-populations, otherwise are typically located in rapids near large eddies. Spawning sites have been identified at the confluence of the Pend d'Oreille and Columbia rivers and further downstream in the Columbia River. Flow regulation has likely contributed to poor spawning and early-rearing success of White Sturgeon in the upper Columbia River by reducing spring flows and increasing water clarity.

**References**

Columbia Basin White Sturgeon Planning Framework. 2013. Prepared by CRITFC, WDFW and ODFW for the Northwest Power and Conservation Council. R. Beamesderfer and P. Anders (eds). 285pp.

### White Sturgeon – Columbia River: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat fragmentation: downstream dams isolate populations from lower basin populations and anadromous food resources. Upstream dam (Keenleyside) cut off access to historical spawning, rearing and feeding habitats. Former highly diverse and productive riverine ecosystem replaced by homogenous, oligotrophic reservoir that provides marginal habitat. Fragmentation eliminated full spectrum of habitats necessary for resident sturgeon to complete their life cycle. | Investigate using fish from adjacent populations in the supplementation program. | Current sufficient | Both |
| 2 | Fish and wildlife habitat loss or degradation | Flow regulation: Increased storage in upper basin and hydro operation have reduced spring flows. Riverine habitats and seasonal floods provide suitable spawning conditions by dispersing newly hatched free embryos to suitable rearing habitat, floods flush fine sediment and prevent armoring, and increased turbidity provides cover from potential predators. | Investigate habitat modifications, including enhancing spawning substrates. | Current insufficient | Both |
| 3 | Resource information collection needs | Need to monitor population trends and success of restoration actions. | Continue to monitor the status and trends of populations within the recovery areas. | Current sufficient | Both |
| 4 | Management Decision Needs | Need to monitor restoration planning, supplementation program, impacts and success. | Continue supplementation to rebuild abundance and maintain genetic diversity. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

# SALMONIDS

## LOWER COLUMBIA CHINOOK SALMON ESU (*Oncorhynchus tshawytscha pop. 1*)

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T2Q | SNR | Low/stable | Moderate-high |

**Biology and Life History**

Photo: WDFW

The season that adults return to freshwater distinguishes populations. For spring-run populations, adults enter rivers in early March not fully mature and spawn from late August to early October. For fall-run populations, adults enter rivers in early to late August and spawn from mid-September to mid-December. Spawning sites are usually in river's mainstem and large tributaries where flows and gravel sizes are optimal for egg deposition and survival. Most juveniles rear in freshwater for several months, out-migrating to estuary or ocean as fry or subyearlings from late winter to summer, and some may rear for a year before out-migrating. Sub-adults live in coastal Pacific Ocean as far north as southeastern Alaska and off British Columbia, Washington and Oregon, where they are largely piscivorous and grow to maturity for 1 to 6 years before migrating back to natal rivers. Most spawners are ages 2 to 5.

**Distribution and Abundance**

The ESU includes Chinook salmon in Washington and Oregon rivers that are Columbia River tributaries from its mouth up to Hood (Oregon) and White Salmon (Washington) rivers, and includes Willamette River to Willamette Falls, Oregon. Dams in several rivers significantly reduced or eliminated the historical distribution. Of 32 historical populations, 22 are in Washington. Washington's seven spring-run populations are extirpated or at high extinction risk. Of 15 fall-run populations, several are extirpated and most others are at high extinction risk. Chinook in 10 Washington hatchery programs are included in ESU, but introduced Chinook from other ESUs are not included, even if naturally spawning. Abundance remains very low for spring-run Chinook in restoration programs. Most fall-run populations also are at low abundance, especially in terms of wild-origin spawners, and at high extinction risk. The Lewis River late fall-run population is the only one with abundance trend nearing interim recovery goal.

**Habitat**

Adults and juveniles use a variety of riverine habitats depending on life stage. Spawners use pool and riffle areas in channels that have adequate depth, velocity, gravel substrate and temperature. Young juveniles use lower velocity and shallower areas including stream margins and non-mainstem channels, such as those found in natural floodplains. Suitable or optimal freshwater temperatures vary by life stage, but generally range between 41 and 59° F. Temperatures above 68° F may block adult migration and over 75° F may be lethal. Riparian trees are important due to habitat-forming large woody debris contributed to channels, and shading that moderates temperature. Columbia River estuary is an important juvenile rearing habitat. Sub-adults rear in Pacific Ocean continental shelf areas west of southeastern Alaska, British Columbia, Washington and Oregon.

