

Idaho State Wildlife Action Plan 2023

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Executive Summary

Idaho's State Wildlife Action Plan (SWAP) is a statewide plan for conserving and managing Idaho's most at-risk fish, wildlife, and plants and the habitats they depend on. For the first time, plant species were incorporated into the 2023 revision. Designed to span 10 years, the SWAP provides strategic and voluntary guidance on priority conservation actions needed for SWAP species including both "species of greatest conservation need" (hereafter SGCN) and "species of greatest information need" (hereafter SGIN) (collectively "SWAP species") as determined by the Idaho Department of Fish and Game (IDFG). The plan also emphasizes prevention of future species listings under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.; ESA), thus helping maintain state-led management authority for Idaho's native fish, wildlife, and plants.

This plan is organized around the "Eight Required Elements," which describe the required information in a SWAP and are intended to be based on the best available and appropriate scientific information. To ensure an approved SWAP, and thus continue to remain eligible for State and Tribal Wildlife Grants Program (STWG) funding, all 8 elements must be adequately addressed.

The Idaho SWAP's fundamental objectives form the basis for evaluating possible conservation actions and outcomes. The following are the fundamental objectives of the SWAP:

- Avoid the need for future endangered species listings
- Recover species currently listed as threatened or endangered
- Maintain state-led management authority for Idaho's native fish, wildlife, and plants
- Maintain healthy fish and wildlife, healthy habitat, and healthy people
- Maximize access for traditional uses of natural resources
- Maintain healthy lands and waters
- Increase opportunities to support the voluntary stewardship efforts of ranchers, farmers, and private landowners to keep working lands working
- Increase public engagement in wildlife management decision-making
- Increase community engagement in conservation planning

Designed to span a 10-year time frame, the Idaho SWAP is statewide in scope and targets the conservation of native fish, wildlife, and plant SGCN and SGIN and their habitats, while also addressing the full array of species and conservation issues. Because populations of migratory species can be limited by factors throughout their annual cycle (e.g., habitat loss anywhere along the migratory path, fish passage barriers, stressors on wintering grounds), we identify strategies that account for these pressures throughout the full life cycle in what is known as "full-life-cycle conservation."

We adopted the USDA Forest Service (FS) ECOMAP provinces (FS ECOMAP Team 2017) as the organizational framework for the SWAP because they provide a scale appropriate for broad-scale conservation and can be used to support cross-boundary collaboration. These

provinces represent areas of land and water that have similar physical and biological characteristics and ecological processes. Throughout the plan, we cross-reference the 5 major geographic and ecological regions of Idaho and use them to provide context for the location of SWAP species and habitats as well as to assist users of the SWAP with finding material relevant to their respective geographic region(s) or objectives.

The following major taxonomic groups are included in the SWAP: amphibians, birds, mammals, reptiles, fishes, invertebrates, and plants (including vascular plants and nonvascular mosses, lichens, and liverworts). In the context of this plan, the term "species" includes taxonomic species as well as selected subspecies, populations, or other entities below the species level (hereafter species). In 4 cases, we treated multiple species as a species group instead of at the individual species level: migratory shorebird assemblage (16 species), spur-throat grasshopper genus *Melanoplus* species group (34 species), mountainsnail genus *Oreohelix* species group (12 species), and harvestman genus *Acuclavella* species group (5 species). By grouping such species, we identify conservation actions that focus on the habitats or other attributes applicable to all species in the group.

The plan includes a narrative of the criteria and selection process used to derive SWAP species, which includes both species that are experiencing known pressures, that without intervention are likely to continue to decline or to become increasingly vulnerable (SGCN), as well as taxa potentially vulnerable but for which current scientific knowledge and expert understanding are lacking (SGIN). The resulting list includes 137 SGCN and 132 SGIN.

We also provide descriptions for 39 habitats (terrestrial, aquatic, and subterranean) essential to the conservation of SWAP species, including their extent and condition. We use the term "habitat" here in its truest sense; that is, generally taken to embody both species assemblages and their interactions with the vegetation and geophysical environment. With some exceptions, terrestrial habitats (both cultural and natural) are organized hierarchically following the US National Vegetation Classification (USNVC 2022). The common language provided by this standard supports wildlife conservation (e.g., modeling and mapping wildlife habitat, patterns of vegetation change over time, managing invasive species) and facilitates interagency cooperation on vegetation management issues that transcend jurisdictional boundaries.

We summarize the challenges (both natural and human-caused) to SWAP species in Idaho and identify voluntary actions that can be considered to address stressors associated with these challenges and the resulting effects on species and habitats. The information is organized around the Conservation Measures Partnership (CMP 2016a) *Direct Threats Classification*. In addition to specific challenges, we include a section (3.12.0) for SGIN with knowledge and information needs.

In identifying the range of conservation actions to include in the SWAP, we considered both the potential impact (i.e., the degree to which the action, if implemented, would lead to desired changes in the situation), and the feasibility (i.e., the degree to which the action could be implemented within likely time, financial, staffing, ethical, or other constraints). We eliminated

actions that were not likely to be effective or feasible and focused on actions that were likely to be the most effective and feasible within our 10-year time frame.

The plan describes our approach to monitoring and evaluation (M&E) while recognizing the need to balance implementation and monitoring priorities. The main purpose of M&E is to understand whether conservation efforts are effective (and why or why not) so that we implement effective conservation actions and take what we have learned to improve the Idaho SWAP over time, as needed (i.e., practice adaptive management). We also include plans for periodic monitoring of SWAP species and their habitats to respond to new information or changing conditions.

We provide a narrative on the extent of IDFG's coordination with, and efforts to involve federal, state, local agencies, and American Indian tribes during the 2023 SWAP revision effort as well as provisions for public participation. Finally, we provide a narrative of how IDFG plans to revise the SWAP during the next revision period. As a SWAP user this chapter provides examples of how you can engage in SGCN conservation through actively participating in the SWAP, either through cooperative planning and public involvement, or through implementation.

The SWAP establishes a strategic program to coordinate efforts of stakeholders engaged in the conservation of Idaho's fish, wildlife, and plants and the habitats they depend on. The SWAP also respects the diverse social and cultural values and natural resource-based economies that sustain Idaho's communities. Most importantly, the SWAP creates opportunities for all stakeholders to collaborate in proactive, voluntary, and community-oriented partnerships to conserve SWAP species and the lands and waters that support these species and that provide for society's needs. Fostering and incentivizing these partnerships into the future will be necessary to sustain Idaho's SWAP species, natural resource-based economies, and culture and heritage.

Chapter 1 Introduction & Planning Framework

Introduction

Idaho's State Wildlife Action Plan (SWAP) is a statewide plan for conserving and managing Idaho's most at-risk fish, wildlife, and plants and their habitats. The SWAP provides strategic voluntary guidance on priority conservation actions needed for SWAP species including both "species of greatest conservation need" (hereafter SGCN) and "species of greatest information need" (hereafter SGIN) (collectively "SWAP species") as determined by the Idaho Department of Fish and Game (IDFG). The plan also emphasizes prevention of future species listings under the Endangered Species Act of 1973, as amended (16 U.S.C. 1531, et seq.; ESA), thus helping maintain state-led management authority for Idaho's native fish, wildlife, and plants.

In authorizing the State and Tribal Wildlife Grants Program (STWG) in 2000 and 2001 respectively, Congress required all states wishing to remain eligible for funding under this program commit to reviewing, and if necessary, revising their plans at least every 10 years (Department of the Interior . . . 2000; Federal Funding . . . 2000; Department of the Interior . . . 2001). This plan represents IDFG's comprehensive review and revision of the 2015 SWAP (IDFG 2017b). In recognition of the role of the states to conserve all wildlife, Congress intended that states develop a strategic program for conserving wildlife for use by all natural resource managers and conservation practitioners through cooperative planning and public involvement. IDFG is Idaho's wildlife management authority, but it is not a major land management agency, and it does not administer significant regulatory programs other than regulating the take of wildlife. IDFG's ability to conserve wildlife depends on its effectiveness in working cooperatively with others. The Idaho SWAP provides effective conservation leadership for the state.

Many Idaho species are experiencing impacts from a variety of sources, such as uncharacteristic wildfire, invasive species, changing climate, or human land uses (e.g., energy development, cropland conversion, urbanization, transportation corridors), and are likely to continue to decline or become increasingly vulnerable without intervention. In addition, many species lack the information needed to adequately assess their conservation status. Moreover, few funding mechanisms exist for Idaho's native fish, wildlife, and plant species that are not hunted, fished, or trapped, resulting in unmet conservation needs.

Eight Required Elements

The "Eight Required Elements" describe the required information in a SWAP and are intended to be based on the best available and appropriate scientific information. First authorized in the Wildlife Conservation and Restoration Program (WCRP) enacting legislation (Federal Funding . . . 2000), the elements were subsequently adopted for use in the STWG Program (Department of the Interior . . . 2000, 2001). The 2007 *Guidance for Wildlife Action Plan*

(Comprehensive Wildlife Conservation Strategy) Review and Revisions incorporated the elements and was jointly signed by the US Fish and Wildlife Service (FWS) Director and the Association of Fish and Wildlife Agencies (AFWA) President (FWS and AFWA 2007). That guidance was updated in 2017 and signed by the FWS Principal Deputy Director and AFWA President (FWS; AFWA 2017). To ensure an approved SWAP, and thus remain eligible for STWG funding, all 8 of the following elements must be adequately addressed:

1. Provides and makes use of information on the distribution and abundance of species of wildlife, including low and declining populations as the state fish and wildlife agency deems appropriate, that are indicative of the diversity and health of the state's wildlife

2. Identifies the extent and condition of wildlife habitats and community types essential to the conservation of species identified in (1)

3. Identifies the problems that may adversely affect the species identified in (1) or their habitats, and provides for priority research and surveys to identify factors that may assist in restoration and more effective conservation of such species and their habitats

4. Determines those actions that should be taken to conserve the identified species and their habitats and establishes priorities for implementing such conservation actions

5. Provides for periodic monitoring of species identified in (1) and their habitats and the effectiveness of the conservation actions determined in (4), and for adapting conservation actions as appropriate to respond to new information or changing conditions

6. Provides for the review of the state wildlife conservation plan and, if appropriate, revision at intervals not to exceed 10 years

7. Provides for coordination to the extent feasible during the development, implementation, review, and revision of the wildlife conservation 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 identified species or their habitats

8. Provides an opportunity for public participation in the development, revision, and implementation of the comprehensive plan

Purpose

Wildlife belongs to the people of Idaho and investing in our shared wildlife is good for all Idahoans. Investing in the SWAP is key to sustaining IDFG's mission to "preserve, protect, perpetuate, and manage" all wildlife, thus providing for the citizens of the state for future generations.

The purpose of this SWAP revision is to identify strategies and actions to conserve or manage Idaho's most at-risk fish and wildlife and their habitats. For the first time, IDFG incorporated plant species into this 2023 revision.

Conservation of at-risk species complements existing programs funded with revenues from the sale of hunting and fishing licenses by providing broad benefits to a diversity of fish, wildlife, and plants. Through proactive conservation, we can avoid the need for federal oversight, increased regulations, and costly endangered species recovery efforts. Maintaining state-led management authority for all species provides a safe and dependable regulatory environment for industry and landowners to invest in and operate from.

Fundamental Objectives

The Idaho SWAP identifies fundamental objectives that form the basis by which we evaluated possible conservation actions and outcomes. Fundamental objectives reflect values, the things we care about (Groves and Game 2016), and are the driving force in any decision-making process. The following fundamental objectives represent what our SWAP is trying to achieve:

- Avoid the need for future endangered species listings
- Recover species currently listed as threatened or endangered
- Maintain state-led management authority for Idaho's native fish, wildlife, and plants
- Maintain healthy wildlife, healthy habitat, and healthy people
- Maximize access for traditional use of natural resources
- Maintain healthy lands and waters
- Increase opportunities to support the voluntary stewardship efforts of ranchers, farmers, and private landowners to keep working lands working
- Increase public engagement in wildlife management decision-making
- Increase community engagement in conservation planning

Scope

Designed to span 10 years, the Idaho SWAP is statewide in scope and targets the conservation of native fish, wildlife, and plant SGCN and SGIN and the habitats they depend on, while also addressing the full array of wildlife. Because populations of migratory species can be limited by factors throughout their annual cycle (e.g., habitat loss anywhere along the migratory path, fish passage barriers, stressors on wintering grounds), we identify strategies that account for these pressures throughout the full life cycle in what is known as "full-life-cycle conservation." Finally, we considered and included additional climate-related actions in our plan following the updated AFWA voluntary guidance on incorporating climate change into SWAPs (AFWA 2022).

How to Use the Idaho State Wildlife Action Plan

The plan is organized around the "Eight Required Elements": Elements 1 and 2 are combined in Chapter 2 "Species & Habitats"; Elements 3 and 4 are combined in Chapter 3 "Challenges &

Actions"; Element 5 is covered in Chapter 4 "Monitoring & Evaluation"; and Elements 6, 7, and 8 are combined in Chapter 5 "Coordination & Review." To orient the user to the geographic and ecological regions of Idaho, and the ecological framework the plan is based on, we provide an overview in Chapter 1 under the heading "Ecological Framework," which also includes a map of Idaho with province boundaries (Fig. 1), followed by a description of each of the 5 ecological provinces represented in the state. We cross-reference these provinces to assist users in finding material relevant to their respective geographic region(s) or objectives. For example, in Chapter 2, the SWAP species lists (Tables 2.1 and 2.2) indicate not only which ecological provinces the species occurs in, but also the percent of the species' distribution within the Idaho portion of each province. This provides a relative measure of the importance of each province to a species and can be used to focus conservation efforts. Also in Chapter 2, each habitat description includes a map of Idaho with province boundaries to show the extent of the habitat in each province. This framework likewise provides a mechanism for adjacent states that share a particular province (e.g., the Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province spans Idaho, Montana, Wyoming, and Utah) to identify opportunities for cross-boundary collaboration with respect to our collective SWAPs. Finally, we cross-reference habitats to all SWAP species and indicate whether a species is obligate, near-obligate, dependent, or associated with a given habitat (see Appendix 5).

In Chapter 2, we introduce Idaho SWAP species under the heading "Species of Greatest Conservation & Information Need." This includes a narrative of the criteria and selection process used to derive both SGCN and SGIN based on our knowledge of the species (or in some cases species assemblages, subspecies, populations, or varieties). The SGCN category includes species known to be experiencing declines, or that are at-risk due to various stressors or emerging issues (Table 2.1). The SGIN category includes species potentially at-risk but for which current scientific knowledge and expert understanding are lacking regarding (1) taxonomic uncertainty, (2) distributional uncertainty, or (3) ecological uncertainty (Table 2.2). For each SWAP species, we provide the conservation status (global rank, subnational rank, and ESA status), population size (categorical range), and percent distribution within the Idaho portion of each ecological province.

In Chapter 2, we also introduce the 39 terrestrial, aquatic, and subterranean habitats covered in the plan that are essential to one or more Idaho SWAP species. With some exceptions (e.g., Agricultural Habitat, Aquatic Vegetation & Freshwater Habitat, Caves & Subterranean Habitats), habitats follow the United States National Vegetation Classification Hierarchy (USNVC 2022) and are grouped by class/subclass (e.g., Forest & Woodland, Shrub & Herb Wetland). For each major habitat class, we provide a general description of the habitat. Nested under each of these are more specific habitats (e.g., Dry Lower Montane–Foothill Forest). For each of these, we provide an Idaho-specific description of the habitat, a map of its extent in the state delineated by ecological province, a general statement of its relative condition (see Chapter 3 for more details on stressors, which are not applicable to ruderal habitats), and a representative photo. Each description also includes examples of SWAP species for which the habitat is important, and a list of common plant species associated with it.

Chapter 3 summarizes the challenges (both natural and human-caused) to SWAP species in Idaho and voluntary actions that can be considered to address stressors associated with these challenges and the resulting effects on species and habitats. This section is organized around the Conservation Measures Partnership (CMP 2016a) *Direct Threats Classification*. In addition to specific challenges, we include a section (3.12.0) for SGIN with knowledge and information needs.

Multiple ways exist to navigate Chapter 3. For example, a person in the business of agricultural or livestock production may want to go straight to the section titled "2. Agriculture & Aquaculture," which includes "Livestock Farming & Ranching." Under each major heading, we provide an overview of the challenge and the overarching effects and voluntary actions that apply to several SWAP species or habitats. A person who grazes livestock in one or more habitats (e.g., sagebrush-steppe and mountain meadows), may want to review the habitat-specific effects and actions associated with these habitats. On the other hand, if a conservation organization is focused on a particular area, it may want to cross-reference habitats and species to the relevant ecological province and use the tables to inform its work. In addition to the habitat-specific actions under each main heading, we include a table of species-specific effects and actions (i.e., those actions suggested to address the specific challenge but are species-related instead of habitat-related). Where a lack of information precludes our ability to identify appropriate conservation actions, we identify research or survey needs designed to obtain the information we need to then identify such actions (see section 3.12).

In Chapter 4 "Monitoring & Evaluation," we describe our approach to monitoring and evaluation (M&E) while recognizing the need to balance implementation and monitoring priorities. The main purpose of M&E is to understand whether conservation efforts are effective (and why or why not) so that we implement effective conservation actions and take what we have learned to improve the Idaho SWAP over time, as needed (i.e., practice adaptive management). We also include plans for periodic monitoring of SWAP species and their habitats to respond to new information or changing conditions.

Chapter 5 describes IDFG's coordination and involvement with federal, state, and local agencies and American Indian tribes during the 2023 SWAP revision. We also describe IDFG's efforts to involve the public in the SWAP revision. Finally, we describe how IDFG plans to revise the SWAP during the next revision period. This chapter provides examples of how stakeholders can engage in SGCN and SGIN conservation through actively participating in the SWAP, either through cooperative planning and public involvement, or through implementation. For example, as a sister Idaho state agency or federal land management agency, this provides a platform for addressing mutual goals (e.g., alignment between the SWAP and the Idaho Forest Action Plan, agency sensitive species lists, FS forest plan revisions). In addition, it gives American Indian tribes an opportunity to provide input on wildlife management that has the potential to affect culturally important species or places. For nongovernmental organizations (NGOs), natural resource-based industry, or private landowners, this creates an opportunity to provide input on wildlife and habitats for the lands you protect or work in. This describes how all Idahoans can have a voice in wildlife

conservation and participate in on-the-ground conservation through participatory science projects.

As you navigate the plan, you can find supporting information in the appendixes, including common and scientific names of animal species referenced in this plan (Appendix 1), common and scientific names of plant species in this plan listed alphabetically by common name (Appendix 2) and by scientific name (Appendix 3), a complete list of habitats and community types referenced in this plan (Appendix 4), and SWAP species by taxonomic group and habitat association (Appendix 5). In addition, we provide a list of targeted stakeholders for both coordination with federal, state/provincial, and local agencies and American Indian tribes as well as public participation in appendixes 6 and 7, respectively. We also provide a list of abbreviations and acronyms as a reference and include a comprehensive glossary so that partners and the public have a shared and common understanding of key terms used in the plan. Finally, we include a bibliography that lists works cited in the text and data sources used in developing the plan.

Idaho's Social–Ecological Setting

Idaho has a rich history with diverse natural areas and resources. The 11th largest United States (US) state by area—with a land area of 82,623 mi^2 (213,993 km^2) and water area of 923 mi^2 (2,391 km^2)—Idaho is bordered by Wyoming, Nevada, Utah, Washington, Montana, Oregon, and British Columbia (US Census Bureau 2022). With a human population of over 1.9 million, Idaho remains one of the fastest-growing states in the nation, primarily from people relocating to the state. Between 2010 and 2020, Idaho was the second-fastest growing state in the nation, increasing over 17%. The projected statewide growth rate is 1.1% annually through 2029, when the state's population will approach 2 million (IDOL 2021). This growth, coupled with other key challenges such as drought, changes in temperature regimes, broad-scale wildfires, invasive species, and the need to increase power production, puts pressures on fish, wildlife, and plants as well as the livelihoods that depend on natural resources (e.g., farming, ranching, forestry, mining, and water use).

Idaho's natural resources are managed or comanaged by a range of state and federal agencies, local governments (e.g., counties), American Indian tribes, corporations, and NGOs. In addition to formal entities with authority for land or wildlife management, many private landowners cooperate with these agencies and entities through voluntary conservation on their lands.

Idahoans love the outdoors. The *2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation* (FWS and US Census Bureau 2011) found that 838,000 Idaho residents and nonresidents 16 years old and older fished, hunted, or wildlife watched (i.e., observing, feeding, and photographing wildlife) in Idaho. In 2011, state residents and nonresidents spent $1.6 billion on wildlife recreation in Idaho. Professional wildlife conservation and management such as described in the SWAP creates healthy wildlife populations, provides recreational and sustainable harvest opportunities for Idahoans, and is the backbone for an important segment of our state's economy.

Many of the challenges and actions we discuss in the SWAP are consistent with current work of the Western Governors' Association's *Working Lands, Working Communities Initiative* (WGA 2022c). Chaired by Idaho Governor Brad Little (at the time of this writing), federal, state, and local policy makers and stakeholders are examining the interdependent relationships between western communities, state and federal land resource management, and the role that local communities play in successful land planning, conservation, and management processes. Emerging issues, such as wildland fire, invasive species, and changing climate, are being discussed with the objective of developing bipartisan strategies to improve cross-boundary land and natural resource management. Efforts like this underscore the importance and timeliness of needed solutions that effectively address conservation objectives while preserving and even enhancing western economies largely built on land-based livelihoods.

Intended to help guide implementation of conservation in Idaho across jurisdictional boundaries and management authorities, the SWAP establishes important scientific context and recommendations that stakeholders can build upon. The SWAP also respects the diverse social and cultural values and natural resource-based economies that sustain Idaho's communities. Most importantly, the SWAP creates opportunities for all stakeholders to collaborate in proactive, voluntary, and community-oriented partnerships to conserve SWAP species and the lands and waters that support these species and that provide for society's needs. Fostering and incentivizing these partnerships into the future will be necessary to sustain Idaho's SWAP species, natural resource-based economies, and culture and heritage.

Ecological Framework

To orient the user to the geographic and ecological regions of Idaho, we provide a map (Fig. 1) and descriptions for each of the 5 FS ECOMAP provinces (Bailey 1995; Cleland et al. 2007; McNab et al. 2007; FS 2017) in the state:

1) Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province
2) Great Plains–Palouse Dry Steppe Province
3) Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province
4) Intermountain Semidesert Province
5) Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province

ECOMAP is the term used for a FS initiative to map ecological units and encourage their use in ecosystem-based approaches to land conservation and management. The framework systematically divides the country into progressively smaller areas of land and water that have similar physical and biological characteristics and ecological processes. We chose ECOMAP provinces as the organizational framework for SWAP because they provide a scale appropriate for large, connected natural area conservation and can be used as a tier for cross-boundary collaboration. We also use them to provide context for determining where (i.e., in which geographic regions or large areas within the state) key habitats occur and when impacts to species or habitats, or actions to address them, might differ in different regions of the state.

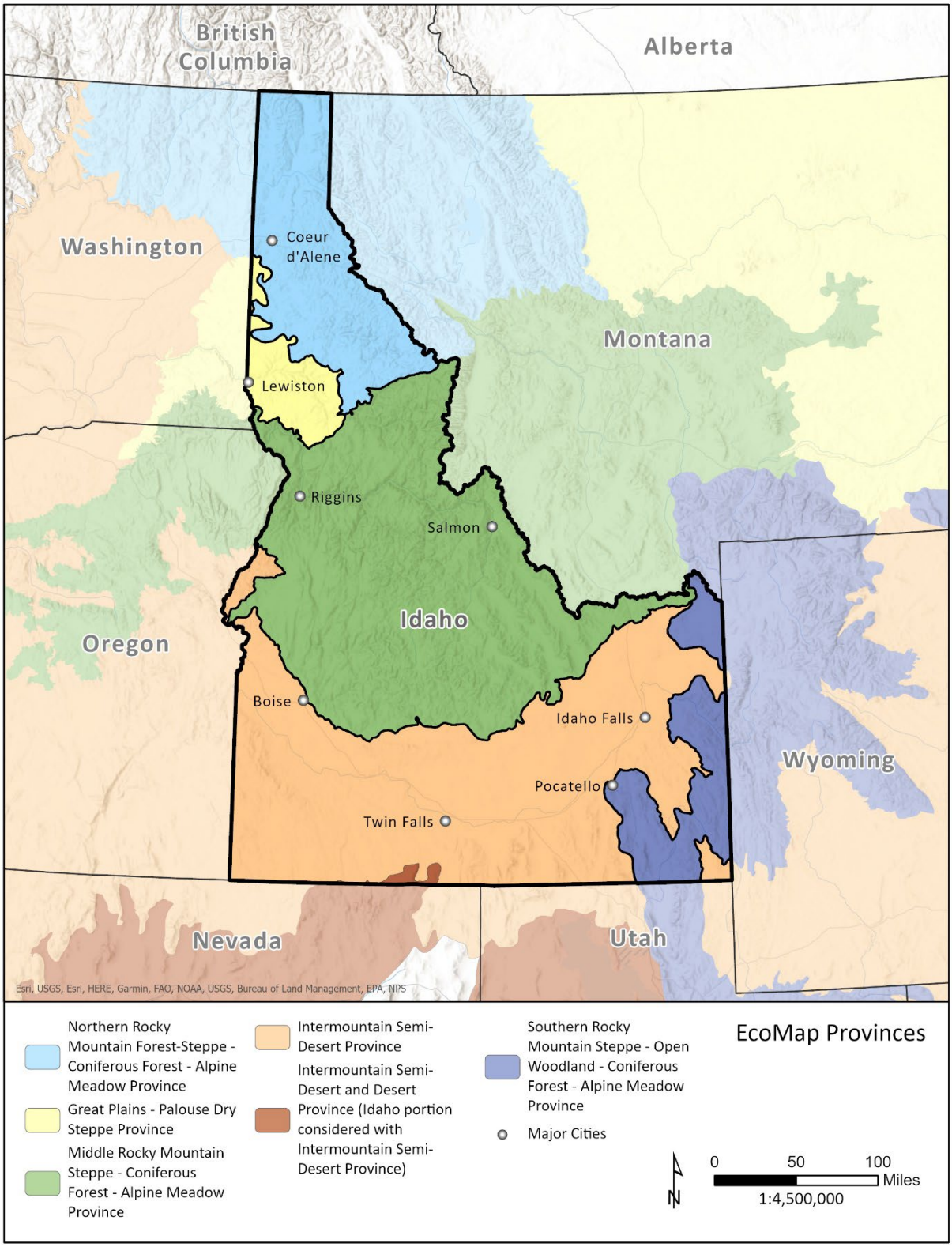


Fig. 1 Map of FS ECOMAP province boundaries in Idaho and adjacent states.

1 Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province

This province has a maritime-influenced cool temperate climate with warm, dry summers and cold, moist winters with heavy snowfall. Snowfields occur near the Canadian border. High-elevation, high-relief mountains are the main landforms. Vegetation is mainly evergreen and deciduous needleleaf forest that varies in composition with altitude and aspect.



Coeur d'Alene Mountains (cc) BY Britta Petersen/IDFG

The dense and diverse forests support a diversity of wildlife including Grizzly Bear, Northern Bog Lemming, Hoary Marmot, Fisher, Moose, and Black Swift. Taxonomic groups and species such as pond-breeding amphibians, lake-nesting birds, low-density forest carnivores, ground-dwelling invertebrates, and pollinators have special conservation needs within this province. In addition, the entire Idaho population of Bloom Peak Douglasia is contained within this province and most of the state's distribution of Water Howellia.

Prominent waterbodies include Priest Lake, Lake Coeur d'Alene, and Lake Pend Oreille—the largest lake in Idaho and the 5th deepest lake in the US. Land and water use includes mining, logging, farming, residential development, roads, and hydroelectricity. With grassland and farmland the predominant habitat types at lower elevations within this province, forested working lands often provide important areas supporting wildlife movements, particularly when connecting mountain ranges.

This region consists predominantly of FS, State (Idaho Department of Lands [IDL]), and private and corporate-owned forested lands, with private agricultural lands at lower elevations. In addition, the sprawling metropolitan area of Coeur d'Alene–Post Falls–Rathdrum, and its associated transportation network, is a major land use that influences plant and animal populations. Timber harvest and the wood products industry is likewise an important land use. Local agriculture (e.g., the production of hops for the beer industry) and cattle ranching also occur. This province is noted for its long and storied mining heritage (primarily for gold, silver,

lead, and zinc), particularly the Coeur d'Alene Mountains and Silver Valley east of Coeur d'Alene where metal extraction continues today. Recreational opportunities within this province include angling, hunting, boating, hiking, camping, horseback riding, wildlife watching, and winter activities such as skiing and snowmobiling. Two of the 5 federally recognized American Indian tribes in Idaho are based in this area: the Coeur d'Alene Tribe (Schitsu'umsh) in Plummer and the Kootenai Tribe of Idaho in Bonners Ferry.

Past fire suppression has resulted in the encroachment of shade-tolerant species and a decrease in fire-tolerant species, alongside increased vertical stand structure, canopy closure, vertical fuel ladders, fire intensity and severity, and insect and disease epidemics, all of which reduce forest resistance and resilience to disturbances and climate change (Hessburg et al. 2019; Hessburg et al. 2022). For example, fire and other disturbances, such as ice, windthrow, rockslides, and landslides, help to maintain Whitebark Pine as the climax species within the upper elevations of the subalpine zone. Across the Idaho Panhandle National Forests (IPNF), nearly 82% of the warm–dry habitat type is at high risk for invasion by invasive weeds (FS 2013). Additionally, human population increases have expanded the wildland urban interface (WUI), which can complicate the use of prescribed fire as a management tool.

Although many forested areas in this province have become overstocked with shade-tolerant species encroaching on historically dominant tree species, not all forested areas have this stand structure. For example, some areas, particularly in the Silver Valley and the Lower Saint Joe River drainage, have been extensively logged. Large clearcuts and continued harvest are changing the ratio of cover to forage for big game species, as well as other species that require forested habitats. Clearcut areas are also increasingly dominated by invasive weeds to the point that habitat value is diminished. Dry hot summers are increasing the mortality of seedlings used to replant harvested areas, which can impact the future habitat suitability of those areas. This is leaving many landscapes in an "either or" scenario of either overstocked forests vulnerable to wildfire with low average tree age and smaller diameter trees, or clearcuts dominated by weeds.

Climate change in northern Idaho may result in increased summer temperatures and drought, and warmer, slightly wetter winters. This will lead to more precipitation falling as rain, and shallower, earlier melting snowpacks. Less snowpack may mean less surface and groundwater being available to sustain wetland hydrology later in summer, resulting in more wetlands drying out earlier in summer. Pollinators may also be heavily impacted in this province by climate change (Halofsky et al. 2018b). Continued monitoring of microclimates along with co-occurrence of cool-air dependent species will provide baseline information for determining best management practices (BMPs). Management that promotes retention of water in wetlands (e.g., North American Beaver translocation) may be needed to mitigate hydrologic changes (see Halofsky et al. 2018a, 2018b; Halofsky et al. 2018c, 2018d). A clear understanding of local climatic landscapes and climatic requirements of wildlife species is the first step toward managing landscapes in such a way to reduce potential climatic stressors on wildlife species.

2 Great Plains–Palouse Dry Steppe Province

This province has a semiarid climate with hot, dry summers and cool, slightly maritime-influenced moist winters. Most of the precipitation occurs in fall, winter, and spring, with winter precipitation falling as snow. Landforms consist of elevated loess-covered basalt plains, plateaus, and river breaks. Soils are generally deep, loamy to silty, and have formed in loess, alluvium, or glacial outwash. Vegetation is predominantly herbaceous with lesser areas of shrublands, forests, riparian, and wetland habitats.

Approximately 40% of this province is arable and has been cultivated due to its deep, highly productive loessial soils. Scattered among the farmland on uncultivated ridges lie patches of some of the last remaining Palouse Prairie grasslands in the world, making it one of the most imperiled habitat types in the US. Palouse Prairie grasslands are characterized by a mixture of perennial bunchgrasses and low shrubs with a particularly high cover and diversity of forbs. They occur mostly on private lands and are home to several grassland-reliant species including the regional endemic Giant Palouse Earthworm, Piper's Milk-vetch, bumble bees, and other native pollinators vital to crop production.



Palouse Prairie grassland remnant on Gormsen Butte, southwestern Latah County, Idaho, with surrounding cropland (cc) BY Janice Hill/IDFG

Below the undulating topography of the Palouse, tributaries to the Clearwater River have cut steep gorges into the plateau. Large expanses of lower montane–foothill grasslands and shrublands grow on the steep slopes along the Palouse, Clearwater, and Snake rivers and other tributary canyons, where soils are generally shallow and well drained, and the climate is warmer and drier. Deciduous shrublands occur on many north-facing canyon slopes. As elevation and distance from riparian areas increases, the habitat transitions into lower montane mixed-conifer forests. Dry forests are dominated by Douglas Fir and Ponderosa Pine while Grand Fir and Western Red Cedar dominate mesic areas. Wetlands and riparian habitats are much more limited in extent, composing less than 3% of the provincial land cover. Depressional and groundwater-dependent wetlands provide important wildlife habitat, such as breeding areas for amphibians. Aquatic riverine and riparian habitats of the Clearwater, Palouse, and Potlatch rivers provide important instream habitat for resident and anadromous fish, freshwater mussels, stream

invertebrates, and plant SGCN, as well as overbank flooding and subsurface connections to wetlands.

The Great Plains–Palouse Dry Steppe Province consists predominantly (82%) of private lands, on which dryland farming is the primary land use. Crops are mainly wheat and legumes. In drier canyonlands, many grasslands are grazed by livestock. Timber harvest is another important land use, with corporate and private timber companies responsible for most of the logging operations. This province is home to the Nez Perce Tribe (Nimiipuu), which is headquartered in Lapwai, Idaho. Population centers within this province include Lewiston and Moscow, and small agricultural communities are dispersed throughout. Outdoor recreational opportunities include hunting, angling, hiking, biking, and wildlife viewing. The largest IDFG wildlife management area (WMA) in Idaho, Craig Mountain WMA, is partially located within this province.

3 Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province

This large province has a maritime-influenced temperate climate with warm, dry summers and cool to cold, moist winters. The maritime influence decreases from west to east with the easternmost portion nonmaritime-influenced and continental. For example, in the eastern half of the province, winters can be relatively dry, and some precipitation also occurs during the summer. Elsewhere, most precipitation occurs during autumn, winter, and spring as snow. Dominant landforms are mountains of moderate to high elevation including alpine. Vegetation is mainly evergreen needleleaf forest that varies in composition with elevation, although lower slopes and plains are dominated by shrubland and herbaceous cover.

Harlequin Duck, Clark's Nutcracker, Fisher, Wolverine, Rocky Mountain Bighorn Sheep, and Rocky Mountain Goat are all examples of SGCN in this region. High mountain lakes are a stronghold for amphibian populations, such as Western Toad, and provide popular recreational fishing opportunities in remote settings. Lakes, ponds, reservoirs, and other aquatic habitats support important wildlife populations including the state's largest nesting colony of Western Grebes on Lake Cascade. Aquatic and wetland habitat is important for most wildlife in arid landscapes and is obligatory for fish, aquatic invertebrates, amphibians, and some mammals. Instream habitat and riparian habitat are usually intrinsically linked in terms of their condition and value as fish and wildlife habitat. Wetlands and riparian habitats tend to have the highest vegetation productivity within the landscape and are key habitat types for foraging herbivores (invertebrates to large ungulates). Finally, the Elusive Polemonium, a plant SGCN, is endemic to this province.

Historically, timber harvest was a main commercial industry, with livestock production also important. A tradition of cattle and sheep ranching exists, and farming and ranching remain major land uses throughout this region. In more recent times, commerce has broadened to tourism and recreation in the region overall. This region provides accessible and popular front country and backcountry opportunities for hunting, angling, trail riding, hiking, wildlife viewing,

and snow and water sports. The Frank Church–River of No Return Wilderness offers the largest roadless area in the continental US for backcountry pursuits. Gold mining has a long legacy in this region, home to historic mining communities such as Warren, Leesburg, and Idaho City. Currently, there is renewed interest in exploration and extraction of gold and other minerals.



Railroad Ridge, White Cloud Peaks, Idaho (cc) BY 2011 Beth Waterbury/IDFG

Important conservation issues in this region include changes in ecological condition and function of forest habitats; water quality of lakes, ponds, and reservoirs; barriers to anadromous salmonid spawning and rearing habitat and migration issues downstream and outside of the region; and changing temperature and precipitation patterns. Habitat condition and pattern have changed due in part to the combined consequences of altered fire regimes and the introduction of invasive species. The once abundant keystone tree species, Whitebark Pine, has declined dramatically from the combination of successional replacement and the nonnative fungal disease White Pine Blister Rust (Tomback et al. 2001). Intensified drought due to increasing temperatures and changing precipitation patterns is increasing the vulnerability of the subalpine–high montane conifer forest by compounding the effects of changing hydrologic regimes, insect and disease outbreaks, and wildfire scope and severity. Snowpack levels are decreasing, and winter temperatures are increasingly milder, creating conditions favorable for pathogen insect survival. More moisture is falling as rain during winter months, changing snowpack and moisture retention within this habitat and in lower elevation habitats whose headwaters lie here. High montane forests, specifically Lodgepole and Whitebark pine ecosystems, are experiencing unprecedented outbreaks of Mountain Pine Beetle, exacerbated by drought and warmer temperatures extending longer into the autumn and winter (Hicke and Latta 2021). The need also exists to determine whether additional stressors may exacerbate the effects of changing temperature and precipitation patterns on SWAP species.

Predicted temperature increases for central Idaho suggest at least a 6-fold increase of area burned by wildfire with each 1.8 °F (1 °C) of temperature increase relative to the median annual area burned for the period 1950 to 2003 (Littell et al. 2009). Dry-forest restoration that develops more open structure consistent with historical disturbance regimes also creates forests more resilient to and compatible with a warmer and drier future (Hessburg et al. 2019; Hessburg et al. 2022). In some areas, increased intensity and frequency of wildfires has

resulted in conversion from shrub-dominated habitats to nonnative annual grasslands, which has reduced habitat value for shrub–steppe obligate species.

4 Intermountain Semidesert Province

This province has a semiarid, cold continental climate with warm to hot, dry summers and cold, dry winters. Climatic regime is one with little or no precipitation during summer or fall. Topography is varied and consists largely of sheets of basalt that form a large plain, to nearly flat and deeply dissected plateaus, to hills, alluvial fans, dunes, canyonlands, and occasional mountain ranges of moderate to high elevations. Vegetation is herbaceous and dwarf to tall shrubland on plains, which changes to shrubland and woodland on higher slopes. Dominant cover types include sagebrush-steppe and shrubland; sparsely vegetated dune scrub and grassland; pinyon–juniper woodland and scrub; chaparral–mountain shrub; freshwater marsh; cliff, scree and badland; rivers; lakes, ponds & reservoirs; caves and subterranean habitats; and Douglas Fir. This province contains some of the most important sagebrush-steppe in Idaho including the highest density of occupied Greater Sage-Grouse leks in the state. In addition, the plant SGCN Christ's Paintbrush is endemic to this province. Although a small portion of the Intermountain Semidesert and Desert Province extends into Idaho (see Fig. 1), for the purpose of SWAP, we include that province in the Intermountain Semidesert Province.

Aquatic and wetland habitats are a limiting resource for many fish and wildlife species in this arid terrain. High-value meadow habitats are primarily located on private land because homesteaders needed reliable water and forage production to make a living on their limited allotments of 160 acres (64.7 ha). Instream and riparian habitat are usually intrinsically linked in terms of their condition and value as fish and wildlife habitat. Wetlands and riparian habitats tend to have the highest vegetation productivity within the landscape and represent key habitat types for foraging herbivores. Dense vegetation cover associated with wetland and riparian habitats are also favorable for many types of wildlife. In addition, high insect densities are associated with these areas of greater primary productivity, and wetland and riparian habitats are essential for many insectivorous animals such as bats and Neotropical migratory birds.

The Intermountain Semidesert Province has the largest human population of any region in Idaho, concentrated in a portion of the province north of the Snake River—the lower Boise and lower Payette River valleys, generally called the Treasure Valley. This area is characterized by urban and suburban development as well as extensive areas devoted to agricultural production of crops for both human and livestock use. Other major population centers within the province include Twin Falls, Pocatello, and Idaho Falls.

The aridity of this region requires water management programs, including water storage, delivery, and regulation for agricultural, commercial, and residential uses. Agricultural fields are irrigated with water mostly supplied by diversion from the Snake, Boise, and Payette rivers. Major hydroelectric reservoirs on the Snake River include CJ Strike, Swan Falls, Lake Walcott, and American Falls Reservoir. Reaches of the Boise and Payette rivers within the province are controlled by upstream dams.



Aged basaltic canyons, Gooding, Idaho (cc) BY 2015 Ross Winton/IDFG

Livestock ranching and farming are major land uses in the province. This industry includes large corporate and small family operations that use a mix of federal, state, and private lands. Mining occurs in isolated locations throughout the province. In addition to private land ownership, the province includes several national wildlife refuges (NWRs) managed by the FWS, public lands administered by the BLM, and state-owned lands administered by IDL. Other major land managers in the province include the 890 mi^2 (2,305 km^2) Idaho National Laboratory (INL), operated by the US Department of Energy (DOE), and the more than 1,172 mi^2 (3,035 km^2) Craters of the Moon National Monument and Preserve (CRMO), cooperatively managed by the National Park Service (NPS) and BLM. Finally, 2 federally-recognized American Indian tribes own lands within the province: the Shoshone–Bannock Tribes of the Fort Hall Reservation, Idaho, and the Shoshone–Paiute Tribes of the Duck Valley Reservation, Nevada.

Among the primary sources of change in this province is the expansion of invasive annual grasses, which alters fire regimes, and leads to the increased frequency and severity of wildfires wherever they are abundant (Remington et al. 2021). In addition, the ongoing conversion of agricultural lands to urban and suburban development limits open space and wildlife habitat values. Further habitat loss is due to the conversion of grazing land used for ranching to development. Accordingly, the maintenance of opportunity for economically viable farming and ranching operations is an important consideration in protecting open space and wildlife habitat in this province.

5 Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province

The climate of this province is modified continental with short, warm summers and long, cold winters. Precipitation is moderate and increases considerably with elevation where much occurs as snow. Compared to other parts of the state, precipitation also occurs more regularly during the summer in this province. Topography is high mountains of steep, little-weathered

slopes. Vegetation includes a mix of shrub-steppe, deciduous forest (mostly Quaking Aspen), and evergreen needleleaf forest that varies in composition with elevation and aspect.

This province includes a major component of the Greater Yellowstone Ecosystem (GYE), one of the largest intact ecosystems remaining in the temperate zones of the world (Keiter and Boyce 1991); terrestrial fauna of the GYE is unique due to its completeness. Unlike nearly any other location in the contiguous US, most species of birds and mammals present in pre-European settlement times are currently present with relatively viable populations (Hansen 2006). Among the superlative wildlife resources of the GYE are one of the largest Elk herds in North America, an iconic Grizzly Bear population, and persistence of regionally rare or at-risk species such as Wolverine, Trumpeter Swan, and Common Loon. Although Trumpeter Swans breed in relatively low numbers in the state, eastern Idaho provides the most important winter habitat for the species in the Rocky Mountain population. This province also contains most of the state's population of the rare plant Winward's Goldenbrush.



View of the Yellowstone Highlands from Warm Butte (cc) BY Terry Thomas/IDFG

Much of the province is dominated by low diversity, Lodgepole Pine forests. Lodgepole Pine provides cover for large animals, such as bears and Elk, but biological diversity in dense, mature lodgepole is low (Lotan and Perry 1983). Fire suppression has also greatly reduced the presence of Quaking Aspen in the forested landscape on the Caribou–Targhee National Forest. Over the past 150 years, there has been an estimated 40% decline in the extent of aspen on the Caribou–Targhee National Forest, primarily due to fire suppression. This is a major decrease in composition from historic ranges of variability (FS 1997). Invasive plants that have a strong propensity to spread into native habitats are a threat to aspen communities and to aspen restoration efforts.

The aridity of this region requires water management programs, including water storage, delivery, and regulation of usage to support agriculture, which is generally irrigated with either flood or sprinkler irrigation mostly supplied by diversion from the Snake and Bear rivers. Livestock grazing, phosphate mining, and recreation are major land uses today with phosphate mining the most important economic activity in southeast Idaho, centered around the town of Soda Springs. In addition, urban areas are expanding in the Bear River Valley and in the foothills near Pocatello. This province provides outdoor recreational opportunities for hunting, angling, trail-riding, hiking, wildlife viewing, kayaking, and river rafting.

Chapter 2 Species & Habitats

Taxonomy & Nomenclature

Within this plan, species are presented in a phylogenetic sequence from phylum to family as currently understood. Arrangement of the classes, orders, and families generally follows the American Fisheries Society's 8th edition of *Common and Scientific Names of Fishes from the United States, Canada, and Mexico* (Page et al. 2023) for fishes, the Society for the Study of Amphibians and Reptiles (Bonett et al. 2017) for amphibians and reptiles, the Mammal Diversity Database of the American Society of Mammalogists (ASM) (Mammal Diversity Database 2023) for mammals (except bats), *Bat Species of the World* (Simmons and Cirranello 2022B) for bats, American Ornithological Society's (AOS) Checklist of North and Middle American Birds (Chesser et al. 2023) for birds, Hitchcock and Cronquist (2018) for vascular plants, and OpenTree et al. (2021) for nonvascular lichens, hornworts, liverworts, and mosses. Invertebrate phylogeny follows Giribet and Edgecombe (2020) for phylum, class, and order, and the Open Tree of Life current synthetic tree (OpenTree et al. 2021) for family. Within families, genera and species are listed alphabetically. Scientific and common names for fishes, amphibians and reptiles, mammals, bats, and birds follow these same taxonomic sources with some exceptions. For example, cutthroat trout (e.g., Yellowstone and Bonneville) classification follows Markle (2018). In addition, we recognize the Northern Idaho Ground Squirrel (*Urocitellus brunneus*) and Southern Idaho Ground Squirrel (*U. endemicus*) as distinct species based on work by Hoisington-Lopez et al. (2012). Because of the complexity of invertebrate taxonomy, we used multiple sources for both scientific and common names, including peer-reviewed literature. Exceptions to this include freshwater mussels (Mollusca: Bivalvia: Unionida), which follow FMCS (2023a), and freshwater gastropods, which follow FMCS (2023b).

Scientific names for plants (vascular plants, mosses, liverworts, hornworts, fungi, and algae) follow Plants of the World Online (POWO 2023) or Tropicos.org (2023). Authors of scientific names for plants are in accordance with relevant contemporary sources (e.g., POWO, Tropicos, etc.) and standard protocols for abbreviation. Common names for vascular plants (pteridophytes, gymnosperms, and angiosperms) follow Hitchcock and Cronquist (2018) or *Intermountain Flora* (9 vols.) (Cronquist et al. 1972; Cronquist et al. 1977, 1984; Cronquist et al. 1989; Cronquist et al. 1994; Cronquist et al. 1997; Holmgren et al. 2005; Holmgren et al. 2012; Holmgren and Holmgren 2017) when given. Otherwise, we used a common name given by one of the following sources: Integrated Taxonomic Information System (ITIS 2023), Flora of North America (FNA 1993+), Global Biodiversity Information Facility (GBIF Secretariat 2023), or NatureServe Explorer (NatureServe 2023). For common names of nonvascular lichens, hornworts, liverworts, and mosses, we used multiple sources including ITIS, GBIF, NatureServe, and others.

Throughout the body of this plan, in lieu of the scientific name of a species, we use the standardized common name employed by an official taxonomic and nomenclatural source when available. We do this because common names are usually more readily adaptable to lay

uses than scientific names, and often more stable. The use of common names, however, presents several problems. For example, the same species may have more than one common name, the same common name may be applied to different species, and many species do not have common names (e.g., many invertebrates, some plants). In most cases, we give a single common name for each species. However, two or more names are occasionally given when general usage so dictates (e.g., many plants).

Although common names of animals and plants are generally written in lowercase, except for proper name components, which are capitalized, that style is not universal. Common names of fishes, amphibians, birds, and reptiles are uppercased by a few professional societies: American Fisheries Society, AOS, and SSAR. They advocate this style to enable readers to readily distinguish between an adjective modifying a common name and the common name itself. For example, does a white-headed woodpecker mean a woodpecker that has a white head or is it the full common name? If uppercased (White-headed Woodpecker), the potential ambiguity is usually avoided. To promote consistency and lessen confusion, and thus avoid the uppercase/lowercase style inconsistency in various taxonomic groups, we have chosen to use uppercase for common names of all animals and plants. Exceptions to this include hybrids (e.g., crack willow) and common names for taxa above the species level (e.g., amphipods, asters), which are not capitalized, as well as the term "steelhead," which is applied to Pacific slope sea-run Rainbow Trout. Both scientific and common names for animals and plants are listed in Appendixes 1, 2, and 3.

Species of Greatest Conservation & Information Need

In the early legislation describing STWG, Congress directed the states to use these funds for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished (H.R. 4818 . . . 2004). Congress further provided that the states consider the broad range of wildlife and associated habitats within their respective jurisdictions, with appropriate priority placed on those species with the greatest conservation need, taking into consideration the relative level of funding available for the conservation of those species.

To identify species for the Idaho SWAP, we interpreted congressional intent to include both species that are experiencing known pressures that without intervention are likely to continue to decline or to become increasingly vulnerable (SGCN), as well as species potentially vulnerable but for which current scientific knowledge and expert understanding are lacking (SGIN). Resolving these knowledge gaps provides us with the information needed to make science-based decisions on the conservation and management of these species. Depending on the source of knowledge uncertainty, examples of actions to address these species could include further taxonomic research to describe the species systematically, field inventories to determine presence and distribution, or ecological studies to understand habitat associations, life history, and stressors.

In setting out to update our 2015 SGCN list, we made the decision to include the following major taxonomic groups: fishes, amphibians, mammals, reptiles, birds, invertebrates, and plants

(including vascular plants and nonvascular lichens, hornworts, liverworts, and mosses). In the context of this plan, the term "species" includes taxonomic species as well as selected subspecies, populations, or other entities below the species level (hereafter species). In 4 cases, we treated multiple species as an assemblage or species group instead of at the individual species level: migratory shorebird assemblage, spur-throat grasshopper genus *Melanoplus* species group, mountainsnail genus *Oreohelix* species group, and harvestman genus *Acuclavella* species group. By grouping such species, we identify conservation actions that focus on the habitats or other attributes applicable to all species in the group.