**References**

Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.

Myers, J., C. Busack, D. Rawding, A. Marshall, D. Teel. D. M. Van Doornik, and M. T. Maher. 2006. Historical population structure of Pacific Salmonids in the Willamette River and Lower Columbia River basins. NOAA Tech. Memo. NMFS-NWFSC-73, 311pp.

### Lower Columbia River Chinook Salmon ESU: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Riverine, riparian, floodplain, and estuarine habitats lost, modified or heavily degraded by agricultural, urban and residential development. | Restore natural instream habitat forming processes and hydrological functions, e.g., remove diking, channelization, water diversions; restore riparian vegetation. Restore estuarine habitats and processes. | Current insufficient | External |
| 2 | Agriculture and aquaculture side effects | Percent of hatchery-origin fish on spawning grounds is often higher than management goal. Threat is loss of natural productivity. | Manage and modify hatchery operations to achieve goals for percent hatchery fish on spawning grounds. | Current sufficient | WDFW |
| 3 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, culverts, water diversions, shoreline industrial uses. | Dam and barrier removal. | Current insufficient | External |
| 4 | Energy development and distribution | Threat is from dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Restore or maintain optimum flows for fish and maintain adequate passage. | Current insufficient | External |
| 5 | Fish and wildlife habitat loss or degradation | Dams impede and prevent passage of adults and juveniles. | Add or improve fish passage in multiple localities (esp. Cowlitz and Lewis). | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## PUGET SOUND CHINOOK SALMON ESU (*Oncorhynchus tshawytscha pop. 15*)

**Conservation Status and Concern**

All populations in ESU are well below recovery plan target ranges for spawner levels. Risk factors are still present, including high fractions of hatchery fish and widespread habitat loss and degradation.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T2Q | SNR | Low/stable | Moderate-high |

**Biology and Life History**

Photo: WDFW

Adults enter rivers from mid-April to mid-September and spawn from late July to early November, with a population's return and spawn timing adapted to their spawning habitat. Spawning sites are usually in mainstem rivers and large tributaries where flows and gravel sizes are optimal for egg deposition and survival. Most juveniles rear in freshwater for several months before transforming to smolts and migrating to saltwater during spring and summer, and some may rear for a year before out-migrating. Juveniles may live in estuaries for a short time before entering marine waters. Sub-adults typically live in Puget Sound and coastal Pacific Ocean off Canada where they are largely piscivorous and grow to maturity for 1 to 6 years before migrating back to their natal rivers. Most spawners are ages 2 to 5 years, with age 4 predominating.

**Distribution and Abundance**

This ESU includes all wild Chinook salmon in rivers flowing into Puget Sound, Hood Canal, and eastern Strait of Juan de Fuca (Elwha River and eastward) in Washington, and hatchery-born Chinook from 26 artificial propagation programs. Currently, of 31 quasi-independent populations identified as historically present, 22 are extant and all of these are monitored annually for adult abundance. Marine distribution includes Puget Sound and coastal Pacific Ocean. Spawner abundance remained fairly constant between 1985 and 2009 but productivity (recruits per spawner) declined. The percentage of naturally spawning hatchery-origin fish averaged greater than 50 percent in one third of populations from 2005 to 2009.

**Habitat**

Adults and juveniles use a variety of riverine habitats depending on life stage. Spawners use pool and riffle areas in channels that have adequate depth, velocity, gravel substrate and temperature. Young juveniles use lower velocity and shallower areas including stream margins and non-mainstem channels, such as those found in natural floodplains. Suitable or optimal freshwater temperatures vary by life stage, but generally range between 41 and 59° F. Temperatures above 68° F may block adult migration and over 75° F may be lethal. Riparian trees are important due to habitat-forming large woody debris contributed to channels, and shading that moderates temperature. Estuaries serve as important rearing habitats, and juveniles use shallow nearshore areas as they migrate through Puget Sound. Sub-adults use deeper, more offshore Puget Sound areas for foraging. Other marine rearing areas include Strait of Georgia and Pacific Ocean continental shelf areas west of Vancouver Island and central British Columbia.