We then compiled available information on natural history, ecology, habitat requirements, dispersal, and challenges from the literature, subject experts, and other data sources to inform the conservation status assessments. When assessing conservation status, we typically use short-term trend (10 years or 3 generations) because for most species, we do not have long-term trend data. In general, trend was assessed over the past 10 years because we lack a complete understanding of generation times for many species. Species-level trend data is included in the rank calculator forms within the IDFG *Conservation Status Assessments: Rank Calculator*, an internal web application. We also conducted a range review to ensure that range extent reflected the most current information for species. For a list of general sources used in the status assessments, as well as sources for depicting range extent, see the section titled "Data Sources" in the bibliography. Species-specific citations used to assess status are cited in the rank calculator forms referenced above. In addition to compiling formal literature and data sources, both exercises relied on the experiential knowledge and expert judgment of many agency (internal/external) and NGO biologists, academics, and naturalists. We reviewed the conservation status rank for species (following standardized methodology for assigning ranks, i.e., Faber-Langendoen et al. 2012; Master et al. 2012; NatureServe 2020) that had been previously ranked (considering new information), as well as assessed the conservation status for species that had not been previously ranked. In our desire to create a transparent, repeatable, and defensible process for selecting SWAP species (both SGCN and SGIN), we nevertheless acknowledge that any prioritization process is flawed, and that ultimately, priorities are based on evidence and reasoning within multiple systems to arrive at a best judgment.

Process for Selecting SWAP Species

To be considered for the SWAP, species must meet all 4 of the following criteria:

- Origin = **Native**—the species is present in Idaho without direct or indirect human intervention, and is present within its native range and natural dispersal potential

- Regularity = **Regularly occurring**—occurrence of the species is consistent in Idaho (e.g., it may migrate in and out of the state, but it returns on at least an annual basis); species occurs regularly within the state at a manageable level; includes year-round and part-time (seasonal) residents as well as long-distance migrants that regularly occur in the state as transient during migration

- Distribution Confidence = **Confident**—the species was reported and confirmed in Idaho by a reliable source

- Current Presence/Absence = **Present**—species is known to currently exist in Idaho

In addition, SWAP species meet at least one of the following criteria addressing conservation status and trend (risk of local extinction or extirpation):

Criteria[a]	Vertebrates	Invertebrates	Plants
Status under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.)	One of the following status categories: • endangered, threatened, or candidate • under review in the candidate or petition process • a delisted taxon that is "recovered" but still within the 5-year post-delisting monitoring period		
IUCN Red List category	Critically Endangered (CR), Endangered (EN), or Vulnerable (VU)		
Idaho state rank	SX (presumed extirpated species with restoration potential) or SH		
Global (including infraspecific taxon) and subnational (Idaho state rank) conservation status rank	Critically imperiled (G1 or S1), imperiled (G2 or S2), or vulnerable (G3 or S3)	Critically imperiled (G1 or S1) or imperiled (G2 or S2)	Critically imperiled (G1, T1, or S1)
Range extent in Idaho	Species is not peripheral or close to the edge of its distribution in Idaho	Species is endemic to Idaho or the region (i.e., Idaho and 1 or more adjacent states or Canadian provinces)	
Rangewide declines	If widespread, species is known to be declining (>10%) or at-risk over much or all of its range (either long-term [over the past approximately 200 years] or short-term [within past 10 years or 3 generations])		
Overall threat impact	Species with known high or very high threats affecting >30% of the population within a 10-year or 3-generation time frame (whichever is longer)		
Range restricted, narrow habitat specialist, or lacking information	Species with biogeographically restricted distributions or thresholds (e.g., habitat specialist, limited movements, etc.) and lacking information		
Concentration areas	Species occurs regularly on migration at particular staging areas, concentration spots, routes, or particular habitats in which the species might warrant conservation attention		NA

[a] To derive a list of species for which we believed it was realistic to implement conservation actions over the 10-year lifespan of this version of the Idaho SWAP, not all criteria were applied equally to all taxonomic groups.

SWAP species are subsequently classified as either SGCN (species of greatest conservation need) or SGIN (species of greatest information need) based on certainty of knowledge regarding taxonomy, distribution, and ecology such that:

- SGCN are species known to be experiencing declines or are at-risk due to various stressors or emerging issues, and for which reasonable (and testable) hypotheses can be devised concerning the role of these stressors. These species do not have the knowledge uncertainty of SGIN, and face known challenges for which we identify conservation actions (see Chapter 3).

- SGIN are species potentially at-risk but for which current scientific knowledge and expert understanding are lacking. For these species, knowledge uncertainty stems from one or more of the following categories: (1) taxonomic uncertainty (species needs additional work to clarify its taxonomy), (2) distributional uncertainty (lack of basic inventory data on species occurrence and distribution), or (3) ecological uncertainty (population dynamics or trends, effects of natural or human-caused threats and stressors, or specific habitat requirements are unknown) (e.g., Molina and Marcot 2007). These are species we believe meet the SGCN criteria, but we lack adequate data to confirm it; conservation actions for SGIN are to fill these knowledge gaps. For each SGIN, we assigned the primary source of knowledge uncertainty recognizing that for many, additional knowledge gaps exist.

In addition to the above process, species were further evaluated for any additional unique species-specific attributes that would influence our determination that they warrant status as a SWAP species.

We identified 137 SGCN (Table 2.1) and 132 SGIN (Table 2.2). Broken down by major taxonomic group, SGCN include 18 fishes, 4 amphibians, 21 mammals, 2 reptiles, 45 birds, 25 invertebrates, and 22 plants. SGIN include 7 fishes, 4 amphibians, 16 mammals, 4 reptiles, 6 birds, 73 invertebrates, and 22 plants. The list of SGIN includes 4 species groups or assemblages: migratory shorebird assemblage (16 species)[a], harvestman genus *Acuclavella* species group (5 species)[b], spur-throat grasshopper genus *Melanoplus* species group (34 species)[c], and mountainsnail genus *Oreohelix* species group (12 species)[d]. Proportion of each species' distribution in each ecological province was calculated in ArcGIS based on the amount of the

[a] The migratory shorebird assemblage includes the following 16 species: American Golden-Plover, Semipalmated Plover, Marbled Godwit, Stilt Sandpiper, Sanderling, Dunlin, Baird's Sandpiper, Least Sandpiper, Pectoral Sandpiper, Semipalmated Sandpiper, Western Sandpiper, Long-billed Dowitcher, Solitary Sandpiper, Lesser Yellowlegs, Greater Yellowlegs, and Red-necked Phalarope.

[b] The harvestman genus *Acuclavella* species group includes the following 5 species: *Acuclavella cosmetoides*, *A. shoshone*, *A. merickeli*, *A. quattuor*, and *A. sheari*.

[c] The spur-throat grasshopper genus *Melanoplus* species group includes the following 34 species: *Melanoplus aix*, *M. alector*, *M. artemisiae*, *M. baldi*, *M. cinereus*, *M. daemon*, *M. digitifer*, *M. idaho*, *M. illash*, *M. indigens*, *M. ixalus*, *M. latah*, *M. lemhiensis*, *M. lemurus*, *M. lolo*, *M. marshallii*, *M. militaris*, *M. obex*, *M. ohadi*, *M. papoosense*, *M. papyraedus*, *M. payettei*, *M. phobetico*, *M. pyro*, *M. salmonis*, *M. shoshoni*, *M. sol*, *M. stipes*, *M. tendoyense*, *M. tincupense*, *M. trigeminus*, *M. washingtonius*, *M. xenus*, and *M. zeus*.

[d] The mountainsnail genus *Oreohelix* species group includes the following 12 species: Seven Devils Mountainsnail, Lyrate Mountainsnail, Whitepine Mountainsnail, Costate Mountainsnail, Deep Slide Mountainsnail, Boulder Pile Mountainsnail, Deseret Mountainsnail, Rocky Mountainsnail, Subalpine Mountainsnail, Thin-ribbed Mountainsnail, Whorled Mountainsnail, and Lava Rock Mountainsnail.

species' range extent in each province. See section titled "Data Sources: Species Distribution (%) by Ecological Province" in the bibliography for a list of sources used to generate range extent.

To assist the reader in interpreting conservation status ranks below, a list of NatureServe global (rangewide) and subnational (US state or Canadian province level) conservation status definitions can be found at https://help.natureserve.org/biotics/biotics_help.htm#Record_Management/Element_Files/Element_Tracking/ETRACK_Rank.htm.

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 137) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[a]				
Group/taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Fishes								
Pacific Lamprey	G4, S1		50–250	10	14	75	0	0
White Sturgeon	G4, S1		2,500–10,000	7	1	55	37	0
White Sturgeon (Kootenai River distinct population segment [DPS])	G4, T1Q, S1	E	1,000–2,500	100	0	0	0	0
Northern Leatherside Chub	G3, S2		Unknown	0	0	6	85	9
Yellowstone Cutthroat Trout	G5, T4, S3		100,000–1,000,000	0	0	7	70	23
Bonneville Cutthroat Trout	G5, T4, S3		10,000–100,000	0	0	0	33	67
Steelhead (Snake River Basin DPS)	G5, T2T3Q, S2	T	10,000–100,000	4	12	85	0	0
Sockeye Salmon (Snake River ESU)	G5, T1Q, S1	E	1–50	0	2	98	0	0
Chinook Salmon (Snake River fall-run ESU)	G5, T1Q, S1	T	2,500–10,000	1	42	57	0	0
Chinook Salmon (Snake River spring/summer-run ESU)	G5, T1Q, S1	T	2,500–10,000	4	12	85	0	0
Bear Lake Whitefish	G1, S1		100,000–1,000,000	0	0	0	100	0
Bonneville Cisco	G3, S2		>1,000,000	0	0	0	100	0
Bonneville Whitefish	G3, S2		100,000–1,000,000	0	0	0	100	0

[a] Percent distribution of species within Idaho portion of each ecological province.
[b] Combination global (G; rangewide) and subnational (S; state, i.e., Idaho) conservation status rank.
[c] Endangered Species Act (ESA) status codes: E—listed as endangered under ESA; T—listed as threatened under ESA; UR—under review in the candidate or petition process; PT—proposed threatened under ESA; C—candidate taxon, ready for proposal; DM—delisted taxon, recovered, being monitored first 5 years.
[d] Population size categories: Z = zero, no individuals believed extant (i.e., species presumed extinct/extirpated); A = 1–50 individuals; B = 50–250 individuals; C = 250–1,000 individuals; D = 1,000–2,500 individuals; E = 2,500–10,000 individuals; F = 10,000–100,000 individuals; G = 100,000–1,000,000 individuals; H = >1,000,000 individuals; U = Unknown; NA = this category is not included in the assessment calculation for annual plants or invertebrates with population sizes that fluctuate greatly from year to year.
[e] NRM = Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province.
[f] GPP = Great Plains–Palouse Dry Steppe Province.
[g] MRM = Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province.
[h] ISP = Intermountain Semidesert Province.
[i] SRM = Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province.

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 137) by taxonomic group (see Appendixes 1 and 2 for scientific names) (*continued*)

				Species distribution (%) by ecological province[a]				
Group/taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Mountain Whitefish	G5, S3		>1,000,000	15	4	38	36	7
Bull Trout	G5, S3	T	10,000–100,000	25	5	61	9	0
Burbot	G5, S1		10,000–100,000	100	0	0	0	0
Bear Lake Sculpin	G3, S2		>1,000,000	0	0	0	100	0
Wood River Sculpin	G2, S2		>1,000,000	0	0	45	55	0
Amphibians								
Western Toad	G4, S3		Unknown	14	4	39	36	7
Woodhouse's Toad	G5, S2		Unknown	0	2	5	90	3
Northern Leopard Frog	G5, S2		Unknown	0	0	8	72	20
Columbia Spotted Frog (Great Basin population)	G4, T2T4Q, S2		Unknown	0	0	0	100	0
Mammals								
Pygmy Rabbit	G4, S3		100,000–1,000,000	0	0	24	71	5
American Pika	G5, S3		10,000–100,000	19	3	55	14	8
Northern Idaho Ground Squirrel	G2, S2	T	2,500–10,000	0	0	86	14	0
Southern Idaho Ground Squirrel	G2, S2		2,500–10,000	0	0	55	45	0
Western Small-footed Myotis	G5, S3		Unknown	7	4	27	52	10
Little Brown Myotis	G3, S3	UR	Unknown	14	4	38	38	7
Yuma Myotis	G5, S3		10,000–100,000	14	4	38	38	7
Hoary Bat	G3G4, S3		Unknown	14	4	38	38	7
Silver-haired Bat	G3G4, S3		Unknown	14	4	38	38	7
Townsend's Big-eared Bat	G4, S3		2,500–10,000	14	4	38	38	7
Wolverine	G4, S1	T	50–250	19	<1	70	2	9
Fisher	G5, S3		Unknown	53	3	44	0	0
Grizzly Bear (Greater Yellowstone Ecosystem population)	G4, TNRQ, S3	T	50–250	0	0	13	26	61
Grizzly Bear (Selkirk–Cabinet population)	G4, TNRQ, S3	T	50–250	100	0	0	0	0
Canada Lynx (Purcell Mountains)	G5, S1	T	Unknown	100	0	0	0	0
Pronghorn	G5, S3		10,000–100,000	0	0	30	68	2
Rocky Mountain Goat	G5, S3		1,000–2,500	16	<1	81	0	2
California Bighorn Sheep	G4, T2, S1		250–1,000	0	0	0	100	0
Rocky Mountain Bighorn Sheep	G4, T4, S2		2,500–10,000	0	3	93	1	2
Moose	G5, T5, S3		2,500–10,000	18	3	46	23	9
Caribou	G5, SX	E	zero, no individuals believed extant	100	0	0	0	0
Reptiles								

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 137) by taxonomic group (see Appendixes 1 and 2 for scientific names) (*continued*)

				Species distribution (%) by ecological province[a]				
Group/taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Great Basin Collared Lizard	G5, S1		Unknown	0	0	1	99	0
Common Gartersnake	G5, S3		Unknown	14	4	39	36	7
Birds								
Trumpeter Swan	G4, S1B, S4N		50–250	0B, 15N	0B, 5N	8B, 21N	54B, 48N	38B, 11N
Cinnamon Teal	G5, S3B		2,500–10,000	12	4	32	45	8
Northern Pintail	G5, S3B, S3N		2,500–10,000	14B, 14N	4B, 4N	38B, 38N	38B, 38N	7B, 7N
Harlequin Duck	G4, S1B		50–250	44	1	54	0	1
Mountain Quail	G5, S2		Unknown	5	19	59	17	0
Greater Sage-Grouse	G3G4, S2		10,000–100,000	0	0	26	71	2
Sharp-tailed Grouse	G5, S3		10,000–100,000	0	0	9	68	23
Eared Grebe	G5, S3B, S3N		1,000–2,500	0B,9N	0B,7N	7B,17N	79B,60N	14B,8N
Western Grebe	G5, S2B		2,500–10,000	24	3	12	54	7
Clark's Grebe	G5, S2B		250–1,000	0	0	9	86	5
Yellow-billed Cuckoo	G5, S1B	T	1–50	0	0	0	85	15
Common Nighthawk	G5, S3B		100,000–1,000,000	13	4	36	40	7
Black Swift	G4, S2B		1,000–2,500	80	<1	19	0	0
Sandhill Crane	G5, S3B		1,000–2,500	5	3	42	42	8
Long-billed Curlew	G5, S2B		2,500–10,000	<1	2	17	76	5
Franklin's Gull	G5, S2B		10,000–100,000	0	0	4	71	25
Ring-billed Gull	G5, S3B, S5N		2,500–10,000	0B, 13N	0B, 5N	14B, 21N	70B, 51N	16B, 10N
California Gull	G5, S2B, S5N		10,000–100,000	0B, 11N	0B, 6N	7B, 17N	77B, 57N	16B, 9N
Caspian Tern	G5, S1B		50–250	0	0	7	83	10
Black Tern	G4G5, S1B		50–250	27	1	9	49	15
Common Loon	G5, S1B, S2N		1–50	100B, 15N	0B, 4N	0B, 23N	0B, 47N	0B, 11N
American Bittern	G5, S1B		2,500–10,000	2	2	6	89	1
White-faced Ibis	G5, S3B		10,000–100,000	0	0	5	74	21
Golden Eagle	G5, S3		1,000–2,500	11	4	38	40	6
Ferruginous Hawk	G4, S3B		250–1,000	0	2	14	77	7
Burrowing Owl	G4, S2B		2,500–10,000	0	0	7	91	2
Great Gray Owl	G5, S3		Unknown	17	5	48	21	9
Short-eared Owl	G5, S3		2,500–10,000	1	5	17	71	5
Lewis's Woodpecker	G4, S3B		2,500–10,000	10	3	46	34	7
White-headed Woodpecker	G4, S2		250–1,000	<1	7	90	3	0

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 137) by taxonomic group (see Appendixes 1 and 2 for scientific names) (*continued*)

				Species distribution (%) by ecological province[a]				
Group/taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Olive-sided Flycatcher	G4, S3B		10,000–100,000	22	2	56	10	9
Loggerhead Shrike	G4, S3		10,000–100,000	<1	2	16	76	5
Canada Jay	G5, S3		10,000–100,000	27	2	59	3	9
Pinyon Jay	G3, S2	UR	1,000–2,500	0	0	0	75	25
Clark's Nutcracker	G5, S3		10,000–100,000	18	1	57	14	10
Sage Thrasher	G4, S3B		100,000–1,000,000	0	0	24	68	8
Gray-crowned Rosy-Finch	G5, S3		2,500–10,000	11	3	52	28	6
Black Rosy-Finch	G4, S2		2,500–10,000	0	0	60	25	15
Cassin's Finch	G5, S3		100,000–1,000,000	14	4	38	38	7
Cassia Crossbill	G1, S1		2,500–10,000	0	0	0	100	0
Grasshopper Sparrow	G5, S3B		100,000–1,000,000	1	7	14	70	8
Brewer's Sparrow	G5, S3B		>1,000,000	<1	4	40	47	9
Sagebrush Sparrow	G5, S2B		10,000–100,000	0	<1	22	72	6
Bobolink	G5, S2B		2,500–10,000	7	2	8	78	6
Wilson's Warbler	G5, S3B		100,000–1,000,000	19	5	50	17	9
Invertebrates								
Snake River Pilose Crayfish	G3G4, S2		10,000–100,000	0	0	0	98	2
Pilose Crayfish	G4G5, S2		10,000–100,000	0	0	0	65	35
Raptor Fairy Shrimp	G1, S1		NA	0	0	0	100	0
Idaho Point-headed Grasshopper	G2, S1S2		NA	0	0	85	15	0
Yellow Bumble Bee	G3G4, S3		NA	8	4	38	42	8
Morrison Bumble Bee	G3, S2		NA	0	0	10	86	4
Western Bumble Bee	G3, S2	UR	NA	22	6	56	9	7
Suckley Cuckoo Bumble Bee	G2G3, S1	UR	NA	14	4	39	35	7
Monarch Butterfly	G4, S2	C	NA	11	4	39	39	7
Gillette's Checkerspot	G3, S2S3		NA	27	8	39	22	4
Idaho Dunes Tiger Beetle	G2, S2		NA	0	0	<1	87	13
Columbia River Tiger Beetle	G2, S1		NA	0	10	90	0	0
Bruneau Dune Tiger Beetle	G1, S1		NA	0	0	0	100	0
Western Ridged Mussel	G3, S3	UR	NA	1	6	35	58	<1
Western Pearlshell	G5, S2		NA	18	3	43	27	8
Shortface Lanx	G2, S2		NA	0	5	39	56	0
Banbury Springs Limpet	G1, S1	E	2,500–10,000	0	0	0	100	0
Shortspire Pondsnail	G1, S1		NA	0	6	94	0	0

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 137) by taxonomic group (see Appendixes 1 and 2 for scientific names) (*continued*)

				Species distribution (%) by ecological province[a]				
Group/taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Snake River Physa	G1, S1	E	NA	0	0	0	100	0
Desert Valvata	G2, S2		NA	0	0	0	88	12
Bliss Rapids Snail	G1, S1	T	NA	0	0	0	100	0
Bruneau Hot Springsnail	G1, S1	E	NA	0	0	0	100	0
Nimapuna Disc	G1, S1S3		NA	14	17	69	0	0
Marbled Disc	G1, S1		NA	0	0	100	0	0
Mission Creek Oregonian	G1, S1		NA	10	32	57	0	0
Plants								
Idaho Xanthoparmelia Lichen	G1, S1		Unknown	0	0	100	0	0
xanthoparmelia lichen (*Xanthoparmelia norchlorochroa*)	G1G2, S2		Unknown	0	0	53	47	<1
liverwort (*Sphaerocarpos hians*)	G1, S1		Unknown	12	88	0	0	0
Whitebark Pine	G3G4, S3	T	Unknown	20	3	54	18	6
Packard's Milk-vetch	G1, S1		Unknown	0	0	8	92	0
Asotin Milk-vetch	G1, S1		Unknown	0	0	100	0	0
Piper's Milk-vetch	G1G2, S1		50–250	28	64	8	0	0
rockcress (*Boechera rollinsiorum*)	G1, S1		Unknown	0	0	55	45	0
Slickspot Peppergrass	G2, S2	T	Unknown	0	0	19	71	10
Robinson's Starwort	G1G2, SNR		Unknown	95	5	0	0	0
Spalding's Catchfly	G2, S1S2	T	2,500–10,000	9	19	71	1	0
Pahove Sandverbena	G4T1T2, S1S2		Unknown	0	0	9	91	0
Macfarlane's Four-o'clock	G2, S1	T	2,500–10,000	6	8	86	0	0
Clearwater Phlox	G1, S1		10,000–100,000	23	10	66	0	0
Elusive Polemonium	G1, S1		Unknown	0	0	100	0	0
Bloom Peak Douglasia	G1, S1		Unknown	100	0	0	0	0
Leslie Gulch Monardella	G1, S1		250–2,500	0	0	0	100	0
Christ's Paintbrush	G1, S1		Unknown	0	0	0	100	0
Water Howellia	G3, S1	DM	1,000–10,000	76	24	<1	0	0
Winward's Goldenbrush	G1, S1		2,500–10,000	0	0	0	33	67
Ute Ladies-tresses	G2G3, S1	T	2,500–10,000	0	0	1	61	38
Indian Valley Sedge	G1, S1		1,000–2,500	0	0	57	43	0

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 132) by taxonomic group (see Appendixes 1 and 2 for scientific names); primary knowledge uncertainty (taxonomic = T, distributional = D, or ecological = E) is noted in parentheses

				Species distribution (%) by ecological province[a]				
Group/Taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Fishes								
Lake Chub (D)	G5, S3		Unknown	100	0	0	0	0
Leopard Dace (E)	G4, S3		10,000–100,000	0	1	63	36	0
Green Sucker (E)	GNR, S3		2,500–10,000	0	0	1	66	33
Pygmy Whitefish (E)	G5, S3		100,000–1,000,000	100	0	0	0	0
Slimy Sculpin (E)	G5, S3		Unknown	87	0	13	0	0
Shoshone Sculpin (D)	G2, S2		10,000–100,000	0	0	0	100	0
Cedar Sculpin (E)	G3G4, S3		10,000–100,000	98	2	0	0	0
Amphibians								
Rocky Mountain Tailed Frog (E)	G4, S3		10,000–100,000	37	2	59	2	0
Great Basin Spadefoot (E)	G5, S3		Unknown	<1	3	21	74	3
Idaho Giant Salamander (E)	G3G4, S3		10,000–100,000	45	4	51	0	0
Coeur d'Alene Salamander (E)	G4, S3		Unknown	77	5	18	0	0
Mammals								
Hoary Marmot (E)	G5, S1		Unknown	54	2	44	<1	0
Merriam's Ground Squirrel (E)	G4, S1		1–1,000	0	0	0	100	0
Wyoming Ground Squirrel (ssp. *nevadensis*) (E)	G5, T4, S2		Unknown	0	0	0	100	0
Dark Kangaroo Mouse (D)	G4, S1		Unknown	0	0	0	100	0
Northern Bog Lemming (D)	G5, S2	UR	1,000–100,000	100	0	0	0	0
Dwarf Shrew (D)	G4, S2		Unknown	0	0	75	12	13
Long-eared Myotis (E)	G5, S3		Unknown	14	4	38	38	7
Fringed Myotis (D)	G4, S3		Unknown	21	6	45	25	2
Long-legged Myotis (E)	G4G5, S3		Unknown	14	4	38	38	7

[a] Percent distribution of species within Idaho portion of each ecological province.
[b] Combination global (G; rangewide) and subnational (S; state, i.e., Idaho) conservation status rank.
[c] Endangered Species Act (ESA) status codes: E—listed as endangered under ESA; T—listed as threatened under ESA; UR—under review in the candidate or petition process; PT—proposed threatened under ESA; C—candidate taxon, ready for proposal; DM—delisted taxon, recovered, being monitored first 5 years.
[d] Population size categories: Z = zero, no individuals believed extant (i.e., species presumed extinct/extirpated); A = 1–50 individuals; B = 50–250 individuals; C = 250–1,000 individuals; D = 1,000–2,500 individuals; E = 2,500–10,000 individuals; F = 10,000–100,000 individuals; G = 100,000–1,000,000 individuals; H = >1,000,000 individuals; U = Unknown; NA = this category is not included in the assessment calculation for annual plants or invertebrates with population sizes that fluctuate greatly from year to year.
[e] NRM = Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province.
[f] GPP = Great Plains–Palouse Dry Steppe Province.
[g] MRM = Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province.
[h] ISP = Intermountain Semidesert Province.
[i] SRM = Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province.

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 132) by taxonomic group (see Appendixes 1 and 2 for scientific names); primary knowledge uncertainty (taxonomic = T, distributional = D, or ecological = E) is noted in parentheses (*continued*)

				Species distribution (%) by ecological province[a]				
Group/Taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Canyon Bat (E)	G5, S3		Unknown	6	6	19	65	4
Pallid Bat (E)	G4, S3		Unknown	9	7	16	64	4
Big Brown Bat (E)	G5, S3		Unknown	14	4	38	38	7
Spotted Bat (E)	G4, S3		Unknown	0	<1	26	73	1
Western Spotted Skunk (E)	G5, S3		Unknown	9	4	40	40	7
American Marten (E)	G5, S3		2,500–10,000	100	0	0	0	0
Kit Fox (D)	G4, S2		250–1,000	0	<1	18	71	11
Reptiles								
Northern Alligator Lizard (D)	G5, S3		Unknown	71	7	22	0	0
Pygmy Short-horned Lizard (E)	G5, S3		Unknown	2	2	21	74	1
Desert Horned Lizard (E)	G5, S3		Unknown	0	0	2	98	0
Western Groundsnake (D)	G5, S3		Unknown	3	0	10	87	0
Birds								
Spruce Grouse (E)	G5, S3		10,000–100,000	24	5	64	5	2
Migratory shorebird assemblage (E)	GNR, SNR[j]		Unknown	12	6	24	52	6
American White Pelican (E)	G4, S3B		2,500–10,000	6	2	5	78	9
Boreal Owl (E)	G5, S1		1–50	20	5	56	9	10
American Pipit (E)	G5, S3B		2,500–10,000	32	<1	62	3	2
Evening Grosbeak (E)	G5, S4		100,000–1,000,000	16	4	42	30	8
Invertebrates								
A cave obligate mite (*Flabellorhagidia pecki*) (D)	G1G2, S1		NA	0	0	35	65	0
Harvestman genus *Acuclavella* species group (D)	GNR, SNR[j]		NA	53	6	41	0	0
A cave obligate harvestman (*Speleomaster lexi*) (D)	G1G2, S1		NA	0	0	0	100	0
A cave obligate harvestman (*Speleomaster pecki*) (D)	G1G2, S1		NA	0	0	5	95	0
Idaho Lava Tube Millipede (D)	G1G2, S1		NA	0	0	9	91	0
Idaho Amphipod (D)	G1, S1		NA	0	0	100	0	0
Constricted Fairy Shrimp (D)	G1, S1		NA	0	0	7	93	0
Lolo Mayfly (E)	G3, S1?		NA	14	<1	86	0	0
A mayfly (*Paraleptophlebia jenseni*) (D)	G2G4, SH		NA	0	0	0	100	0
A mayfly (*Paraleptophlebia traverae*) (D)	GH, SH		NA	0	88	12	0	0

[j] Species groups represent all species within that genus or assemblage in need of similar actions. Group-level conservation ranks are not appropriate, instead the user is referred to the individual species ranks.

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 132) by taxonomic group (see Appendixes 1 and 2 for scientific names); primary knowledge uncertainty (taxonomic = T, distributional = D, or ecological = E) is noted in parentheses (*continued*)

				Species distribution (%) by ecological province[a]				
Group/Taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Columbia Primitive Minnow Mayfly (D)	G2, SH		NA	43	20	16	15	6
A mayfly (*Ameletus tolae*) (D)	G1G2, SH		NA	100	0	0	0	0
A grasshopper (*Argiacris amissuli*) (D)	G1G3, SH		NA	0	0	100	0	0
A grasshopper (*Argiacris keithi*) (D)	GH, SH		NA	0	0	100	0	0
A grasshopper (*Argiacris militaris*) (D)	G3G4, SH		NA	0	0	88	12	0
A grasshopper (*Barracris petraea*) (D)	G3?, SH		NA	0	0	100	0	0
Spur-throat grasshopper genus *Melanoplus* species group (E)	GNR, SNR[j]		NA	23	2	47	27	2
Tiny Forestfly (D)	G3, S1S2		NA	0	6	34	60	0
Idaho Forestfly (D)	G2, S1		NA	43	25	32	0	0
Umatilla Willowfly (D)	G3, S1		NA	28	72	0	0	0
Straight Snowfly (D)	G2, S1		NA	53	47	0	0	0
Idaho Snowfly (D)	G1, S1		NA	56	44	0	0	0
Duckhead Snowfly (D)	G1, S1		NA	0	0	12	88	0
Palouse Snowfly (D)	G3, SH		NA	52	48	0	0	0
Boise Snowfly (D)	G3, S1		NA	0	0	17	83	0
Cascades Needlefly (D)	G3, SH		NA	61	25	14	0	0
Clearwater Roachfly (D)	G2, S1		NA	100	0	0	0	0
Utah Sallfly (D)	G3, SH		NA	0	0	0	24	76
Lolo Sallfly (D)	G2, SH		NA	0	0	99	1	0
A yellow-masked bee (*Hylaeus lunicraterius*) (D)	GNR, SH		NA	0	0	12	88	0
High Country Bumble Bee (D)	G3G5, S2		NA	0	0	100	0	0
A miner bee (*Calliopsis barri*) (D)	GNR, S1		NA	0	0	<1	99	1
A miner bee (*Perdita barri*) (D)	GNR, SH		NA	0	0	12	88	1
A miner bee (*Perdita wyomingensis sculleni*) (D)	GNR, TNR, SH		NA	0	0	75	25	0
A leafcutting bee (*Ashmeadiella sculleni*) (D)	GNR, S1?		NA	0	0	0	100	0
Rocky Mountain Parnassian (E)	G5, S2S3		NA	16	5	46	25	9
Beartooth Copper (E)	G5, T3T5, S1		NA	0	0	94	6	0
A moth (*Protogygia arena*) (D)	GNR, S1		NA	0	0	0	100	0
A flower moth (*Schinia edwardsii*) (D)	GNR, S1		NA	0	0	100	0	0
Wiest's Primrose Sphinx (D)	G3, SH		NA	0	0	0	100	0
A caddisfly (*Glossosoma idaho*) (D)	G2G3, SH		NA	0	0	0	77	23

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 132) by taxonomic group (see Appendixes 1 and 2 for scientific names); primary knowledge uncertainty (taxonomic = T, distributional = D, or ecological = E) is noted in parentheses (*continued*)

				Species distribution (%) by ecological province[a]				
Group/Taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
A caddisfly (*Rhyacophila oreia*) (D)	G2, S1S2		NA	5	6	87	1	1
A caddisfly (*Rhyacophila robusta*) (D)	G2G3, SH		NA	50	0	50	0	0
A caddisfly (*Goereilla baumanni*) (D)	G1, SH		NA	59	0	41	0	0
A caddisfly (*Manophylax annulatus*) (D)	G1G3, SH		NA	16	0	84	0	0
A caddisfly (*Apatania barri*) (D)	GU, SH		NA	0	0	100	0	0
A caddisfly (*Arctopora salmon*) (D)	G3, SH		NA	0	0	100	0	0
A caddisfly (*Homophylax auricularis*) (D)	G1G3, SH		NA	0	0	66	34	0
A caddisfly (*Limnephilus challisa*) (D)	G1G2, SH		NA	0	0	100	0	0
A caddisfly (*Philocasca banksi*) (D)	G1G3, SH		NA	100	0	0	0	0
A caddisfly (*Psychoglypha smithi*) (D)	G1G3, SH		NA	0	0	100	0	0
An ant-like flower beetle (*Amblyderus owyhee*) (D)	GNR, SH		NA	0	0	0	85	15
A metallic wood-boring beetle (*Chrysobothris horningi*) (D)	GNR, SH		NA	0	0	24	76	0
A metallic wood-boring beetle (*Chrysobothris idahoensis*) (T)	GNR, SH		NA	0	0	24	76	0
A click beetle (*Beckerus barri*) (D)	GNR, SH		NA	21	0	79	0	0
Lined June Beetle (D)	GNR, S1S2		NA	0	0	18	82	0
Blind Cave Leiodid Beetle (E)	G1G3, S1		NA	0	0	4	95	1
A tiger beetle (*Cicindela decemnotata montevolans*) (D)	G4G5, TNR, S1S2		NA	0	0	0	27	73
A skiff beetle (*Hydroscapha redfordi*) (E)	GNR, S1		NA	13	0	87	0	0
Salmon River Pebblesnail (D)	G2G3, S1S2		NA	0	51	49	0	0
Pixie Pebblesnail (D)	GH, SH		NA	0	0	100	0	0
Unexpected Pebblesnail (D)	G1, S1		NA	0	0	6	94	0
Bear Lake Springsnail (E)	G2, S1		NA	0	0	0	33	67
Skade's Jumping-slug (D)	GNR, S1		NA	100	0	0	0	0
Blue-gray Taildropper (D)	G3G4, S1		NA	92	8	0	0	0
Papillose Taildropper (D)	G4, S1		NA	100	0	0	0	0
Rocky Mountain Axetail (D)	GNR, S1		NA	90	10	0	0	0
Mountainsnail genus *Oreohelix* species group (T)	GNR, SNR[j]		NA	4	7	58	16	16
Selway Forestsnail (D)	G1G2, S1S2		NA	6	6	88	0	0
Salmon Oregonian (D)	G3G4, S1		NA	6	<1	94	0	0
Columbia Oregonian (T)	G3Q, S1		NA	23	0	47	30	0
Cottonwood Oregonian (D)	G2, S1		NA	0	29	71	0	0

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 132) by taxonomic group (see Appendixes 1 and 2 for scientific names); primary knowledge uncertainty (taxonomic = T, distributional = D, or ecological = E) is noted in parentheses (*continued*)

				Species distribution (%) by ecological province[a]				
Group/Taxon	**Conservation status rank[b]**	**ESA status[c]**	**Pop. size[d]**	**NRM[e]**	**GPP[f]**	**MRM[g]**	**ISP[h]**	**SRM[i]**
Giant Palouse Earthworm (D)	G1, S1		NA	14	86	0	0	0
Plants								
liverwort (*Ptilidium ciliare*) (D)	G5, SH		Unknown	74	26	0	0	0
orthotrichum moss (*Orthotrichum pulchellum*) (D)	G4, SH		Unknown	6	8	86	0	0
Beautiful Bryum Moss (D)	G3, SH		Unknown	0	0	100	0	0
dendroalsia moss (*Dendroalsia abietina*) (D)	G4, SH		Unknown	100	0	0	0	0
Midget Quillwort (D)	G1G2, S1		50–250	<1	<1	73	27	0
Slender Moonwort (D)	G2?, SH		zero, no individuals believed extant	100	0	0	0	0
Idaho Stonecrop (D)	G1G2, S1S2		Unknown	4	6	90	0	0
Bodin's Milk-vetch (D)	G4, SH		Unknown	0	0	100	0	0
Least Bladdery Milk-vetch (D)	G5, SH		Unknown	97	3	<1	0	<1
Christ's Elk-Season Lupine (T)	G5T1?, SNR		Unknown	82	18	0	0	0
Northwestern Yellow Hard Flax (D)	G5, SH		Unknown	57	36	7	0	0
Hillman's Stinkweed (D)	G4G5, T1, SNR		1,000–10,000	0	0	100	0	0
Woolly Stanleya (var. *runcinata*) (T)	G4, T1, S1		Unknown	0	0	100	0	0
Kelsey's Phlox (subsp. *glandulosa*) (T)	G4, T1T3Q, SNR		Unknown	0	0	0	46	54
Mountain Blue-curls (D)	G5, SH		Unknown	74	26	0	0	0
Disappearing Monkey-flower (D)	G3, SH		Unknown	0	0	14	86	0
Nez Perce Monkey-flower (T)	G1, S1		Unknown	54	41	5	0	0
Katie's Daisy (D)	G1G2, S1		Unknown	0	0	0	83	17
Spokane False Goldenaster (T)	G1?, SH		zero, no individuals believed extant	93	7	0	0	0
Nevada Goldenrod (D)	G4, SH		Unknown	0	0	0	100	0
Swinger's Biscuit-root (D)	G1, S1		Unknown	6	8	86	0	0
Brunsfeld's Biscuit-root (D)	G1, S1		Unknown	33	10	56	1	0

Habitats

In this section, we provide descriptions for 39 key or priority habitats and community types (terrestrial, aquatic, and subterranean) essential to the conservation of SWAP species, including their extent and condition. Key habitats were identified and prioritized for actions (see Chapter 3) based on the estimated effectiveness and feasibility to address challenge-specific stressors likely to affect SGCN during the next 10 years. We use the term "habitat" here in its truest sense; that is, generally taken to embody both species assemblages and their interactions with the vegetation and geophysical environment. We provide habitat relationships for each SGCN and SGIN and indicate whether the species is considered obligate, near-obligate, dependent, or associated with one or more habitats (Appendix 5). With some exceptions, terrestrial habitats are organized hierarchically following the US National Vegetation Classification (USNVC 2022). The common language provided by this standard supports wildlife conservation (e.g., modeling and mapping wildlife habitat, patterns of vegetation change over time, managing invasive species). Using such a classification likewise facilitates interagency cooperation on vegetation management issues that transcend jurisdictional boundaries and encourages stakeholders and partners to use and contribute to a common system when working together.

As a surrogate for relative condition, we assessed the conservation status of each key habitat using a suite of factors designed to assess elimination or extirpation risk (Master et al. 2012). Conservation status is summarized as a series of ranks (S-rank at the subnational or state level) from most imperiled to secure. We used standardized methodology developed by NatureServe, which can be used for both species and ecosystems (ecological communities and systems) and is used by the NatureServe network of natural heritage programs and conservation data centers across North America (Faber-Langendoen et al. 2012; Master et al. 2012). Resulting S-ranks are given for each key habitat in the individual descriptions below. A list of NatureServe global (rangewide) and subnational (US state or Canadian province level) conservation status definitions can be found at https://help.natureserve.org/biotics/biotics_help.htm#Record_Management/Element_Files/Element_Tracking/ETRACK_Rank.htm.

In this plan, aquatic habitat types follow the Strahler order for rivers and streams as described in the *National Rivers and Streams Assessment 2013–2014* (EPA 2020); however, we also include intermittent small streams (1st, 2nd order), which had been excluded from the 2013–2014 sample frame. Nonflowing waterbodies (i.e., lakes, ponds, and reservoirs) are classified based on the National Lakes Assessment 2017 (EPA 2017). Although formally classified by USNVC as aquatic vegetation (i.e., open water with rooted or floating herbaceous aquatic vegetation), we treated the USNVC macrogroup "Western North American Freshwater Aquatic Vegetation" ("Aquatic Vegetation") as an aquatic habitat in SWAP. Finally, we followed the IUCN *Habitats Classification Scheme* (IUCN 2022) for the SWAP habitat "Caves & Subterranean Habitats."

We created maps depicting the distribution of habitats from a variety of data sources deemed most appropriate. Data sources included land cover (USGS 2016; LANDFIRE 2016),

hydrography flowlines, waterbodies, and points (EPA and USGS 2012), the National Wetlands Inventory (NWI) (FWS 2017), vegetation plots and transects (IDFG unpublished data), soils (NRCS 2016), springs (DEQ 2010; IDWR 2022a), water right points of diversion (IDWR 2022d), conservation sites (IDFG 2017a), and Geographic Names Information System (GNIS) feature classes (e.g., spring points) (BGN 2008).

Forest & Woodland

These habitats are dominated by broadleaf deciduous and needleleaf coniferous trees having at least 10% canopy cover. Canopy height and cover varies with tree age, disturbance history (e.g., fire, flooding), and local environmental conditions (e.g., elevation, soils, temperature, precipitation, snow accumulation, drainage). Habitats range from subalpine and montane uplands to riparian zones. Forests typically have tree crowns that touch (closed canopy) or nearly touch, while woodlands have open canopies. The understory varies depending on tree shading, moisture, and disturbance. It can be dominated by variable-height shrubs and reproducing trees or a diverse layer of herbaceous species. Except in canopy gaps, stands with high tree canopy cover can have relatively sparsely vegetated or mossy understories.

Dry Lower Montane–Foothill Forest



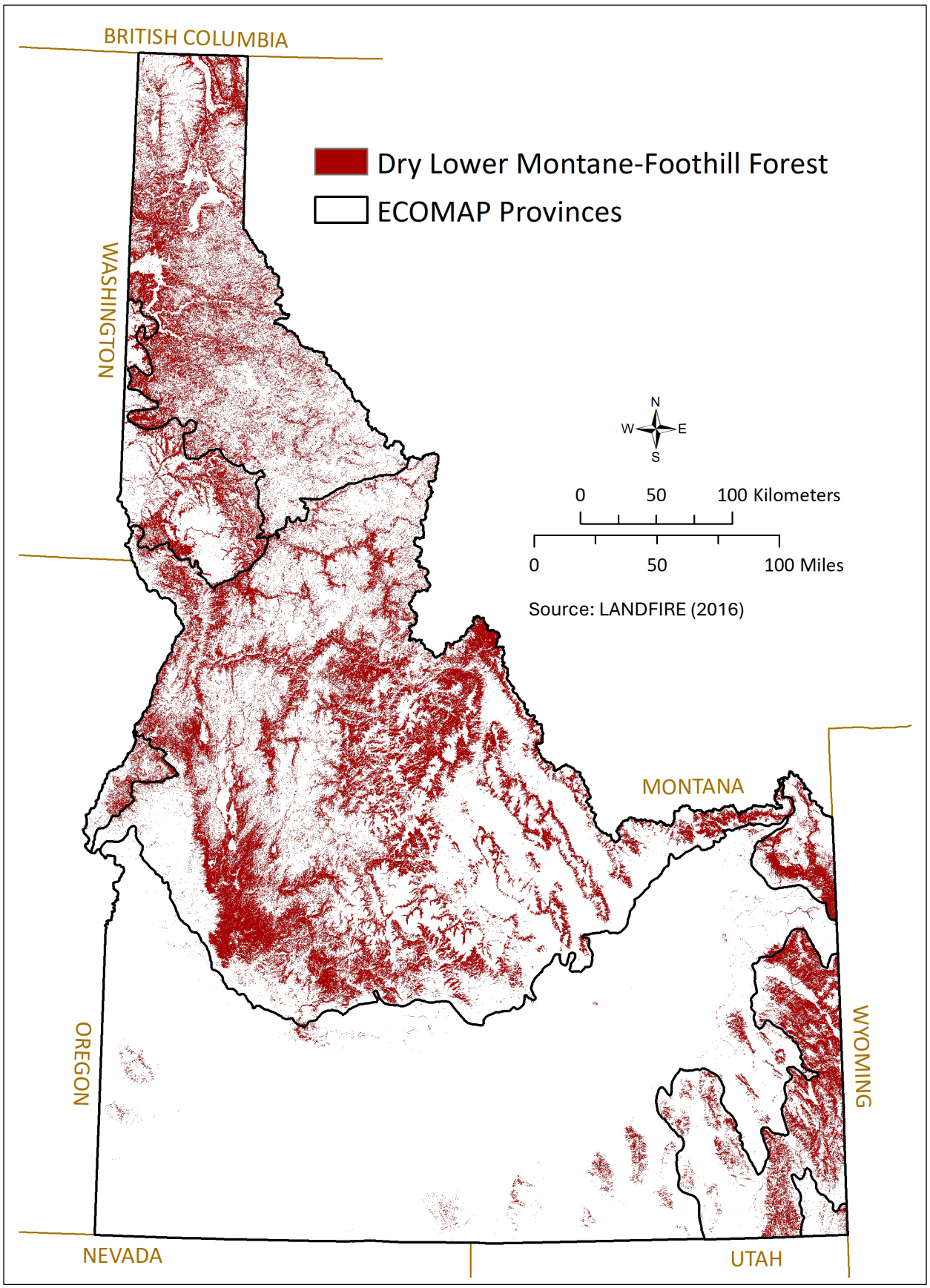
South Fork Salmon River (cc) BY 2010 Chris Murphy/IDFG

Fire-dependent conifer forests, woodlands, and savannas typically dominated by Ponderosa Pine or Douglas Fir or both, with Limberpine and Rocky Mountain Juniper on rocky outcrops. Stands are found in dry settings of the lower montane to foothill zones of the interior Pacific Northwest and central to northern Rocky Mountains. This habitat often occurs on drought-prone slopes and ridgetops near the lower elevation of tree growth. Climate ranges from warm winter-moist in western foothills and canyons to cool summer-moist in eastern Idaho mountains. Relatively frequent, low- to moderate-intensity wildfires historically maintained stands of widely spaced, larger, fire-resistant trees.

Open forests with native understory vegetation and historic fire regimes occur in the canyons of the Salmon River and other scattered locations. Elsewhere, increased stand density, structure, and canopy closure reduce forest resistance and resilience to disturbances.

Associated, dependent, or near-obligate SWAP species include Western Toad, Common Nighthawk, Mountain Quail, Clark's Nutcracker, Evening Grosbeak, White-headed Woodpecker, Silver-haired Bat, Northern Idaho Ground Squirrel, Northern Alligator Lizard, Western Bumble Bee, Columbia Oregonian, Marbled Disc, Least Bladdery Milk-vetch, Nez Perce Monkey-flower, Idaho Stonecrop, and 2 liverworts. Dry Lower Montane–Foothill Forest has a habitat relative status (i.e., S-rank) of S3 and there are 46 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Understory vegetation reflects fire history, topography, and soils. Tall understory shrubs, such as Rocky Mountain Maple, Western Serviceberry, and Curl-leaf Mountain-mahogany, are patchy, while mid-height Big Sagebrush, Antelope-brush, Mallow Ninebark, Shiny-leaf Spirea, snowberries, or Snowbrush Ceanothus are more widespread. Low shrubs, such as Kinnikinnick, Creeping Oregon-grape, Mountain-box, and Common Juniper, also occur. Graminoids are often abundant in the understory, especially Bluebunch Wheatgrass, Idaho Fescue, Pinegrass, and Geyer's Sedge, but also Spike-fescue, needlegrasses, Wheeler's Bluegrass, and Cheatgrass. Forbs can be conspicuous, including Arrowleaf Balsamroot, eriogonums, Heart-leaf Arnica, Sweet-cicely, Thick-leaved Peavine, Spreading Dogbane, Weedy Milk-vetch, and others.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Dry Lower Montane-Foothill Forest
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Source: LANDFIRE (2016)
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Mesic Lower Montane Forest

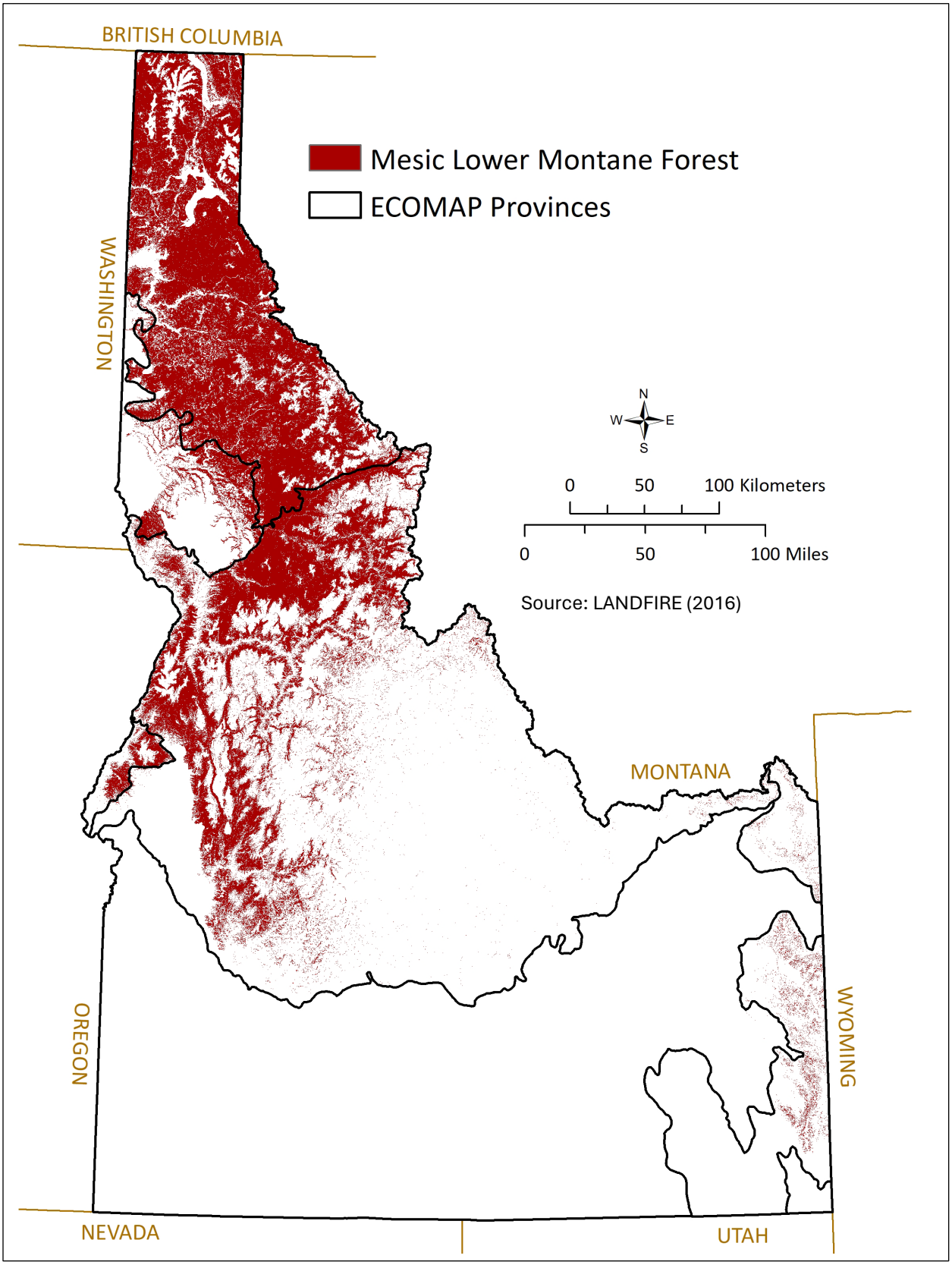


Upper Priest River, Idaho (cc) BY 2007 Chris Murphy/IDFG

Productive, mesic to moist mixed conifer forests of the lower montane zone of the central–northern Rocky Mountains and interior Pacific Northwest. These forests can occur on all slopes, but are especially common on cooler, moister aspects and where soil moisture is sustained (e.g., toeslopes, valleys, benches). Snow accumulates, although climate is moderated by relatively warm and moist maritime air masses in winter.