**References**
Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.
Ruckelshaus, M. H., K. P. Currens, W. H. Graeber, R. R. Fuerstenberg, K. Rawson, N. J. Sands, and J. B. Scott. 2006. Independent populations of Chinook salmon in Puget Sound. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-78, 125pp.

**Puget Sound Chinook Salmon ESU: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Riverine, riparian, floodplain, estuarine, and nearshore-marine habitats lost, modified or heavily degraded by agricultural, urban and residential development. | Restore natural instream habitat forming processes and hydrologic functions, e.g., remove diking, channelization, water diversions; restore riparian vegetation, estuarine and nearshore marine habitats and processes. | Current insufficient | Both |
| 2 | Agriculture and aquaculture side effects | Loss of natural productivity; percent of hatchery-origin fish on spawning grounds is often higher than management goal. | Manage and modify hatchery operations to achieve goals for percent hatchery fish on spawning grounds. | Current sufficient | Both |
| 3 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, culverts, water diversions, shoreline industrial uses. | Dam and barrier removal; add or improve fish passage facilities in some localities. | Current insufficient | External |
| 4 | Energy development and distribution | Dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Restore or maintain optimum flows for fish. | Current insufficient | External |
| 5 | Climate change and severe weather | River scour and excessive sedimentation from high flows and bank/hillsides erosion. | Restore and manage forests to protect channels, stream banks, and floodplains, and reduce effects of heavy rains and high flows. | Current insufficient | External |
| 6 | Overharvesting of biological resources | Annual fishery management processes are required. | Species and habitat management planning. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## UPPER COLUMBIA RIVER SPRING CHINOOK SALMON ESU (*Oncorhynchus tshawytscha pop. 12*)

**Conservation Status and Concern**

Although there have been increases in natural-origin spawner abundance, average productivity levels remain extremely low. Risks due to relatively high percent of hatchery-origin fish on spawning grounds, habitat degradation, and dam impacts are major concerns.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Endangered | Candidate | Yes | G5T1Q | SNR | Low/stable | Moderate-high |

**Biology and Life History**

Photo: WDFW

Adults begin entering Columbia River in March and enter their natal upper Columbia tributaries from early May to early August. Spawning occurs from August to mid-September. Juveniles rear for over a year in freshwater and then migrate through Columbia River mainstem to saltwater during spring to early summer. Pacific Ocean areas used by sub-adults for 2 to 3 years of rearing are not well-known, but likely occur offshore of northern continental shelf waters. Most spawners are ages 4 or 5 years. Upper Columbia River spring-run Chinook are part of a highly distinct evolutionary lineage and are genetically well-differentiated from most other Chinook salmon in Washington.

**Distribution and Abundance**

This ESU includes spring-run Chinook salmon in tributaries of upper Columbia River upstream of Yakima River confluence. Three extant populations occur in Wenatchee, Entiat, and Methow rivers, which drain eastside of the Cascades Mountains. Tributaries within these rivers support sub-populations containing important biological diversity (e.g., White River and Twisp River). Historical populations in Okanogan River and in upper Columbia River areas upstream of Grand Coulee Dam are extirpated. Six artificial propagation programs are included in the ESU. Abundance has increased since 1991 but this ESU did not meet viability criteria when last reviewed, and was rated at moderate-to-high extinction risk.

**Habitat**

Adults and juveniles use riverine and stream habitats in Wenatchee, Entiat, and Methow basins. Snow is major form of precipitation and rainfall is low. Snowmelt creates high flows in spring that adults utilize to access spawning habitat. Adequate stream conditions (e.g., flow, temperature, cover, prey) are required year-round because juveniles rear for more than a year before out-migrating. Suitable or optimal freshwater temperatures vary by life stage, but generally range between 41 and 59$^{o}$ F. Temperatures above 68$^{o}$ F may block adult migration and over 75$^{o}$ F may be lethal. Riparian trees are particularly important for moderating water temperature, and for contribution of large woody debris for in-stream habitat formation. Numerous dams in Columbia R. migration corridor negatively affect passage, flow and temperature conditions. Sub-adults rear in the North Pacific Ocean.