Intact stands of mesic forest are widely scattered across lower mountain slopes of north and north-central Idaho. Across drier portions of this habitat's extent, increased stand density, structure, and canopy closure reduce forest resistance and resilience to disturbances. Associated, dependent, near-obligate, or obligate SWAP species include Rocky Mountain Tailed Frog, Idaho Giant Salamander, Black Swift, Spruce Grouse, Olive-sided Flycatcher, Moose, Fisher, Fringed Myotis, Common Gartersnake, Selway Forestsnail, Western Bumble Bee, Columbia Oregonian, Skade's Jumping Slug, dendroalsia moss (*Dendroalsia abietina*), Clearwater Phlox, and Robinson's Starwort. Mesic Lower Montane Forest has a habitat relative status (i.e., S-rank) of S3 and there are 50 SWAP species for which this habitat is important, 5 of which are obligates (Appendix 5).

Grand Fir, Douglas Fir, Western Red Cedar, or Western Hemlock are the major mid- to late-seral dominants. Early- to mid-seral Western Larch, Engelmann Spruce, Western White Pine, Lodgepole Pine, and Paper Birch are locally abundant. High severity, stand replacing fire return intervals tend to be long (>150 years), although lower severity fires can be more frequent in drier areas where Western Larch, Douglas Fir, or Ponderosa Pine may be abundant. Gaps created by insect or wind-caused mortality can be important for maintaining diversity. Understory vegetation is often diverse and lush, composed of mesic-site shrubs, numerous forbs, and various ferns. Typical shrubs include tall Rocky Mountain Maple, alders, Scouler's Willow; mid-height Fool's Huckleberry, Globe Huckleberry, Shiny-leaf Spirea, Common Snowberry, and Baldhip Rose; and low-growing Mountain-box, Prince's-pine, and Twinflower. Common forbs include Wild Sarsaparilla, Queen's Cup, Wild Ginger, Trefoil Foamflower, violets, Western Goldthread, Beargrass, Arrowleaf Groundsel, fairy-bells, Little False Solomon's Seal, and White Trillium. Ferns include Northern Maidenhair Fern, Common Oak-fern, wood-ferns, Lady-fern, and Western Sword-fern. Graminoids are uncommon.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Subalpine–High Montane Forest

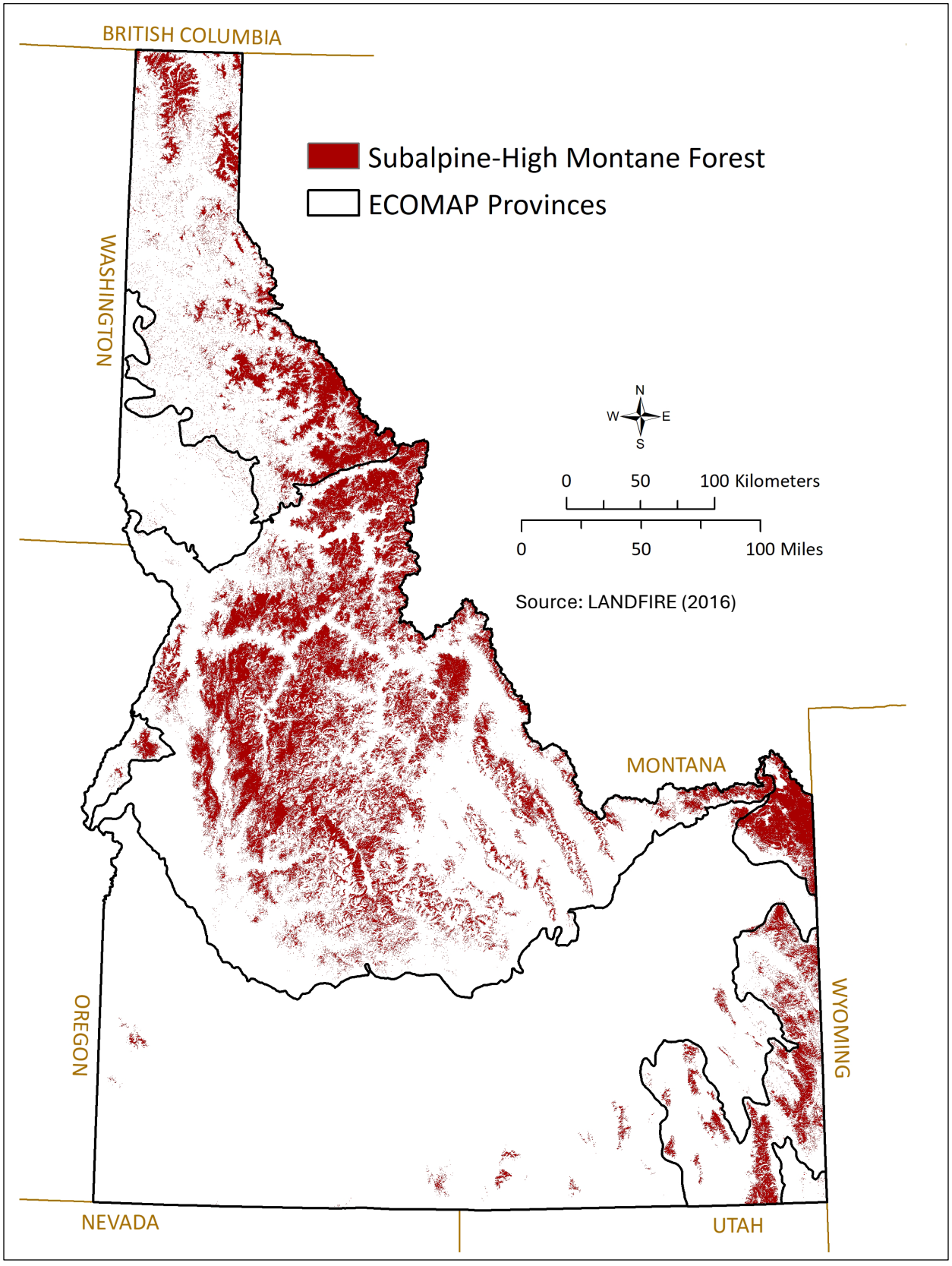


Brundage Mountain, Idaho (cc) BY 2020 Chris Murphy/IDFG

High elevation forests and woodland found throughout montane and subalpine mountains of the western US. Subalpine zones are harsh. Vegetation is shaped by wind desiccation, lightning, snow deposition, severe cold and ice, and avalanches. Wildfire severity ranges from moderate to stand-replacing in the upper montane, although fire return intervals can be well over 150 years. Extensive stands of even-aged Lodgepole Pine develop after fires. Insect outbreaks (e.g., Mountain Pine Beetle) are major natural disturbances. Most of this habitat type in central Idaho is dominated by early-seral young Lodgepole Pine while forests in wetter locations (e.g., north Idaho or summer-moist east Idaho) tend to be dominated by late-seral species.

Most existing habitat extent has been minimally altered by human land uses. However, this habitat is particularly susceptible to warming temperatures, reduced snow cover, and drought. Associated, dependent, near-obligate, or obligate SWAP species include Rocky Mountain Tailed Frog, Spruce Grouse, Clark's Nutcracker, Canada Jay, Cassia Crossbill, Boreal Owl, Rocky Mountain Goat, American Marten, Hoary Bat, Dwarf Shrew, Western Bumble Bee, Suckley Cuckoo Bumble Bee, Bodin's Milk-vetch, and Whitebark Pine. Subalpine–High Montane Forest has a habitat relative status (i.e., S-rank) of S4 and there are 35 SWAP species for which this habitat is important, 3 of which are obligates (Appendix 5).

Characteristic trees, often forming large stands across glacial carved terrain, include Subalpine Fir, Engelmann Spruce, Lodgepole Pine, Mountain Hemlock (maritime climate influenced areas), and Quaking Aspen. Subalpine Larch, Subalpine Fir, Whitebark Pine, and Limberpine form clumped to open stands closer to timberline. The variable understory is a mix of species adapted to dry cool summers and cold snowy winters. Heath family shrubs, such as Trapper's Tea, Globe Huckleberry, Fool's Huckleberry, Grouseberry, Red Mountain-heath, and Dwarf Bilberry, are common. Other evergreen shrubs include Common Juniper, Snowbrush Ceanothus, and Mountain Big Sagebrush. Deciduous shrubs, such as Sitka Alder, Rocky Mountain Maple, Alpine Prickly Currant, Canada Buffalo-berry, Mountain Snowberry, Shiny-leaf Spirea, and Bunchberry, can also occur. Open stands support abundant graminoids, namely Hitchcock's Woodrush, Idaho Fescue, Geyer's Sedge, rushes, and Pinegrass, with Bluejoint Reedgrass and Soft-leaved Sedge where moist. Forbs are diverse and range from Beargrass, Showy Polemonium, Leafy Lousewort, Weedy Milk-vetch, Prickly Sandwort, Alpine Knotweed, and arnicas on drier sites, to White Marsh-marigold, Red Baneberry, lovages, Clasping-leaved Twisted-stalk, meadowrues, Queen's Cup, Western Goldthread, mitreworts, False Bugbane, and Sweetscented Bedstraw on mesic soils.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Aspen Forest & Woodland

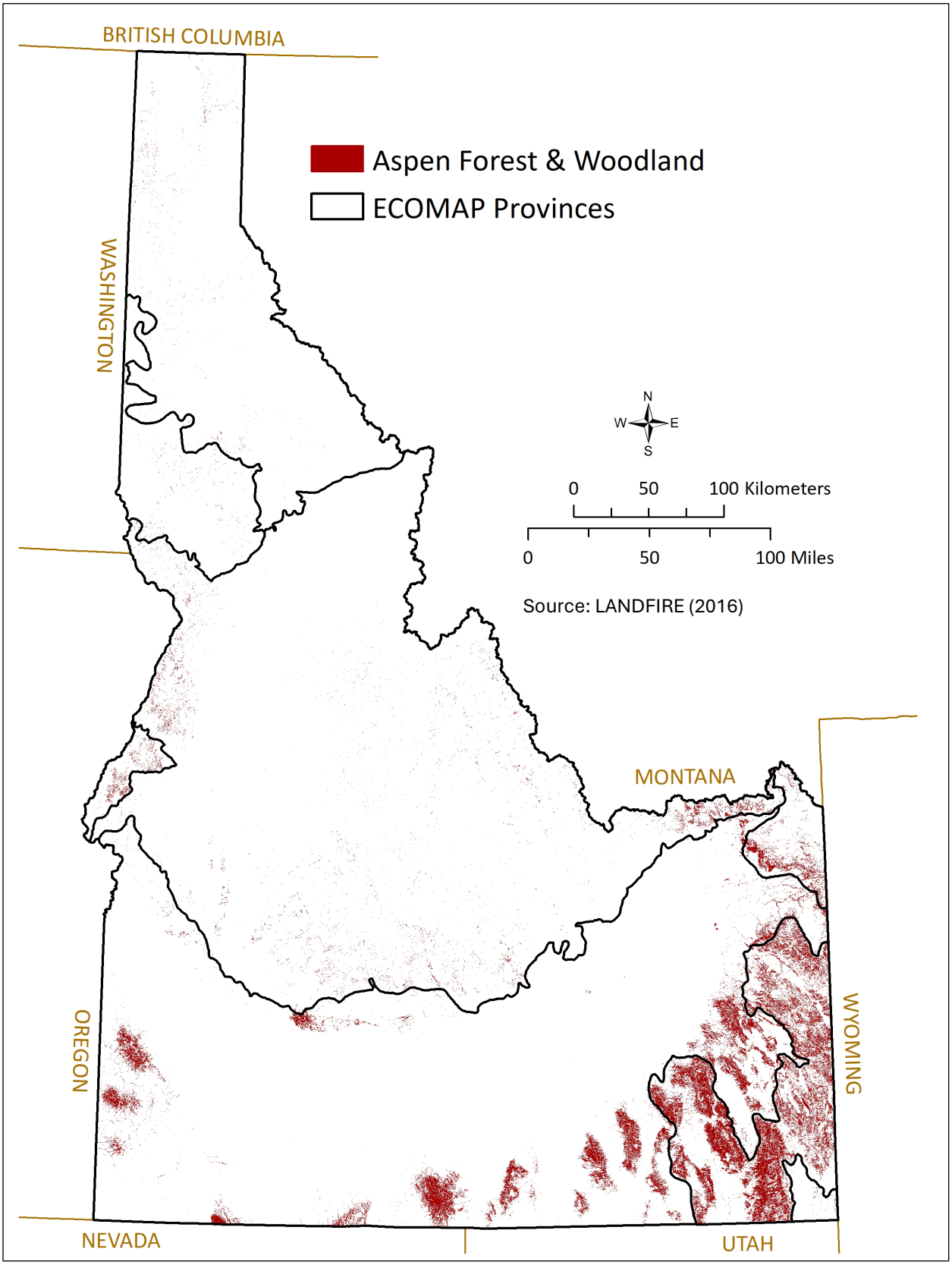


Bannock Range 2008 Tim Weekley/IDFG

Open to dense canopies dominated by mixed age classes of Quaking Aspen. Stands typically occur on montane slopes and valleys, but may extend into subalpine (e.g., avalanche chutes) and lower montane sites. Bigtooth Maple is locally dominant in southeast Idaho where it forms extensive stands on protected moist, lower montane slopes and in canyons. In the absence of fire or other natural- or human-caused disturbance, Subalpine Fir, Lodgepole Pine, Douglas Fir, or Rocky Mountain Juniper (at lower elevations) may co-occur with early seral Quaking Aspen. Aspen distribution is limited by adequate soil moisture required to meet high evapotranspiration demand. Site moisture may be supplemented by snowmelt, groundwater, and summer thunderstorms.

Intact stands of this habitat are typically located in high-elevation watersheds, where they experience natural disturbance cycles (e.g., fire, avalanches). Lower elevation stands tend to be less productive, with less diverse understories, and at greater risk of dieback due to various stressors. Associated or dependent SWAP species include Sharp-tailed Grouse, Cassin's Finch, Cassia Crossbill, White-headed Woodpecker, Great Gray Owl, Moose, Grizzly Bear (Greater Yellowstone Ecosystem population), and Silver-haired Bat. Aspen Forest & Woodland has a habitat relative status (i.e., S-rank) of S3 and there are 15 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Understories are often lush, structurally complex, and diverse, but vary depending on moisture and disturbance. Tall deciduous shrubs, namely Western Serviceberry, Chokecherry, and Scouler's Willow can be common, along with shorter Mountain Snowberry, Woods' Rose, Mountain-box, Common Juniper, Mountain Big Sagebrush, or Creeping Oregon-grape. Typical graminoids are Alaska Wheatgrass, Mountain Brome, Blue Wild-rye, needlegrasses, Wheeler's Bluegrass, Pinegrass, and upland sedges (Hood's and Geyer's). Forbs are conspicuous, especially tall species such as Fendler's Meadowrue, Sticky Purple Geranium, sweet-roots, Silvery Lupine, Nettle-leaf Horse-mint, Western Valerian, Many-flowered Stickseed, Butterweed Groundsel, Western Coneflower, Engelmann's Aster, and California False Hellebore. Shorter forbs include Little False Solomon's Seal, Common Yarrow, Woodland Strawberry, Northern Bedstraw, Northern Mule's-ears, and annuals.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Whitebark Pine Forest & Woodland

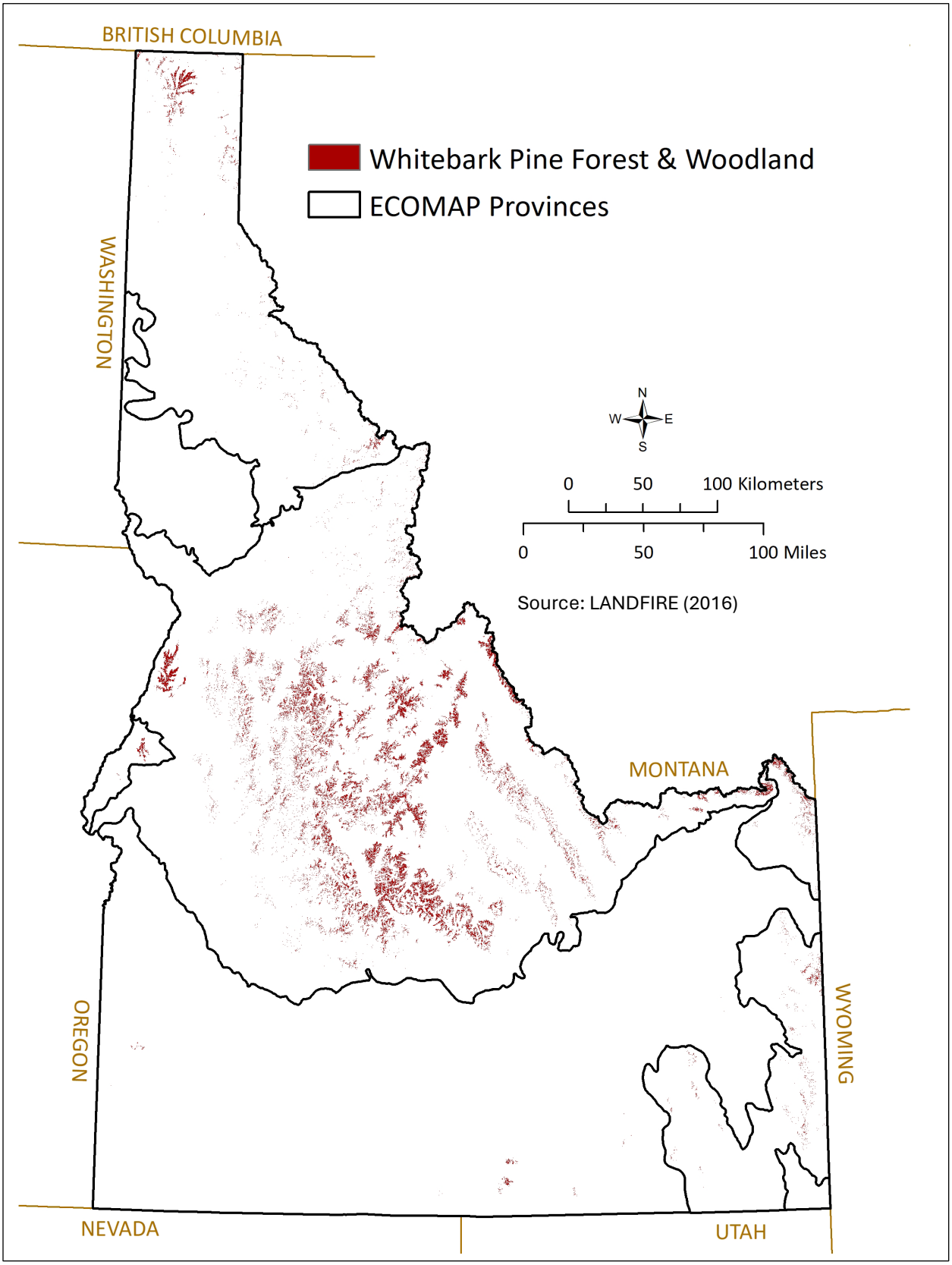


Big Windy Peak, Lemhi Mountains, Idaho © 2014 Jessica Irwin

This subalpine habitat occurs in remote, high-elevation mountain regions of the interior Pacific Northwest and central and northern Rocky Mountains. Whitebark Pine, sometimes with abundant Subalpine Fir, dominates tree islands occurring in a mosaic with alpine turf at timberline. Slow growing, long-lived Whitebark Pine colonizes open and dry, rocky ridges, slopes, and steep cirque headwalls where it creates habitat for less hardy tree species. Sites are harsh, with trees exposed to wind desiccation, lightning, and ice. Other trees may occur, including Limberpine, Subalpine Larch, Mountain Hemlock, and Engelmann Spruce. Whitebark Pine is a seral species, establishing after a disturbance such as wildfire or avalanche. Although fire can be necessary to maintain Whitebark Pine habitat and Clark's Nutcracker seed caching sites, varying intensity levels result in different impacts to Whitebark Pine communities. For example, even low-intensity fire can kill individual trees if subjected to bole scorching (FWS 2018). Fire intervals vary from 30 to 300 years (Tomback et al. 2001).

Most of this habitat has not been significantly altered by human land uses, although it is particularly susceptible to disease, changing climate conditions, and other stressors. Associated, dependent, near-obligate, or obligate SWAP species include Clark's Nutcracker, Rocky Mountain Goat, Moose, Wolverine, Long-eared Myotis, American Pika, Hoary Marmot, High Country Bumble Bee, Bloom Peak Douglasia, and Whitebark Pine. Whitebark Pine Forest & Woodland has a habitat relative status (i.e., S-rank) of S3 and there are 14 SWAP species for which this habitat is important, 2 of which are obligates (Appendix 5).

The shrub understory is typically patchy, characterized by Common Juniper, Alpine Prickly Currant, Canada Buffalo-berry, Mountain Snowberry, or Grouseberry. The herbaceous layer ranges from sparse to a moderately dense cover of graminoids, including Spike-fescue, Idaho Fescue, Geyer's and Ross's sedges, or Wheeler's Bluegrass. Forbs indicative of droughty, poorly-developed soil are scattered, such as arnicas, lupines, Northern Goldenrod, Beargrass, Common Yarrow, Little-leaf Pussy-toes, and Blueleaf Cinquefoil. Although birds and mammals (e.g., Grizzly Bear and rodents) eat and cache Whitebark Pine seeds, Clark's Nutcracker is almost exclusively the seed dispersal mechanism for the species (FWS 2018), transporting the large, wingless seeds long distances and caching them across open subalpine habitat. In suitable sites, Whitebark Pine regenerates in clusters from forgotten caches.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Pinyon–Juniper Woodland

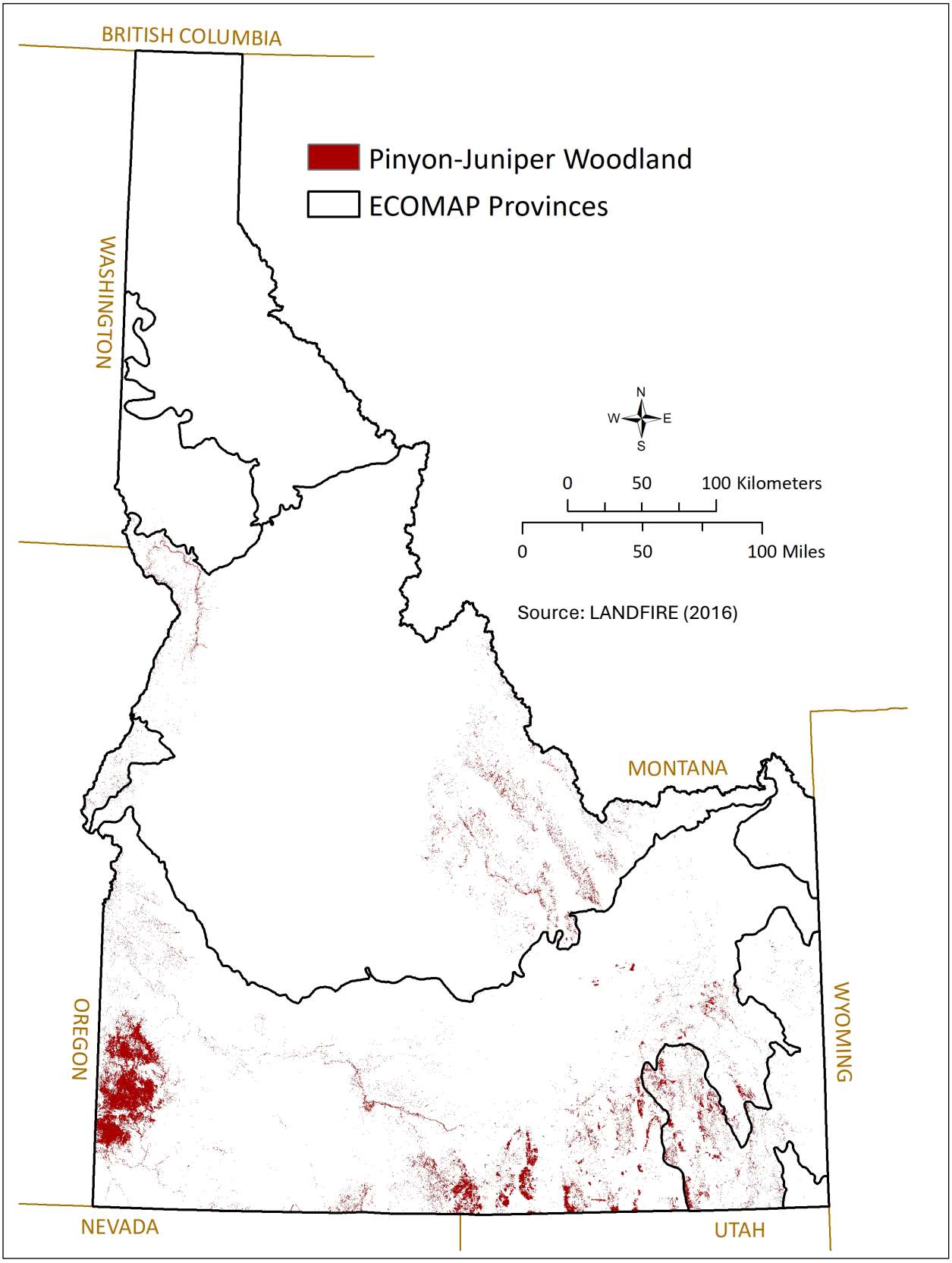
Widely occurring woodlands ranging from xeric plains, canyons, and foothills to mesic lower slopes. Stands have an open to closed canopy of Western Juniper (southwest Idaho), Utah Juniper (east and south-central to southeast Idaho), Singleleaf Pinyon (foothills of southern Albion Mountains), or Curl-leaf Mountain Mahogany. Singleleaf Pinyon sites are moister and have less-extreme frosts than adjacent Utah Juniper woodlands or shrub–steppe. Curl-leaf Mountain-mahogany dominates on calcareous or altered basalt where fire is uncommon or can be intermixed with pinyon–juniper.



Jim Sage Mountain CC BY 2002 Jennifer Miller/IDFG

Minimally-disturbed stands of this habitat, characterized by widely-spaced, old, large-diameter trees with native plant understory communities, occur across south Idaho where fire has not been suppressed. Over the past 125 years or more, some areas have experienced increased juniper density in existing stands as well as expansion into shrub-steppe habitats. Associated or obligate SWAP species include Golden Eagle, Ferruginous Hawk, Pinyon Jay, Gray-crowned Rosy-Finch, Western Spotted Skunk, Canyon Bat, Pallid Bat, Pygmy Rabbit, Pygmy Short-horned Lizard, and Elusive Polemonium. Pinyon–Juniper Woodland has a habitat relative status (i.e., S-rank) of S4 and there are 25 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Open stands, maintained by fire, have a productive understory similar to mesic sagebrush steppe in composition. Denser stands have sparser understories. Understory shrubs include Big Sagebrush, Antelope-brush, rabbit-brushes, Low Sagebrush, Black Sagebrush, horse-brushes, or Slenderbush Buckwheat, with Creambush Ocean-spray, goldenbrushes, or Spiny Green-bush on rocks. Mesic sites may have Creeping Oregon-grape and deciduous shrubs such as Mountain Snowberry, Wax Currant, serviceberries, or cherries. Herbaceous species reflect soil (depth, texture, moisture) and environmental conditions (slope, aspect, lithology, shade, disturbance). Common grasses include Bluebunch Wheatgrass, Idaho Fescue, Great Basin Wildrye, Sandberg's Bluegrass, Indian Ricegrass, Needle-and-Thread, Salmon Wildrye, needlegrasses, or Spike-fescue. Forbs can be diverse but typically have low cover and are commonly represented by Arrowleaf Balsamroot, Wyeth Buckwheat, Mat Buckwheat, Silvery Lupine, Rocky Mountain Helianthella, Long-leaf and Hood's phloxes, biscuit-roots, Longleaved Hawksbeard, pricklypear cactus, Western Groundsel, cryptanthas, or Tapertip Onion.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Montane Riparian & Swamp Forest

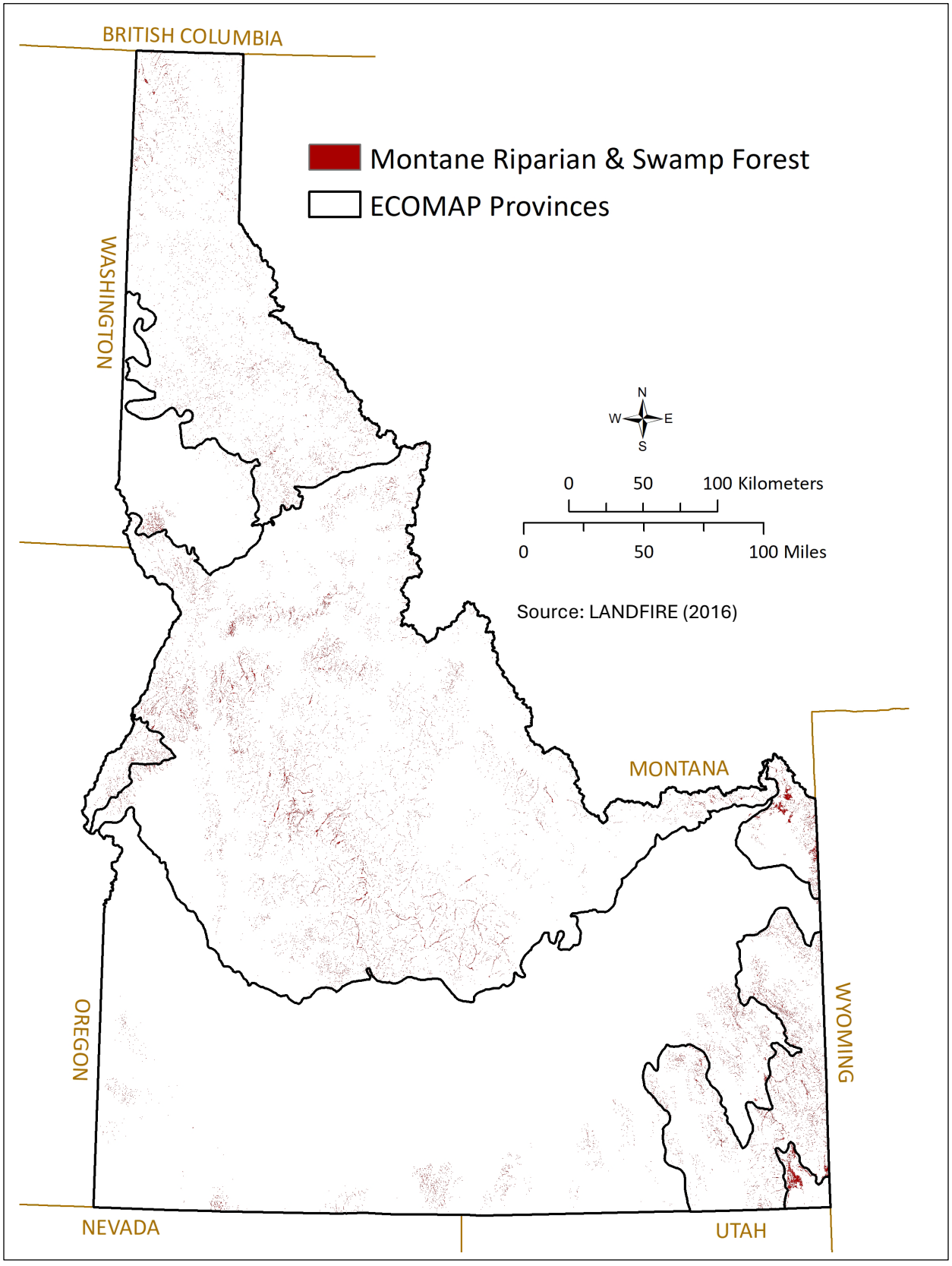


Queens River (cc) BY 2007 Chris Murphy/IDFG

Seasonally-flooded forests and woodlands on floodplains and alluvial terraces of rivers and streams in the montane to subalpine zones. Stands occur in steep and narrow valleys, in wide, low-gradient, glacial-carved valleys with meadows, on spring-fed slopes at stream headwaters, and on lake margins. Engelmann Spruce is frequently the primary tree, although Lodgepole Pine, Subalpine Fir, or Mountain Hemlock may co-occur or be dominant. Narrow-leaved or Black Cottonwood, Quaking Aspen, Douglas Fir, or Grand Fir can be locally abundant in the montane zone.

Intact, minimally-altered riparian forests occur in higher-elevation watersheds and are generally diverse and composed of old trees. In some valley locations, cottonwood forests may be limited due to floodplain constraints, changing hydrologic regimes, or other stressors. Associated, dependent, or near-obligate SWAP species include Rocky Mountain Tailed Frog, Coeur d'Alene Salamander, Harlequin Duck, Spruce Grouse, Great Gray Owl, Moose, Fisher, Townsend's Big-eared Bat, Northern Bog Lemming, Common Gartersnake, Western Bumble Bee, Suckley Cuckoo Bumble Bee, and Papillose Taildropper. Montane Riparian & Swamp Forest has a habitat relative status (i.e., S-rank) of S4 and there are 26 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Understory composition varies, depending on environmental setting. At higher elevations, heath family shrubs, such as Trapper's Tea, Bog Blueberry, Grouseberry, and Red Mountain-heath, are common. An array of tall deciduous shrubs is often present, especially on sunnier streambanks, including Sitka and Mountain alders, Red-osier Dogwood, Drummond's and Dusky willows, Fool's and Globe huckleberries, Rocky Mountain Maple, Western Serviceberry, Douglas's Hawthorn, Swamp Gooseberry, Stinking Currant, Alder Buckthorn, Thimbleberry, Common Snowberry, and Douglas's Spirea. Herbaceous layers can be diverse. Characteristic graminoids include Bluejoint Reedgrass, Mountain, Southern Beaked, Water, and Soft-leaved sedges, Blue Wild-rye, and Common Brome. Along with Lady-fern, robust forbs are characteristic, such as Arrowleaf Groundsel, Clasping-leaved Twisted-stalk, Canby's Lovage, Little False Solomon's Seal, Leafy-bracted Aster, Cow-parsnip, false hellebores, Sitka Burnet, and Western Meadowrue. Low-growing forbs are common, including White Marsh-marigold and Jeffrey's Shooting Star at high elevations, and Common Horsetail, False Bugbane, Alpine Mitrewort, Sweetscented Bedstraw, Dwarf Enchanter's Nightshade, Blueleaf Strawberry, and Round-leaved Violet at lower elevations.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Source: LANDFIRE (2016)
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Lowland–Foothill Riparian Forest

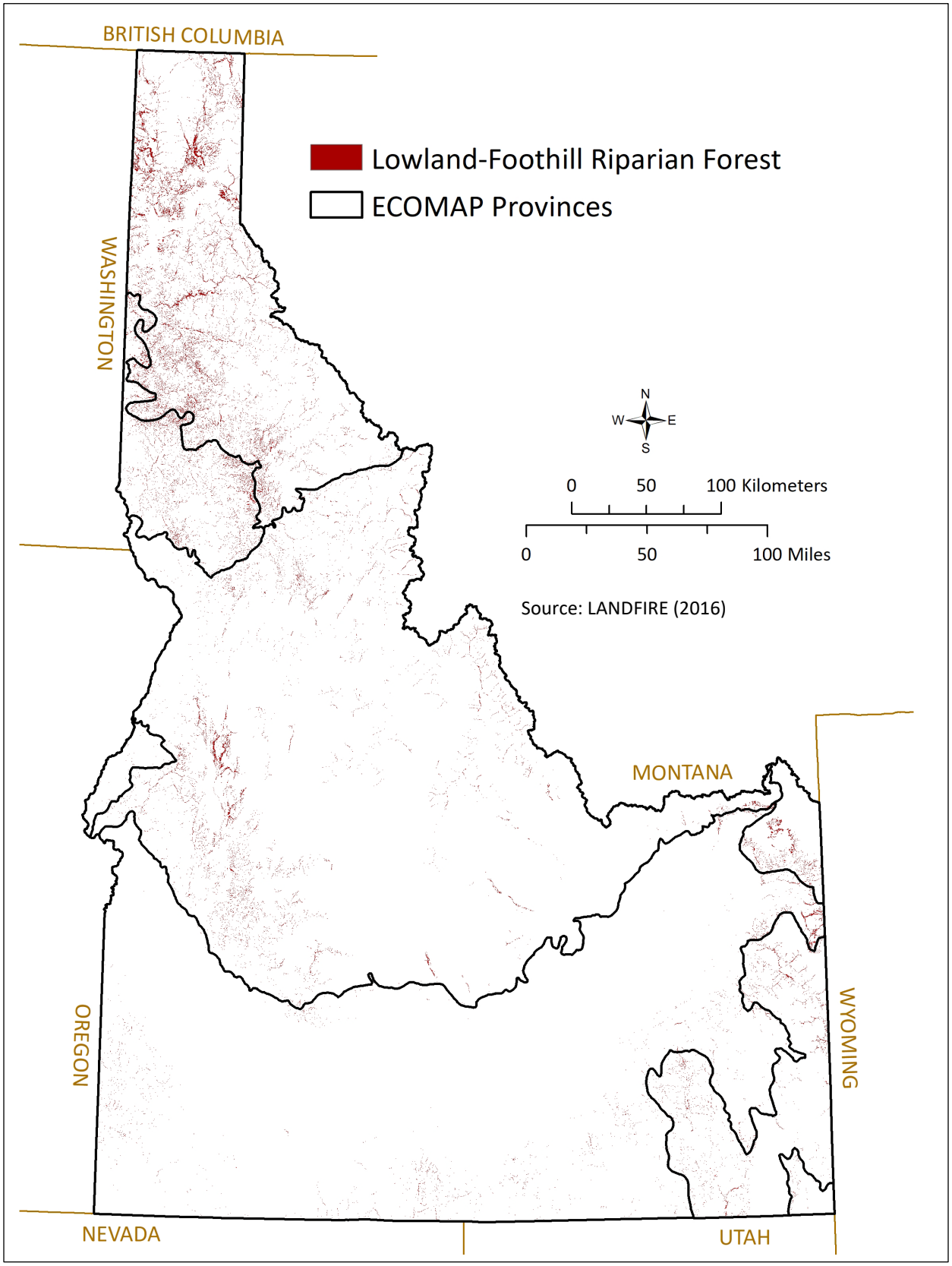
Diverse and variable forests occurring on floodplains and terraces of rivers and streams. Settings are plains, canyons, foothills, and lower montane areas. Persistence depends on frequent flooding, which creates open alluvial bars suitable for tree reproduction. Stands also occur adjacent to side channels, oxbow ponds, swales, and spring-fed wetlands. Terrace stands are sustained by groundwater.



Weiser River (cc) BY 2004 Ed Bottum/IDFG

Intact stands of this habitat occur along Idaho's low-elevation streams and rivers such as the North Fork Coeur d'Alene, upper Salmon, upper Snake, Big Wood, and upper South Fork Boise. In other locations, the condition, function, and viability of floodplain forests may be limited due to floodplain constraints, changing hydrologic regimes, or other stressors. Associated, dependent, or obligate SWAP species include Coeur d'Alene Salamander, Trumpeter Swan, Yellow-billed Cuckoo, Lewis's Woodpecker, American Marten, Fringed Myotis, Common Gartersnake, Western Bumble Bee, Mission Creek Oregonian, Indian Valley Sedge, Water Howellia, and Ute Ladies-tresses. Lowland–Foothill Riparian Forest has a habitat relative status (i.e., S-rank) of S3 and there are 31 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Black Cottonwood is typically ubiquitous; however, it is replaced by Narrow-leaved Cottonwood in eastern Idaho. White Alder, Peach-leaf Willow, junipers, Box-elder, and Bigtooth Maple also locally occur. Along with cottonwoods, Douglas Fir, Ponderosa Pine, Grand Fir, and Quaking Aspen characterize lower montane areas, while Red Alder, Paper Birch, Western Red Cedar, and Western White Pine codominate in north Idaho. Introduced trees (e.g., Russian Olive) occur but are not dominant. Shrubs are diverse and include Water Birch, Rocky Mountain Maple, Western Serviceberry, Chokecherry, hawthorns, Red-osier Dogwood, Mountain Alder, willows, Blue Elderberry, Lewis's Mock Orange, Western Clematis, Golden Currant, snowberries, Woods' Rose, Lemonade Sumac, Douglas's Spirea, Western Poison Ivy, *Rubus* spp., Alder Buckthorn, ninebarks, and Devil's Club (north Idaho). The herb layer varies in response to sunlight and disturbance. Common native graminoids include Woolly Sedge and Blue Wild-rye; introduced species are locally abundant. Tall native forbs include Little False Solomon's Seal, goldenrods, Stinging Nettle, horsetails, Sweet-cicely, American Licorice, Lady-fern, asters, buttercups, Western Hemlock, Cow-parsnip, Western Meadowrue, Western Mugwort, and Skunk Cabbage. Claytonias, bedstraws, and Dwarf Enchanter's Nightshade are common low-growing species.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Lowland-Foothill Riparian Forest
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Source: LANDFIRE (2016)
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Ruderal Flooded & Swamp Forest & Woodland

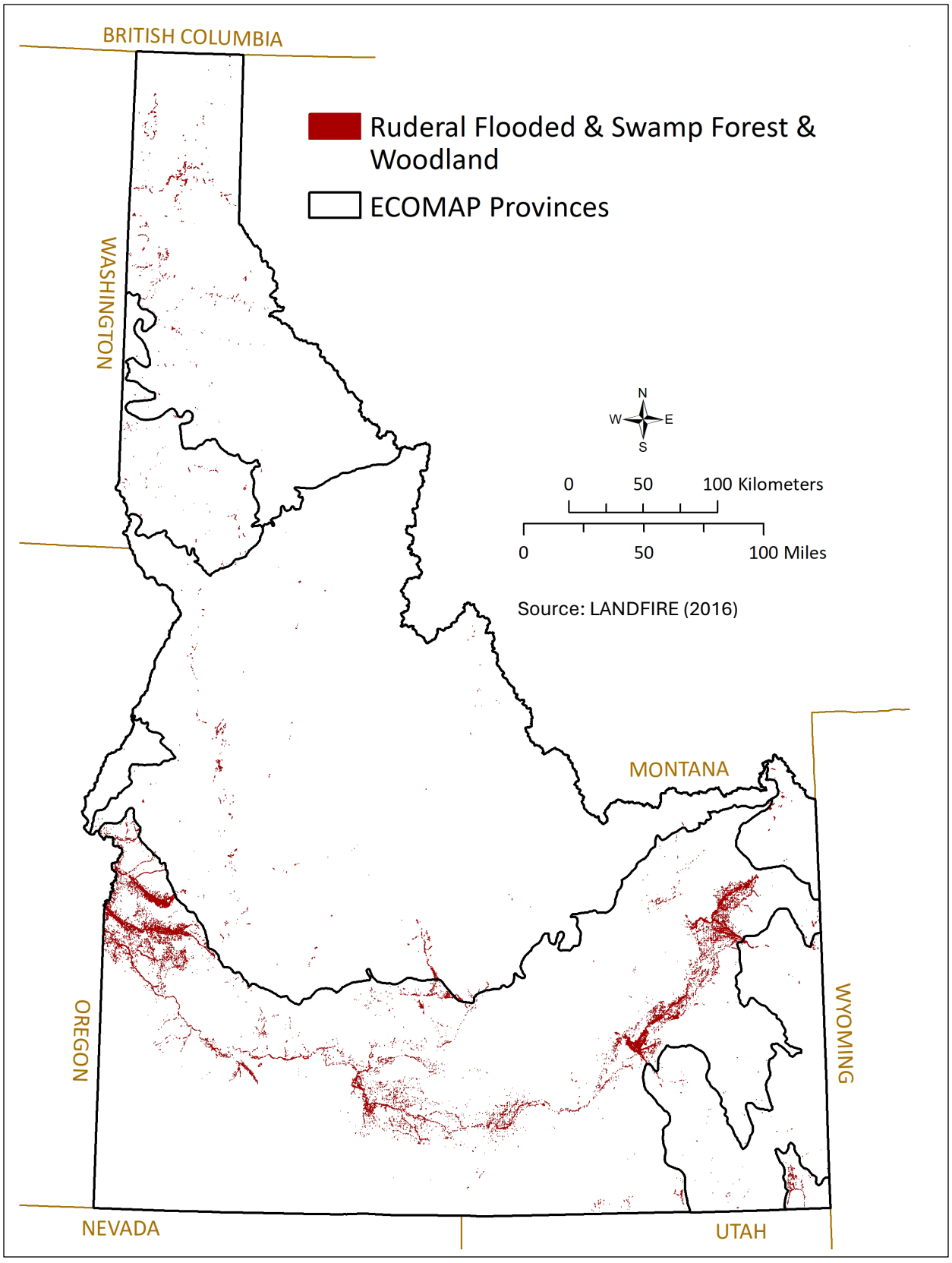
Low-elevation riparian forests and woodlands developing in human-altered or created settings. Stands occur along managed rivers, in disturbed floodplains, on reservoir fringes, around altered seeps and springs, on levees, along irrigation ditches and diversions, around created ponds and marshes, and in agricultural areas fed by irrigation.



Portneuf River, Idaho (cc) BY 2011 Chris Murphy/IDFG

Associated SWAP species include Cinnamon Teal, Yellow-billed Cuckoo, Moose, Little Brown Myotis, Silver-haired Bat, Common Gartersnake, Western Bumble Bee, and Suckley Cuckoo Bumble Bee. Ruderal Flooded & Swamp Forest & Woodland has a habitat relative status (i.e., S-rank) of SNA (i.e., conservation status rank is not applicable because the ecosystem is nonnative) and there are 8 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

This habitat type is dominated by introduced invasive tree species. Abundant trees include Russian Olive, tamarisks, Silver Maple, Box-elder, Green Ash, Eastern and Fremont cottonwoods, White Poplar, White and Crack willows, Siberian and American elms, Black Locust, catalpas, White Mulberry, and fruit trees (e.g., cherries, apples, pears, Apricot). Invasive shrubs can be common, especially False Indigo, roses, and Himalayan Blackberry. Invasive plant species are also abundant in the understory such as the vine-like White Bryony and Bittersweet, grasses (e.g., Reed Canarygrass, Quackgrass, Smooth Brome, Meadow Foxtail, Creeping Bentgrass, Canada Bluegrass, Cheatgrass, Mouse Barley), and noxious weeds (e.g., Canada Thistle, Poison-hemlock, Pepperwort, Purple Loosestrife, Yellow Flag, Leafy Spurge, hound's-tongues). Other introduced ruderal species are common including Common Orache, Madwort, Curly Dock, lamb's quarters, Prickly Lettuce, Common Yellow Sweet-clover, and seeded Tall Wheatgrass. Relict or recovering native woody species, including Peach-leaf, Yellow, and Coyote willows, Golden Currant, Mountain Alder, Red-osier Dogwood, and Woods' Rose, are frequently intermixed but not dominant. Common native herbs, such as Woolly Sedge, Common Horsetail, Clasping-leaved Dogbane, goldenrods, and ruderal marsh species (e.g., Common Cat-tail, Hardstem Bulrush, Soft Rush, Common Duckweed), also occur.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Source: LANDFIRE (2016)
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Temperate & Boreal Grassland & Shrubland

These are mesic to seasonally dry upland habitats dominated by shrubs or herbaceous grasses or forbs. Tree cover is typically <10% and limited by a combination of drought, fire, or cold air pooling in valley bottom meadows. Soils are often well developed and productive. Habitats occur from canyons and foothills to subalpine zones. Where deciduous or evergreen shrubs (varying in height) dominate (with at least 10% to 20% cover), there is typically a diverse understory or intershrub herbaceous layer of grasses and forbs. Grasses may include both bunchgrass and sod-forming species, with annuals in disturbed areas. Forbs can be diverse and sometimes codominant with grasses. Except where disturbed, the ground surface varies from litter and duff to biological soil crusts.

Montane–Foothill Grassland & Shrubland

Grassland and deciduous shrublands range from canyons and loess hills on plateaus, to foothill and montane slopes. Areas include dry foothills below tree line and shrubby gaps in mountains maintained by avalanches, wildfires, and timber harvest. Grasslands occur on warm, dry sites maintained by frequent low-intensity wildfire, while deciduous shrubs occur on cool, mesic sites (e.g., drainages, snow drift areas, north aspects, talus borders).