**References**

Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.

**Upper Columbia River Spring Chinook ESU: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Riverine, riparian, floodplain, and estuarine habitats lost, modified or heavily degraded by agricultural, urban and residential development. | Restore natural instream habitat forming processes and hydrological functions, e.g., remove diking, channelization, water diversions; restore riparian vegetation. Restore estuarine (lower Columbia River) habitats and processes. | Current insufficient | External |
| 2 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, culverts, water diversions, other water extraction. | Dam and barrier removal. | Current insufficient | External |
| 3 | Energy development and distribution | Dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Restore or maintain optimum flows and maintain adequate passage for fish. | Current insufficient | External |
| 4 | Fish and wildlife habitat loss or degradation | Dams impede and prevent passage of adults and juveniles. | Fish passage facilities need to be added or improved in multiple localities | Current insufficient | External |
| 5 | Agriculture and aquaculture side effects | Percent of hatchery-origin fish on spawning grounds need to be well-monitored and managed so that management goals for wild fish productivity are met. Threat is loss of natural productivity and diversity. | Manage and modify hatchery operations to achieve goals for percent hatchery fish on spawning grounds. | Current sufficient | Both |
| 6 | Overharvesting of biological resources | Annual fishery management processes are required. | Species and habitat management planning. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SNAKE RIVER FALL CHINOOK SALMON ESU (*Oncorhynchus tshawytscha pop. 2*)

This ESU includes one extant population. Abundance has improved substantially since ESA-listing, however hatchery-origin spawner proportions are high and dams continue to compromise habitat.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T1Q | SNR | Medium/increasing | Moderate-high |

**Biology and Life History**

Photo: WDFW

Adults begin entering Columbia River in August and enter Snake River in September. Spawning occurs from mid-October through mid-December in mainstem and lower areas of Snake River tributaries. Juveniles rear for several months and sometimes over a year in freshwater, and rearing may occur in Snake mainstem reservoirs. Migration to sea through Snake and Columbia rivers' mainstems occurs from spring through summer. Sub-adults rear in Pacific Ocean coastal areas off British Columbia and Washington, and most rear for one to three years before returning to spawn.

**Distribution and Abundance**

Distribution of historical spawning habitat has been significantly altered by Snake River mainstem dams. Habitat upstream of Hells Canyon Dam is inaccessible, and a 108 mile mainstem reach between that dam and upper end of Lower Granite Dam reservoir is remaining primary spawning habitat. Spawning also occurs now in lower areas of Snake River tributaries such as Grande Ronde, Clearwater and Tucannon rivers. Fish in two artificial production programs are included in ESU. Abundance of wild-born fish has increased in recent years due to on-going hatchery supplementation, and majority of naturally spawning fish are hatchery-origin. Returning wild-born adults have been estimated at over 4,000 fish since 2005, with an increasing trend to 2013.

**Habitat**

Adults and juveniles use riverine and reservoir habitats of the Snake River and lower mainstem areas of its tributaries. Habitat available is significantly reduced from historical conditions. Snake Basin rainfall is generally low and snow is major form of precipitation. High spring-time flows are important for successful juvenile outmigration. Natural seasonal hydrology has been altered by dams that control Snake River mainstem and some tributaries' flows. Four dams in lower Snake River and four dams in the Columbia River migration corridor negatively affect passage, flow and temperature conditions needed for adult and juvenile survival. Suitable or optimal freshwater temperatures vary by life stage, but generally range between 41 and 59$^{o}$ F. Temperatures above 68$^{o}$ F may block adult migration and over 75$^{o}$ F may be lethal. Sub-adults rear in the North Pacific Ocean and appear to predominately use British Columbia and Washington coastal areas.

**References**


Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.

Waples, R. S., R. P. Jones, B. R. Beckman and G. A. Swan. 1991 Status Review for Snake River Fall Chinook Salmon. NOAA Technical Memorandum NMFS F/NWC-201, 80pp.