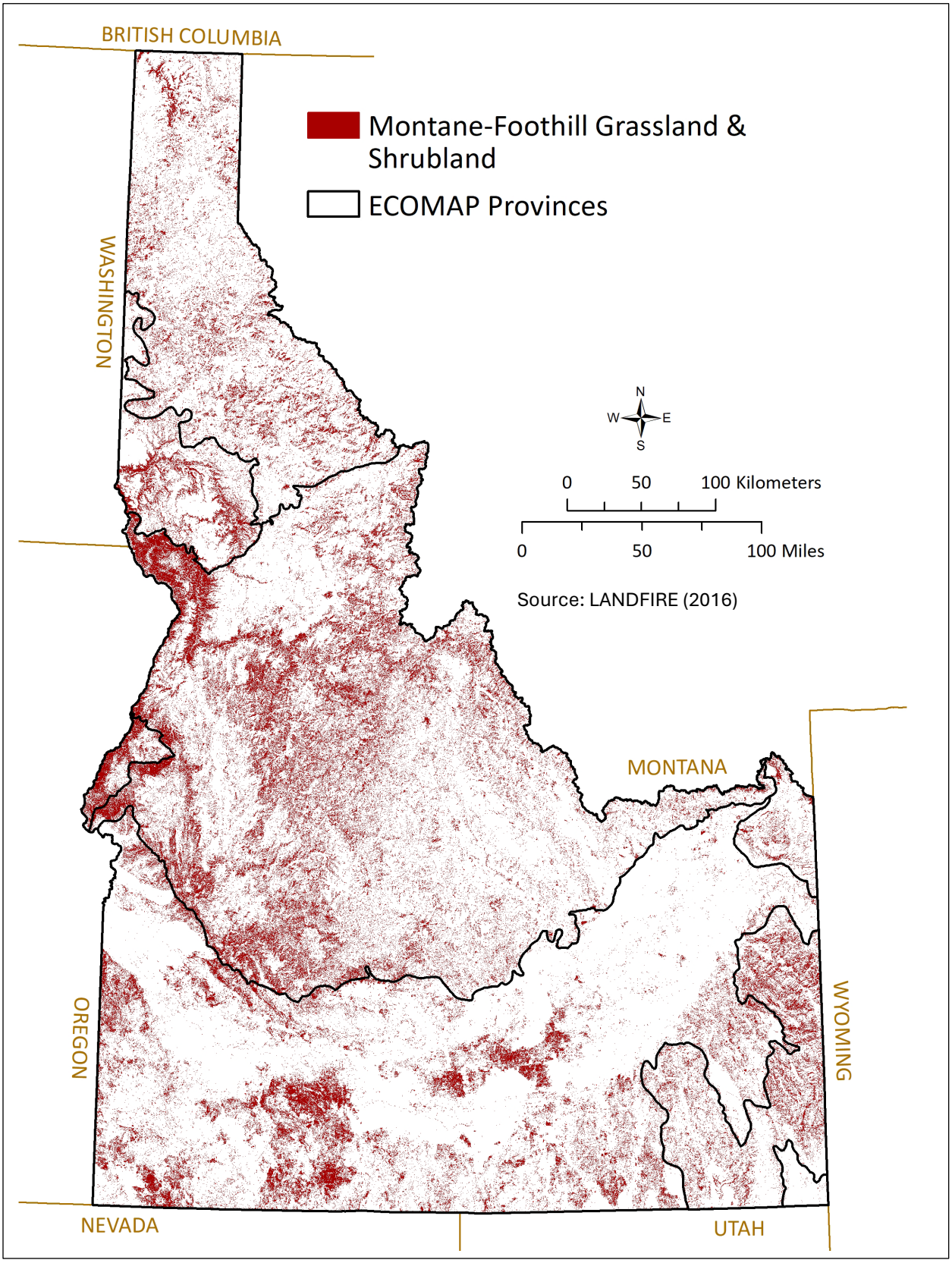


Lower Salmon River, Idaho (cc) BY 2007 Chris Murphy/IDFG

Many canyon (e.g., Hells Canyon, Salmon River) and montane grasslands and shrublands are intact, dominated by deciduous shrubs, native bunchgrasses, and wildflowers. Montane shrublands also tend to be minimally altered by human land uses. In some locations, various stressors (e.g., invasive annual grasses, conversion) have resulted in grassland habitat loss or degradation. Associated, dependent, near-obligate, or obligate SWAP species include Woodhouse's Toad, Long-billed Curlew, Mountain Quail, Sharp-tailed Grouse, Grasshopper Sparrow, Short-eared Owl, Pronghorn, Rocky Mountain Bighorn Sheep, Kit Fox, Northern Idaho Ground Squirrel, Southern Idaho Ground Squirrel, Northern Alligator Lizard, Yellow Bumble Bee, Monarch Butterfly, Giant Palouse Earthworm, Piper's Milk-vetch, Nez Perce Monkey-flower, Macfarlane's Four-o'clock, and Spalding's Catchfly. Montane–Foothill Grassland & Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 37 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Canyon, Palouse Prairie, and foothill grasslands are dominated by Bluebunch Wheatgrass, Idaho Fescue, Rough Fescue, Great Basin Wildrye, Prairie Junegrass, Needle-and-Thread, and Sandberg's Bluegrass. Others include Threeawn, Sand Dropseed, wheatgrasses (e.g., *Elymus* spp., *Thinopyrum* spp.), and invasive annual grasses. Oatgrasses, needlegrasses (*Achnatherum*

spp.), sedges, and Spike-fescue are more abundant at high elevations. Spike-mosses, mosses, and lichens can cover soil between bunchgrasses. Low elevation shrub patches are dominated by Western and Utah serviceberries, Netleaf Hackberry, hawthorns, Mallow Ninebark, Common Snowberry, roses, Western Sumac, Blue Elderberry, and Creambush Ocean-spray. Rocky Mountain Maple, Mountain Snowberry, Bitter Cherry, Chokecherry, and Redstem Ceanothus become prominent in the lower montane. Forbs are conspicuous, such as Arrowleaf Balsamroot, Blanket-flower, lupines, eriogonums, biscuit-roots, Rocky Mountain Helianthella, beardtongues, crane's-bills, Western Hawkweed, cinquefoils, arnicas, asters, phloxes, fleabanes, Old Man's Whiskers, stoneseeds, Common Yarrow, milk-vetches, goldenrods, paintbrushes, and pussy-toes. Montane shrubs occur with mesic herbs. They include Sitka Alder, mountain-ashes, Fool's Huckleberry, Scouler's Willow, Globe Huckleberry, elderberries, Snowbrush Ceanothus, currants, spireas, Thimbleberry, and Red Raspberry.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Montane-Foothill Grassland & Shrubland
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Source: LANDFIRE (2016)
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Subalpine–High Montane Mesic Meadow

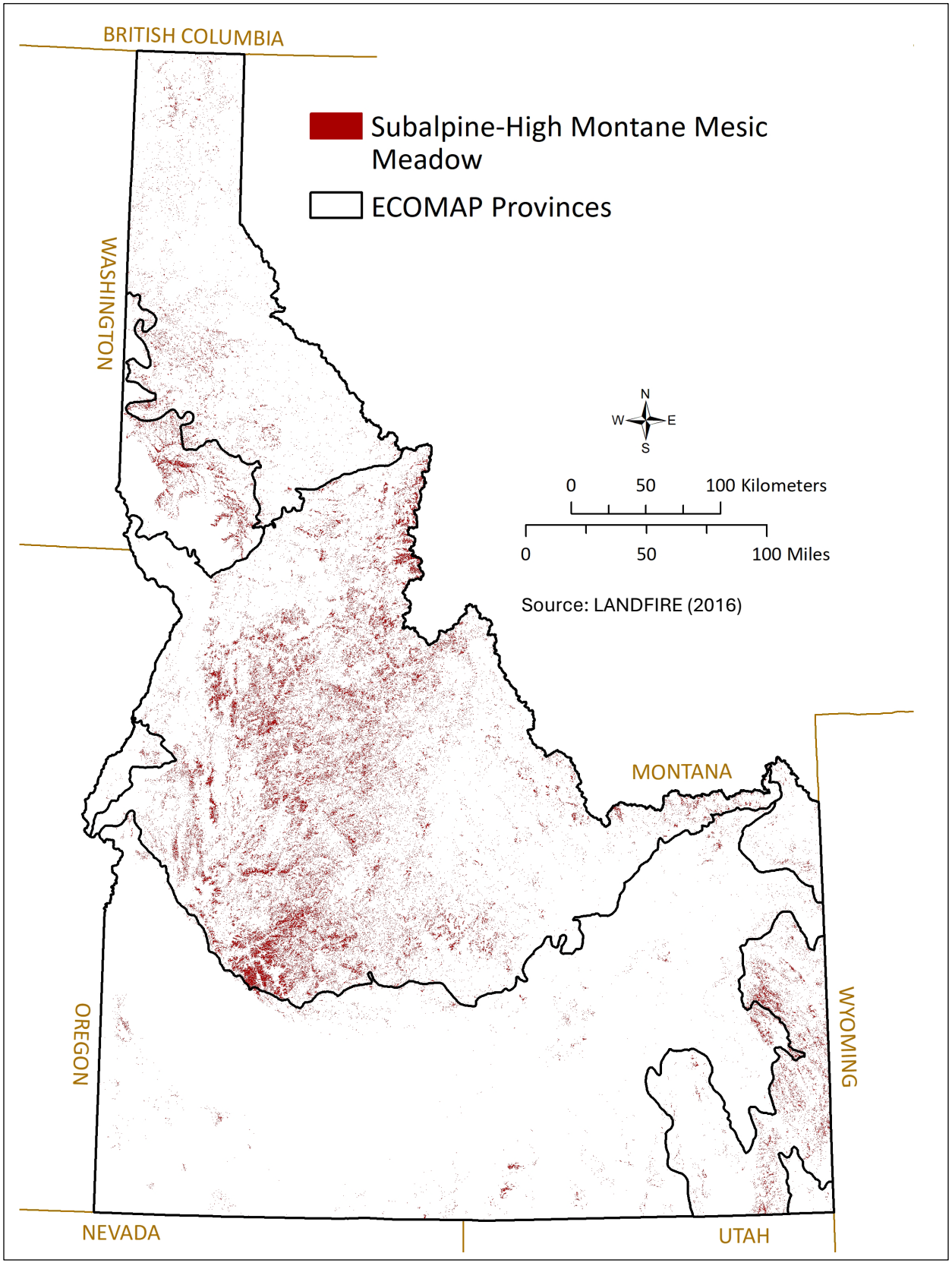


Hidden Lake, Grass Mountains
2009 Chris Murphy/IDFG

Mesic meadows occur in seasonally moist but relatively well-drained sites in broad glacial outwash basins, on toeslopes and steeper rocky slopes with ample moisture, and in snow-accumulating swales at mid to high elevations. Soils, fire, cold air accumulation, and sometimes windswept drought conditions limit tree establishment. This habitat is transitional between wet meadows and upland forests or Mountain Big Sagebrush steppe.

Many mesic meadows in Idaho's mountain basins are intact, dominated by native vegetation and maintained by natural processes. Some areas however are susceptible to the effects of increased conifer encroachment, invasive plants, and reduced snow cover and snowmelt. Associated, dependent, or near-obligate SWAP species include Western Toad, American Pipit, Great Gray Owl, Rocky Mountain Goat, Rocky Mountain Bighorn Sheep, Wolverine, American Pika, Hoary Marmot, Western Bumble Bee, Suckley Cuckoo Bumble Bee, Gillette's Checkerspot, Bodin's Milk-vetch, Christ's Paintbrush, and Midget Quillwort. Subalpine–High Montane Mesic Meadow has a habitat relative status (i.e., S-rank) of S3 and there are 20 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Some mesic meadows support patches of Shrubby Cinquefoil, Silver Sagebrush, or Wolf's Willow on the fringes. More typically, there is an open to dense, diverse, and often forb-rich herb community. Burrowing mammals can increase forb diversity. Characteristic forbs include Engelmann's Aster, fleabanes, lovages, Western Sweet-root, stickseeds, bluebells, American Saw-wort, Fireweed, Cow-parsnip, angelicas, meadowrues, valerians, groundsels (e.g., *Packera* spp., *Senecio* spp.), false hellebores, Alpine Knotweed, Western Coneflower, Common Camas, Globe Penstemon, Northern Mule's-ears, cinquefoils, goldenrods, Pearly-everlasting, paintbrushes, Mountain Death Camas, Beargrass, phloxes, Common Yarrow, onions, bellflowers, pussy-toes, gentians, and Western Blue Flag. Many meadows have dense stands of native graminoids, the most abundant being Baltic Rush, Timber and California oatgrasses, Tufted Hairgrass, Western Wheatgrass, Blue Wild-rye, Bluejoint Reedgrass, muhlys, Idaho Fescue, and numerous sedges: Freeway, Northern Meadow, Small-winged, Narrow-leaved, Long-bracted, Rusty, Hood's, Raynold's, and Parry's.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Subalpine-High Montane Mesic Meadow
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Ruderal Grassland & Shrubland

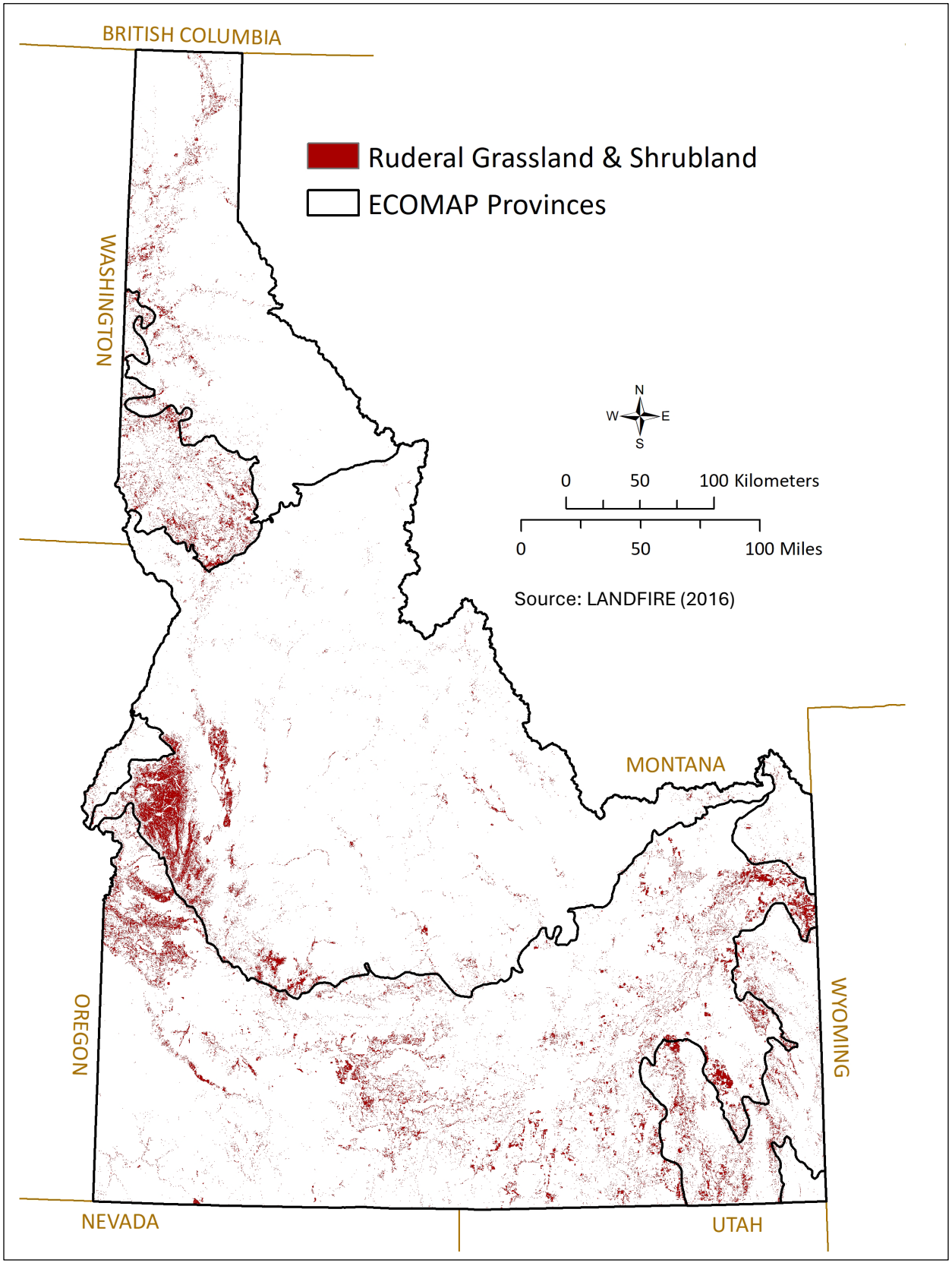
Early seral grasslands, meadows, and shrublands dominated by introduced species mixed with colonizing native species. They occur on disturbed sites such as abandoned or rested farms (including Conservation Reserve Program lands), vacant lots, areas between farms, roadsides, former industrial or residential areas, livestock corrals, and nonmowed pastures. Many introduced grasses and forbs have been purposefully seeded for forage or hay and to prevent soil erosion. Moisture and productivity are higher than in Semidesert Ruderal Scrub & Grassland.



Palouse (cc) BY 2009 Janice Hill/IDFG

Associated or dependent SWAP species include Western Toad, Woodhouse's Toad, Northern Pintail, Sharp-tailed Grouse, Grasshopper Sparrow, Burrowing Owl, Pronghorn, California Bighorn Sheep, Little Brown Myotis, Merriam's Ground Squirrel, Pygmy Short-horned Lizard, Yellow Bumble Bee, and Monarch Butterfly. Ruderal Grassland & Shrubland has a habitat relative status (i.e., S-rank) of SNA and there are 18 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Dominant and diagnostic species include naturalized forage grasses such as Smooth Brome, Kentucky Bluegrass, bentgrasses, fescues, ryegrasses, Orchard-grass, Intermediate Wheatgrass, Quackgrass, Timothy, Common Velvet-grass, and others. Nonnative annuals may be present, including bromes, North Africa Grass, or Sweet Vernalgrass. Introduced annual forbs, such as Prickly Lettuce, Field Pennycress, Flixweed, and Yellow Salsify, are frequent. Seeded perennial forbs including Alfalfa, Holy-clover, Chick-pea Milk-vetch, Blue Garden Flax, or native species are locally common. Invasive shrubs are occasional, with some areas dominated by roses, Scot's Broom, or Himalayan Blackberry. Native shrubs, grasses, and forbs typical of Montane–Foothill Grassland & Shrubland habitat may be present with variable cover. Although disturbed and composed of introduced species, this habitat still provides pollinator and wildlife forage and security habitat.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Source: LANDFIRE (2016)
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Snowbrush Ceanothus Chaparral

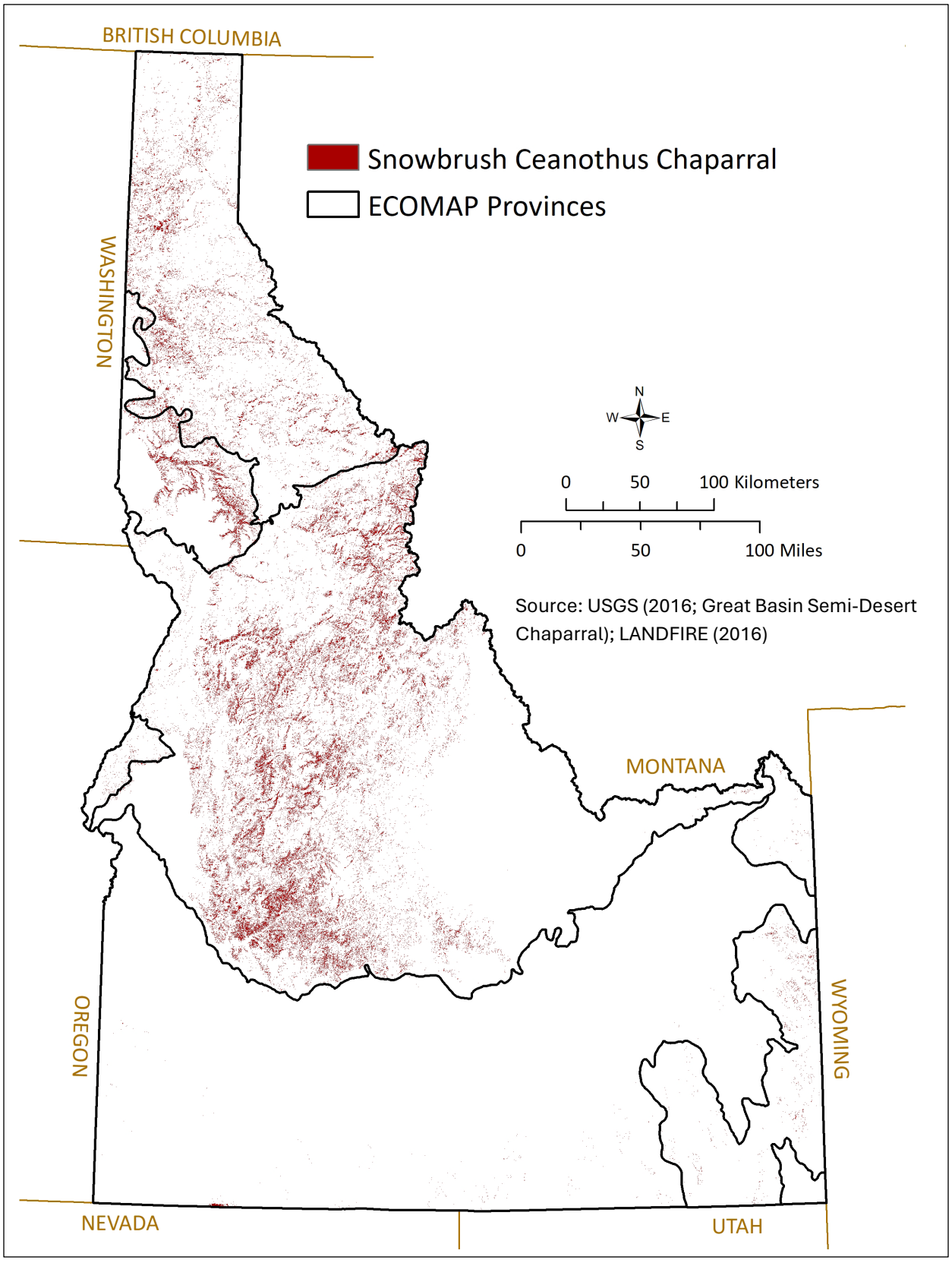
This habitat is widely distributed, mostly occurring as patches on montane to subalpine ridges and slopes where most precipitation occurs as snow. These shrublands have open to high-density canopies of cold-adapted evergreen sclerophyllous and deciduous shrubs with variable undergrowth. They often form in concave topographic features where snowdrifts accumulate. Stands also develop in recently-burned montane forest and Mountain Big Sagebrush stands. Many chaparral species are fire-adapted, resprouting vigorously after burning and producing fire-resistant seeds that require heat to germinate.



Camas Peak, Soldier Mountains, Idaho (cc) BY 2004
Jennifer Miller/IDFG

Many stands are located in relatively remote mountainous areas and are minimally altered. However, Snowbrush Ceanothus seeds germinate after fire, and fire suppression in some locations may limit seed germination and allow succession to conifer forests. Some areas are also experiencing dieback and replacement of this habitat due to reduced snow depth or early snowmelt. Associated or dependent SWAP species include Sharp-tailed Grouse, Moose, Grizzly Bear (Selkirk–Cabinet population), and Townsend's Big-eared Bat. Snowbrush Ceanothus Chaparral has a habitat relative status (i.e., S-rank) of S4 and there are 6 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Snowbrush Ceanothus is the dominant, diagnostic shrub. It is an early seral species with nitrogen fixation occurring in root nodules. Deciduous shrubs, such as Bitter Cherry, Chokecherry, Mountain Snowberry, Western Serviceberry, Scouler's Willow, or others may codominate, with less common species being Mountain Big Sagebrush, bitter-brushes, and Creeping Oregon-grape. Gaps in the shrub layer support native bunchgrasses such as Alaska Wheatgrass, Bluebunch Wheatgrass, Idaho Fescue, Nelson's Needlegrass, Great Basin Wildrye, Prairie Junegrass, and Sandberg's Bluegrass. Pinegrass or Geyer's Sedge can be locally common. Medium to tall forbs often occur, including Silvery Lupine, giant-hyssops, Western Sweet-root, eriogonums, and Spreading Dogbane. Various annual forbs can be prominent on bare soil, especially where snow lingers in the late spring.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Source: USGS (2016; Great Basin Semi-Desert Chaparral); LANDFIRE (2016)
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Shrub & Herb Wetland

These habitats occur on seasonally to semipermanently flooded, or annually saturated sites, such as depressions, sloped springs, saturated basins, and stream or river floodplains, ranging from the subalpine zone to low-elevation canyons. Vegetation includes peatlands (e.g., fens), freshwater marshes, alkaline–saline marshes, wet meadows, and swamp or riparian shrublands. Soils range from mineral in floodplains to organic in fens and many marshes. Wetlands are supported by groundwater, surface-water flooding, or a combination of sources. Plants are characteristically adapted to these wet conditions. They include locally dominant short to tall deciduous or evergreen shrubs, and emergent grass-like plants, grasses, and forbs, sometimes with a wet moss layer (especially in fens)—the types determined by flooding or saturation frequency and duration, drainage, and climate. There is <10% cover of scattered trees.

Bog & Fen

Fens are defined as groundwater-fed wetlands with >12 in (>30 cm) of peat, supporting plants and mosses adapted to nutrient-poor, saturated conditions. Peat bogs, rare in Idaho, occur where precipitation is the primary water source. Fens are uncommon in Idaho. They have groundwater constantly near the surface and cold temperatures, preventing decomposition of organic material (peat). Fens form in spring-fed areas, as floating mats on pond or lake margins, or in basins with perched aquifers. They occur at low elevations in north Idaho but are typically found in montane and subalpine zones.