**Snake River Fall Chinook Salmon ESU: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, water diversions, other water extraction. | Dam and barrier removal. | Current insufficient | External |
| 2 | Energy development and distribution | Threat is from dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Restore or maintain adequate passage and optimum flows for fish. | Current insufficient | External |
| 3 | Fish and wildlife habitat loss or degradation | Dams impede and prevent passage of adults and juveniles. | Fish passage facilities need to be added or improved in multiple localities. | Current insufficient | External |
| 4 | Agriculture and aquaculture side effects | Percent of hatchery-origin fish on spawning grounds need to be well-monitored and managed so that management goals for wild fish productivity are met. Threat is loss of natural productivity and diversity. | Manage and modify hatchery operations to achieve goals for percent hatchery fish on spawning grounds. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## SNAKE RIVER SPRING/SUMMER CHINOOK SALMON ESU (*Oncorhynchus tshawytscha pop. 8*)

**Conservation Status and Concern**

The entire ESU is rated at high extinction risk. Besides low abundance, risks due to percent of hatchery-origin fish on spawning grounds, habitat degradation, and dam impacts are major concerns.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T1Q | SNR | Low/increasing | Moderate-high |

**Biology and Life History**

Photo: WDFW

Adults begin entering Columbia River in March and enter their natal Snake River tributaries from April to mid-May. Spawning occurs from August through September. Timing is influenced by spawning habitat elevation. Juveniles rear for over a year in freshwater and then migrate through Snake and Columbia rivers' mainstems to saltwater during spring to early summer. Pacific Ocean areas used by sub-adults for 2 to 3 years of rearing are not well-known, but likely occur offshore of northern continental shelf waters. Most spawners are ages 4 or 5 years. Snake River spring/summer Chinook are part of a highly distinct evolutionary lineage and are genetically well-differentiated from most other Chinook salmon in Washington.

**Distribution and Abundance**

This ESU includes spring/summer-run Chinook salmon in tributaries of the Snake River (Idaho, Oregon and Washington), and 31 historic populations were identified, with 4 being extirpated, in areas that are currently accessible. Numerous historical populations in Idaho were extirpated by Lewiston Dam and in upper Snake Basin by Hells Canyon Dam. Distribution in Washington includes the Tucannon River, Asotin Creek, and part of Wenaha River. The Asotin population is considered extirpated, but hatchery strays may be present. Fifteen artificial propagation programs are included in the ESU, including the Tucannon hatchery program in Washington. Abundance and productivity remain low for Tucannon wild population. Natural spawning abundance in Tucannon River has increased since 2009 but remains well below the minimum abundance threshold.

**Habitat**

Adults and juveniles use riverine and stream habitats of tributaries to the Snake River and occur in relatively high elevation areas. Rainfall is generally low and snow is major form of precipitation. Snowmelt creates high flows in spring that adults utilize to access spawning habitat. Adequate stream conditions (e.g., flow, temperature, cover, prey) are required year-round because juveniles rear for more than a year before out-migrating. Suitable or optimal freshwater temperatures vary by life stage, but generally range between 41 and 59$^{o}$ F. Temperatures above 68$^{o}$ F may block adult migration and over 75$^{o}$ F may be lethal. The Tucannon River includes low elevation habitats within grasslands or agricultural fields and higher elevation habitats within evergreen forests. Riparian trees are particularly important in lower elevation areas for moderating water temperature, and throughout for contribution of large woody debris for in-stream habitat formation. Numerous dams in Snake and Columbia rivers' migration corridors negatively affect passage, flow and temperature conditions. Sub-adults rear in the North Pacific Ocean.

**References**

Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.

### Snake River Spring/Summer Chinook Salmon ESU: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Riverine, riparian, floodplain, and estuarine habitats lost, modified or heavily degraded by agricultural, urban and residential development. | Restore natural instream habitat forming processes and hydrological functions, e.g., remove diking, channelization, water diversions; restore riparian vegetation. Restore estuarine (lower Columbia River) habitats and processes. | Current insufficient | External |
| 2 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, culverts, water diversions, other water extraction. | Dam and barrier removal. | Current insufficient | External |
| 3 | Energy development and distribution | Threat is from dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Restore or maintain adequate passage and optimum flows for fish. | Current insufficient | External |
| 4 | Fish and wildlife habitat loss or degradation | Dams impede and prevent passage of adults and juveniles. | Fish passage facilities need to be added or improved in multiple localities. | Current insufficient | External |
| 5 | Agriculture and aquaculture side effects | Percent of hatchery-origin fish on spawning grounds need to be well-monitored and managed so that management goals for wild fish productivity are met. Threat is loss of natural productivity and diversity. | Manage and modify hatchery operations to achieve goals for percent hatchery fish on spawning grounds. | Current sufficient | Both |
| 6 | Overharvesting of biological resources | Annual fishery management processes are required. | Species and habitat management planning. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.

## COLUMBIA RIVER CHUM SALMON ESU (*Oncorhynchus keta pop. 3*)

**Conservation Status and Concern**

After near extirpation, abundance of this ESU remains very low, and extinction risk was rated very high.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T2Q | SNR | Low/declining | Moderate |

**Biology and Life History**

Photo: WDFW

Adults return to Columbia River from mid-October to November and reach spawning grounds from late October to early December. Spawning occurs from early November to mid-January in Columbia River mainstem and its tributaries. Early or 'summer' returning chum salmon occur in Cowlitz River, with earlier spawn timing than fall-run chum. Spawners use lower reaches of rivers, tributaries and side-channels from just above tidal influence to upstream areas below where gradients increase and partial natural barriers are more common. They often choose spawning sites with upwelling groundwater or that are spring-fed. Emerged fry spend little time rearing in freshwater and begin seaward migration at relatively small sizes, with an early capability for seawater adaptation. Outmigration occurs from March through May and peaks from mid-April to early May. Juveniles use lower Columbia estuarine areas for feeding and rearing and may be present from February through June. Sub-adults use Pacific Ocean areas for rearing but migration distances and specific distributions over multiple years at sea are not well-known. Returning adults are usually ages 3 to 5 years.

**Distribution and Abundance**

This ESU includes all chum salmon in the Columbia River and its Washington and Oregon tributaries. Of 17 historical populations, 11 are in Washington. Chum salmon from three Washington artificial propagation programs are included in the ESU. Lower Columbia Chum Salmon were nearly extirpated in the 1940's. Among Washington populations, Grays River and Lower Gorge populations are the only ones that have consistently maintained natural spawning and relatively stable abundance. All others are at very low abundance. In 2010 total abundance was less than 12 percent of 1951 estimated abundance. ESU status was rated at very high risk.

**Habitat**

Lower elevation and lower gradient riverine areas of Columbia River tributaries and sections of the Columbia River mainstem below Bonneville Dam are primary spawning habitats. Areas with upwelling groundwater and spring-fed flows are important for spawners. Juveniles use these same areas for a short time. Lower Columbia estuarine habitats are important feeding and rearing areas for juveniles prior to ocean entry. Pacific Ocean habitats used for rearing are likely to be coastal and continental shelf areas but oceanic distribution of sub-adults through their growth period is not well-known.

**References**

Ford, M. J. (ed.). 2011. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. U.S. Dept. Commerce, NOAA Tech. Memo. NMFS-NWFSC-113, 281pp.

Myers, J., C. Busack, D. Rawding, A. Marshall, D. Teel. D. M. Van Doornik, and M. T. Maher. 2006. Historical population structure of Pacific Salmonids in the Willamette River and Lower Columbia River basins. NOAA Tech. Memo. NMFS-NWFSC-73, 311 p.

**Columbia River Chum Salmon ESU: Conservation Threats and Actions**

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Riverine, riparian, floodplain, and estuarine habitats lost, modified or heavily degraded by agricultural, urban and residential development. | Restore natural instream habitat forming processes and hydrological functions, e.g., remove diking, channelization, water diversions; restore riparian vegetation. Restore estuarine habitats and processes. | Current insufficient | External |
| 2 | Fish and wildlife habitat loss or degradation | Habitat loss and degradation due to dams, transportation crossings, culverts, water diversions, shoreline industrial uses. | Remove structures that increase delivery or accumulation of fine sediments, that block or impede passage, or modify flows. | Current insufficient | External |
| 3 | Energy development and distribution | Threat is from dam operations that modify natural hydrological cycle and flows and restrict or eliminate fish passage. | Optimum flows for chum need to be restored or maintained (e.g., mainstem redd de-watering threat), adequate passage maintained and flooded spawning habitat restored. | Current insufficient | External |

NOTE: Numbers are for reference only and do not reflect priority.

## HOOD CANAL SUMMER CHUM SALMON ESU (*Oncorhynchus keta pop. 2*)

**Conservation Status and Concern**

Abundance has improved significantly since time of ESA-listing, but viability conditions have not been met completely. Evaluation of efficacy of habitat improvements and reintroductions is needed.

| Federal Status | State Status | PHS | Global Ranking | State Ranking | Population size/trend | Climate Vulnerability |
|---|---|---|---|---|---|---|
| Threatened | Candidate | Yes | G5T2Q | SNR | Medium/increasing | Moderate-high |

**Biology and Life History**

Photo: WDFW

Adults return to natal streams from early August into October. Spawn timing ranges from mid-August to late October. Spawners use lower reaches of rivers, their tributaries and side-channels from just above tidal influence to upstream areas below where gradients increase and partial natural barriers are more common. Juvenile emergence from redds (nests) usually begins in February and continues for several months. Their freshwater residence time is short and they move rapidly downstream to rear in nearshore marine waters, including estuaries. As juveniles grow they move to more offshore waters, and during summer migrate to oceanic waters. Sub-adults rear in Pacific Ocean areas and likely migrate to North Pacific off British Columbia and Alaska, but migration distances and rearing localities over their multiple years at sea are not well-known. Adults mature and return to natal streams at ages two to five, but most are age three or four.

**Distribution and Abundance**

This ESU includes summer-run chum salmon in rivers draining to Hood Canal and Strait of Juan de Fuca, westward to and including Dungeness River. Two independent populations exist and each includes multiple sub-populations inhabiting separate rivers or creeks. Some sub-populations had been extirpated and overall abundance was at historically low levels by about 1990. Abundance levels have generally increased since 2000, due to implementation of recovery measures, including harvest management, short-term hatchery supplementation, and reintroduction. Extinction risks are likely relatively low currently, but full recovery has not been achieved yet. Reintroductions appear to be succeeding at re-establishing historic distribution, but those sub-population abundances are low.

**Habitat**

The most downstream and lowest gradient areas of rivers and creeks are primary spawning habitats. Spawners enter rivers during typically low flow periods in late summer and early fall, thus adequate water flow and quality need to be maintained. Juveniles spend very little time in natal stream habitats. Estuaries and nearshore areas of Hood Canal, Admiralty Inlet zone of Puget Sound, and Strait of Juan de Fuca are very important early rearing habitats for juveniles prior to Pacific Ocean entry. Sub-adults likely use Pacific Ocean coastal or continental shelf habitats, but oceanic habitats throughout growth period are not well-known.

**References**

Point No Point Treaty Tribes and Washington Department of Fish and Wildlife. 2014. Summer Chum Salmon Conservation Initiative (SCSCI) Five-year Review: Supplemental Report No. 8 of SCSCI - An Implementation Plan to Recover Summer Chum in the Hood Canal and Strait of Juan de Fuca Region. WDFW, Olympia, WA. 237pp.

### Hood Canal Summer Chum Salmon ESU: Conservation Threats and Actions

| | STRESSOR | DESCRIPTION | ACTION NEEDED | LEVEL OF INVESTMENT | LEAD |
|---|---|---|---|---|---|
| 1 | Fish and wildlife habitat loss or degradation | Lower river areas, estuarine, and nearshore-marine habitats to some extent have been lost, modified or degraded by agricultural and residential development, and there is threat of further build-out and development. | Land use planning needs. | Current insufficient | Both |
| 2 | Resource information collection needs | Reintroduction programs in several localities need long-term monitoring. | Research, survey or monitoring - fish and wildlife populations. | Current sufficient | WDFW |
| 3 | Climate change and severe weather | Adequate flows during late summer spawn timing are needed. | Land use planning. | Current insufficient | External |
| 4 | Overharvesting of biological resources | Harvest impacts are currently low, but management for low impacts needs to be maintained. | Species and habitat management planning. | Current sufficient | Both |

NOTE: Numbers are for reference only and do not reflect priority.