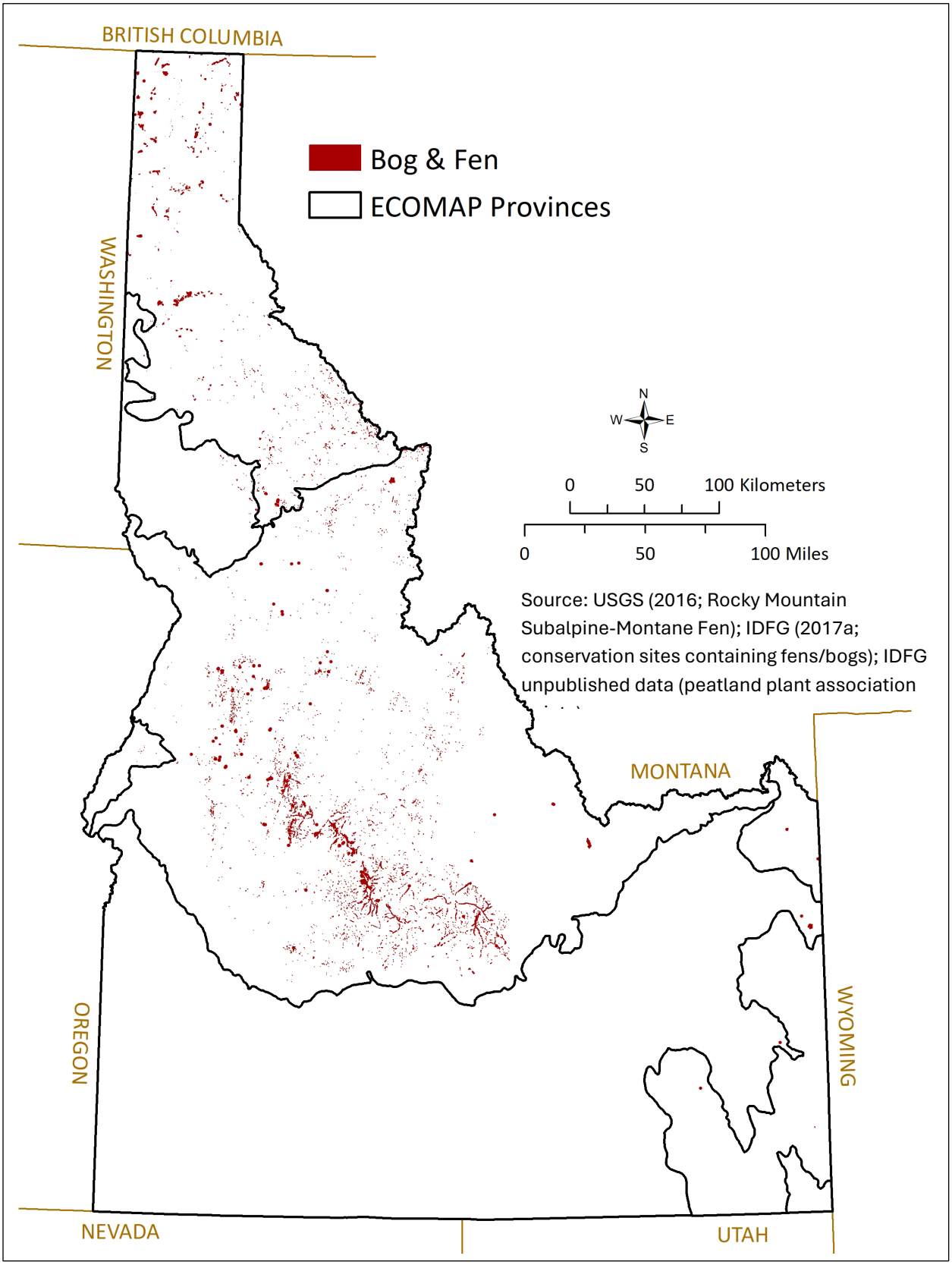


Tranquil Basin fen (cc) BY 2004 Lisa Harloe/IDFG

Nearly pristine fens can be found in remote high-elevation headwater mountain valleys. At lower elevations, the extent and condition of some fens have decreased due to several stressors affecting surface and subsurface hydrology and the sensitive plant communities. Associated, dependent, or near-obligate SWAP species include Black Tern, Olive-sided Flycatcher, Great Gray Owl, Grizzly Bear (Selkirk–Cabinet population), Northern Bog Lemming, and a click beetle (*Beckerus barri*). Bog & Fen has a habitat relative status (i.e., S-rank) of S2 and there are 6 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Fen pH reflects bedrock lithology and influences nutrient availability and plant communities. Alkaline fen pH is >6 in areas with calcareous or types of granite, while acidic bogs and fens occur on other bedrock with pH 4 to 6. Peat accumulation can form mounds or ridges that lie perpendicular to the direction of groundwater flow. This topography results in a complex mosaic of plant communities. Acidic bogs and fens typically have a sphagnum moss ground

layer. Lodgepole Pine and Engelmann Spruce trees are scattered. Heath family shrubs, primarily Bog Blueberry, Western Bog Laurel, and Trapper's Tea are abundant. Bog Birch, short willows (e.g., Wolf's and Diamondleaf), and Douglas's Spirea can be common. Dominant graminoids include Few-flowered Spike-rush, sedges (Southern Beaked, Water, Mountain, Wool-fruit, Cusick's, Mud, Buxbaum's, and Bristle-stalked), Many-spiked Bog Cotton, and Northern Deergrass. Forbs are abundant and include Buckbean, Purple Cinquefoil, Rocky Mountain Butterweed, White Marsh-marigold, and carnivorous species such as English Sundew and Western False-asphodel. Alkaline fens have a nonsphagnum moss layer. Bog Birch, Shrubby Cinquefoil, and willows are locally dominant. Few-flowered Spike-rush is characteristic, along with caespitose bulrushes (e.g., Northern Deergrass), sedges (Short-beaked, Pale), rushes, arrow-grasses, and Simple Kobresia. Forbs include Dwarf Meadowrue and Northern Grass-of-Parnassus. Fens support boreal plants that are rare in Idaho such as Bog-rosemary.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Source: USGS (2016; Rocky Mountain Subalpine-Montane Fen); IDFG (2017a; conservation sites containing fens/bogs); IDFG unpublished data (peatland plant association
MONTANA
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Freshwater Marsh

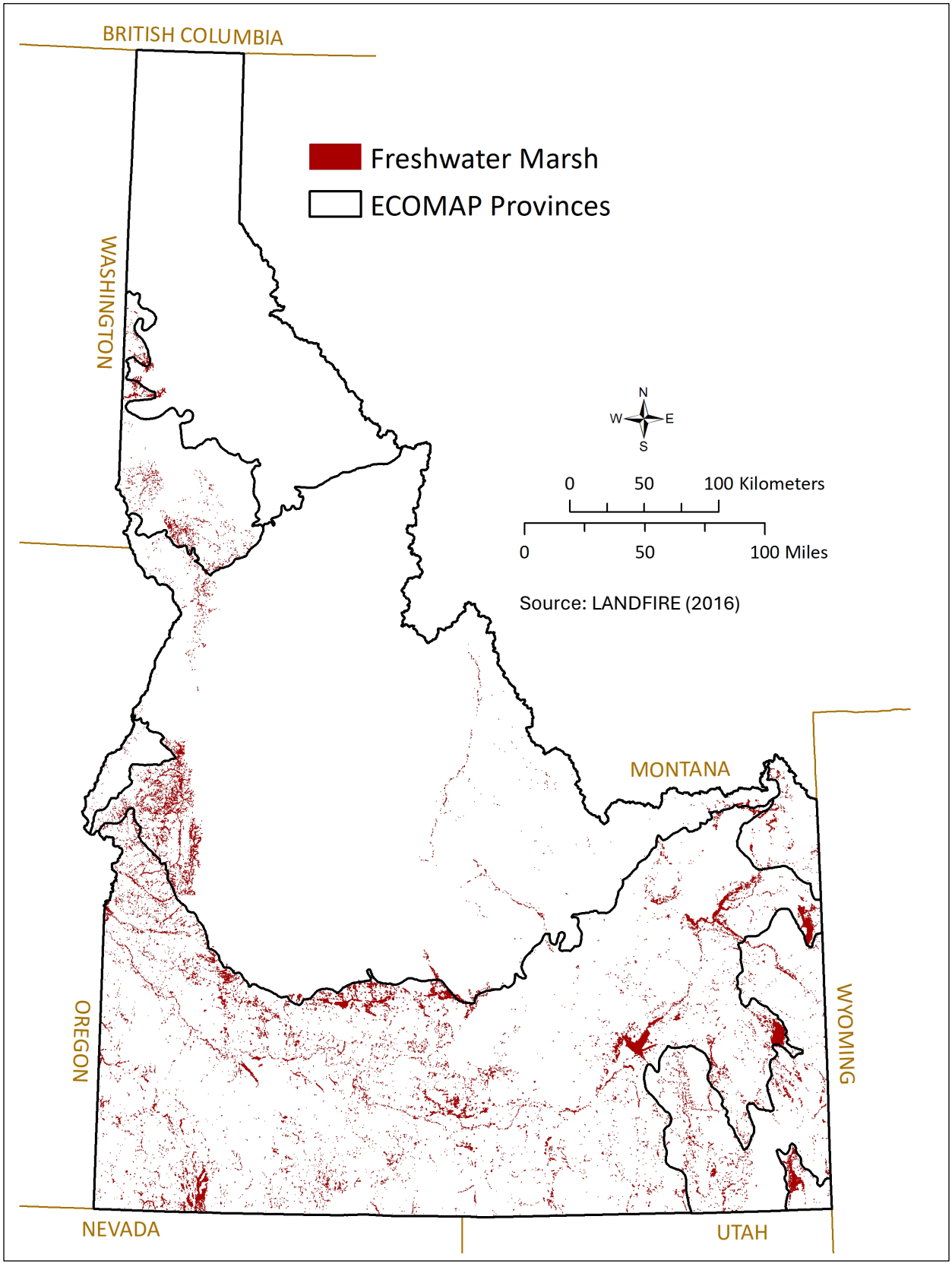


Grays Lake NWR, Idaho (cc) BY 2013 Chris Murphy/IDFG

Freshwater to brackish marshes across semiarid regions of Idaho. Marshes often occur in depressions such as river floodplain swales and oxbows, stockponds and reservoirs, created irrigation or wastewater wetlands, deflation areas between sand dunes, lake margins, and seasonally flooded basins. Marshes also form below springs, in river side channels, and along ditches and slow-moving streams. They are mostly small patch and semipermanently flooded by nutrient-rich freshwater, but flooding can be seasonal to permanent. The water table is often perched over impermeable clay, caliche, or bedrock. Soils are organic-rich or mineral. Periodic water drawdown is essential for organic matter decomposition and maintaining plant diversity.

Diverse, properly managed, and functioning marshes (created, restored, or naturally occurring) can be found across Idaho, especially on WMAs and NWRs. Associated, dependent, near-obligate, or obligate SWAP species include Northern Leopard Frog, Columbia Spotted Frog (Great Basin population), Northern Pintail, Trumpeter Swan, Black Tern, Franklin's Gull, American Bittern, White-faced Ibis, Sandhill Crane, 3 grebe SGCN (Clark's, Western, Eared), Short-eared Owl, Moose, and Water Howellia. Freshwater Marsh has a habitat relative status (i.e., S-rank) of S3 and there are 20 SWAP species for which this habitat is important, 5 of which are obligates (Appendix 5).

Vegetation is often characterized by tall emergent graminoids over 2 m tall, Common Cat-tail or bulrushes (Hardstem, Softstem, American Three-square). Plant diversity can be low in extremely dense stands. On tall emergent fringes, or in seasonally flooded marshes, shorter plants may dominate. Key species are Common and Walking spike-rushes, rushes (Baltic, Soft, Torrey's), bulrushes (Common Three-square, Seacoast Tuberous Bulrush, Small-fruit Bulrush), sedges, American Mannagrass, wild rices, Rice Cutgrass, Seaside Arrow-grass, Switchgrass, and Foxtail Barley. Common forbs include Stinging Nettle, milkweeds, water-hemlocks, hedge-nettles, goldenrods, Water Smartweed, Common Mare's-tail, Northern Water-plantain, arrowheads, bugleweeds, and Common Willow-herb. Annuals, such as beggar-ticks, smartweeds, docks, flatsedges, Barnyard-grass, and Rabbitsfoot Grass, germinate after water drawdown. Aquatic species, such as pondweeds (*Potamogeton* spp., *Stuckenia* spp.), Hornwort, Common Bladderwort, and duckweeds, occur in open water between emergent patches.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Freshwater Marsh
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Source: LANDFIRE (2016)
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Vernal Pool

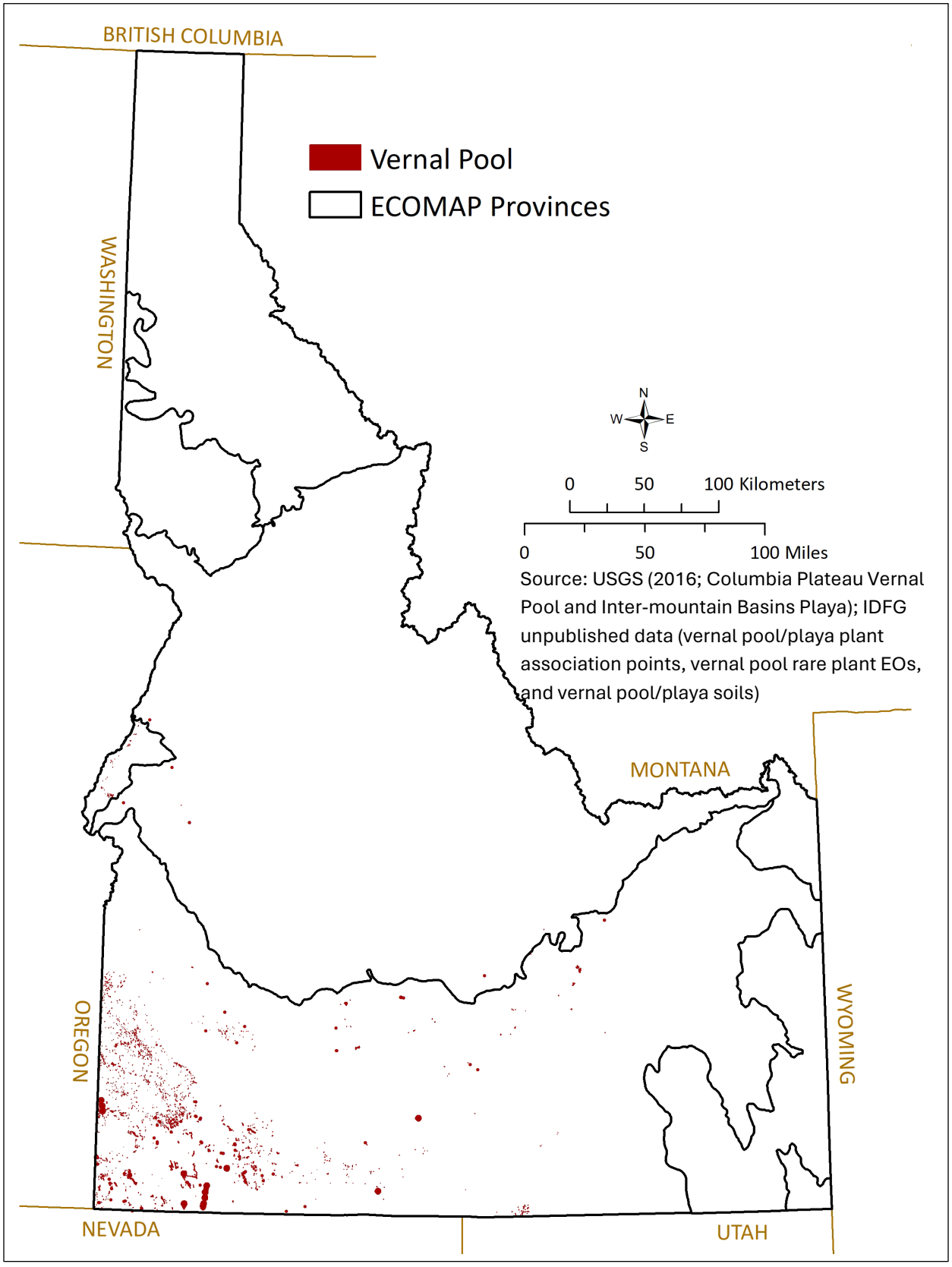
Shallow, ephemerally flooded precipitation and snowmelt-filled closed depressions ranging from small to lakelike. They occur on basalt plateaus and benches in foothills across south Idaho. Pools frequently fill with water during winter and spring. They dry by early summer, though in wet years they can remain inundated or may not flood in dry years. The average hydroperiod varies, lasting 10 to 100 days. Soils are typically silty clay, sometimes with sand or rock intermixed. Drainage is impeded by a clay or cemented layer, or bedrock.



Weiser River basin vernal pool, Idaho (cc) BY 2009 Chris Murphy/IDFG

Examples of intact vernal pools are scattered across remote and rugged expanses of the Owyhee Plateau. The hydrology, soil, and vegetation of vernal pools in many other areas of southwest Idaho is altered by various stressors including soil disturbance, invasive plants, wildfire, and drought. Associated, near-obligate, or obligate SWAP species include Great Basin Spadefoot, Northern Pintail, Cinnamon Teal, Greater Sage-Grouse, Constricted Fairy Shrimp, Water Howellia, and Mountain Blue-curls. Vernal Pool has a habitat relative status (i.e., S-rank) of S3 and there are 8 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Vernal pools have relatively high diversity of plants and invertebrates adapted to shallow ephemeral flooding. Communities can form distinct zones or concentric rings of plants with similar moisture tolerances. Some vernal pools are dominated by perennial species, namely Silver Sagebrush, which dominate the entire pool or form a ring around wetter herbaceous communities. Common Spike-rush and Mat Muhly are frequently dominant perennials in pools with longer inundation, co-occurring with Nevada Rush, Hairy Waterclover, Fringed Water-plantain, Common Camas, and Willow Dock, with Owyhee Sagebrush, Bottlebrush, Sandberg's Bluegrass, and Gumbo Biscuit-root on margins. Annuals frequently occur and are diverse, the most characteristic being Needle Spike-rush, Annual Hairgrass, popcorn-flowers, navarretias, White-margined Knotweed, Smooth Spike-primrose, Porterella, Sedge and Tiny mouse-tails, Tufted Foxtail, Dwarf Woolly-heads, downingias, and Purslane Speedwell. In southwest Idaho, playa-like vernal pools with rocky, whitish clay bottoms occur. They are irregularly flooded and often have only sparse plant cover, primarily the endemic Davis's Pepperwort, with claypan-adapted forbs such as spring parsleys. Due to the isolation and unique ecology of vernal pools, many endemic or specialized plants and invertebrates (e.g., fairy shrimps, tadpole shrimps) occur.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Source: USGS (2016; Columbia Plateau Vernal Pool and Inter-mountain Basins Playa); IDFG unpublished data (vernal pool/playa plant association points, vernal pool rare plant EOs, and vernal pool/playa soils)
MONTANA
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Lowland Marsh, Wet Meadow & Shrubland

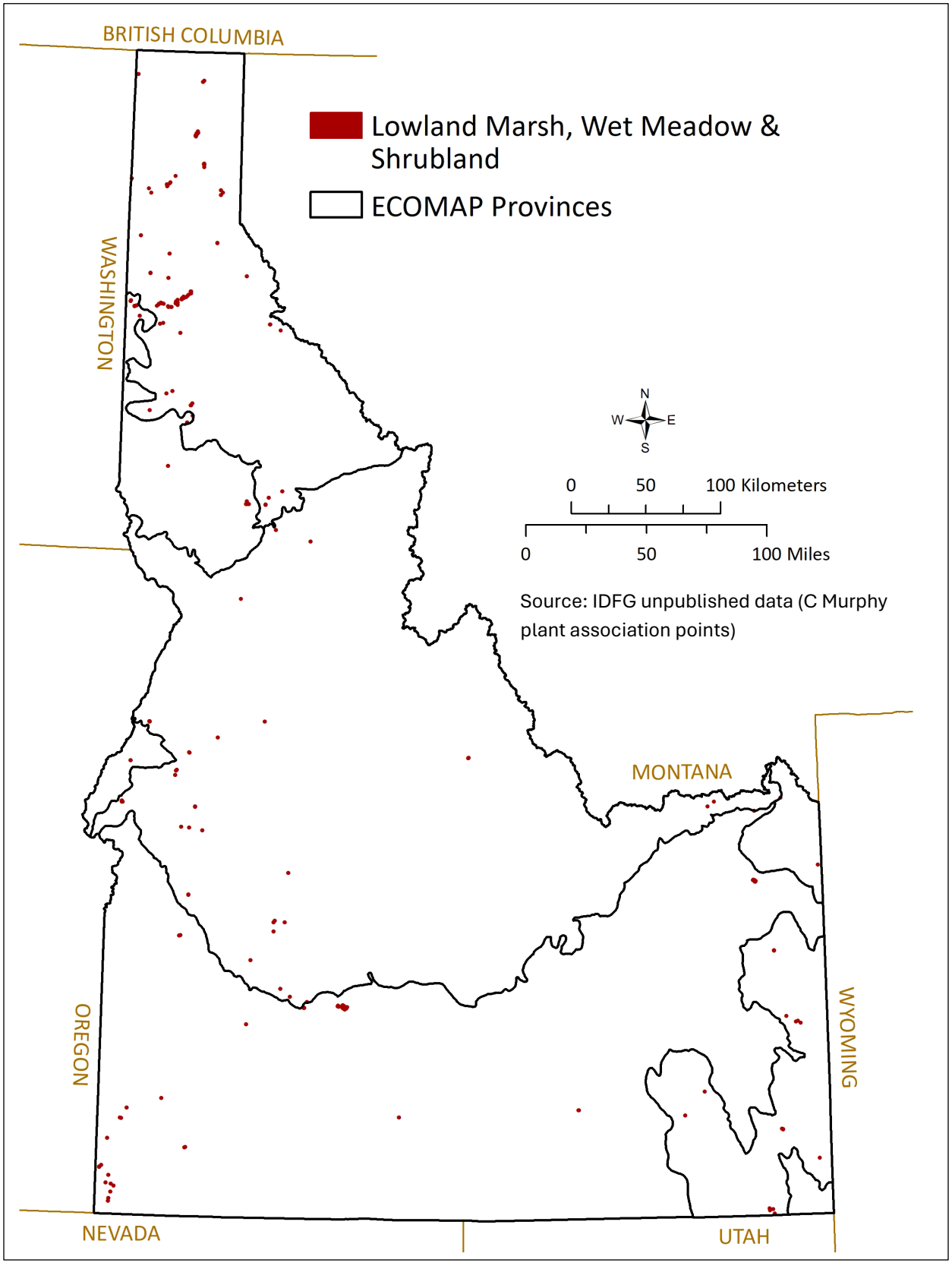


Duck Valley, Idaho (cc) BY 2005 Chris Murphy/IDFG

Low elevation, seasonally wet riparian shrublands, meadows, marshes, and mudflats in valleys, plains, and basins. This habitat occurs on flats, floodplains (oxbows, backwaters, depressions), pond and lake margins, sloped seeps and springs, drainages, and swales. Mudflats occur in drawdown zones of waterbodies. Hydrology is supported by groundwater or flooding. Meadows and pools are seasonally flooded or saturated, while marshes can be persistently flooded. Soils are fine-textured alluvium with drainage impeded by underlying clay.

Many of Idaho's most productive and diverse low-elevation marshes and meadows occur on WMAs such as the Coeur d'Alene River and Camas Prairie–Centennial Marsh. Examples of culturally important camas meadows occur at Weippe Prairie and Duck Valley. Other low-elevation seasonal wetlands are often altered by human land uses, lack of disturbance, and climate change. Associated, dependent, or obligate SWAP species include Western Toad, Northern Leopard Frog, Columbia Spotted Frog (Great Basin population), Northern Pintail, Trumpeter Swan, the migratory shorebird assemblage, Black Tern, Greater Sage-Grouse, Sandhill Crane, Short-eared Owl, Moose, Spotted Bat, Common Gartersnake, Yellow and Western bumble bees, Monarch Butterfly, Indian Valley Sedge, Water Howellia, and Ute Ladies-tresses. Lowland Marsh, Wet Meadow & Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 28 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Dominant shrubs include Mountain Alder, Douglas's Spirea, Douglas's Hawthorn, Red-osier Dogwood, roses, willows, Common Snowberry, and Pacific Ninebark. The herb layer includes Bluejoint Reedgrass, sedges, Fowl Mannagrass, Small-fruit Bulrush, Cow-parsnip, Stinging Nettle, Arrowleaf Groundsel, Columbian Monkshood, Lady-fern, and Skunk Cabbage. Graminoids dominate marshes, primarily bur-reeds, sedges, rushes, spike-rushes, bulrushes (Hardstem Bulrush, Wool-grass), wild rices, mannagrasses, and Common Cat-tail. Forbs are common, such as Water Horsetail, Purple Cinquefoil, Buckbean, beggar-ticks, bugleweeds, arrowheads, Northern Water-plantain, Common Mare's-tail, loosestrifes, skullcaps, and speedwells. Exposed mudflats support diverse mats of native and introduced annuals. Species composition in meadows varies. California Oatgrass, Tufted Hairgrass, spike-rushes, Baltic and Nevada rushes, Nebraska and Freeway sedges, Meadow Barley, Big Bluegrass, wildryes, wheatgrasses, Mat Muhly, and Common Three-square are diagnostic graminoids. Forbs can codominate, namely Common Camas, Northern Mule's-ears, ragworts, Slender Cinquefoil, Western Blue Flag, Western Mugwort, clovers, docks, asters, yampahs, beardtongues, and paintbrushes. Annuals are abundant and Silver Sagebrush is a locally abundant shrub.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Lowland Marsh, Wet Meadow & Shrubland
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Source: IDFG unpublished data (C Murphy plant association points)
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Montane Marsh, Wet Meadow & Shrubland

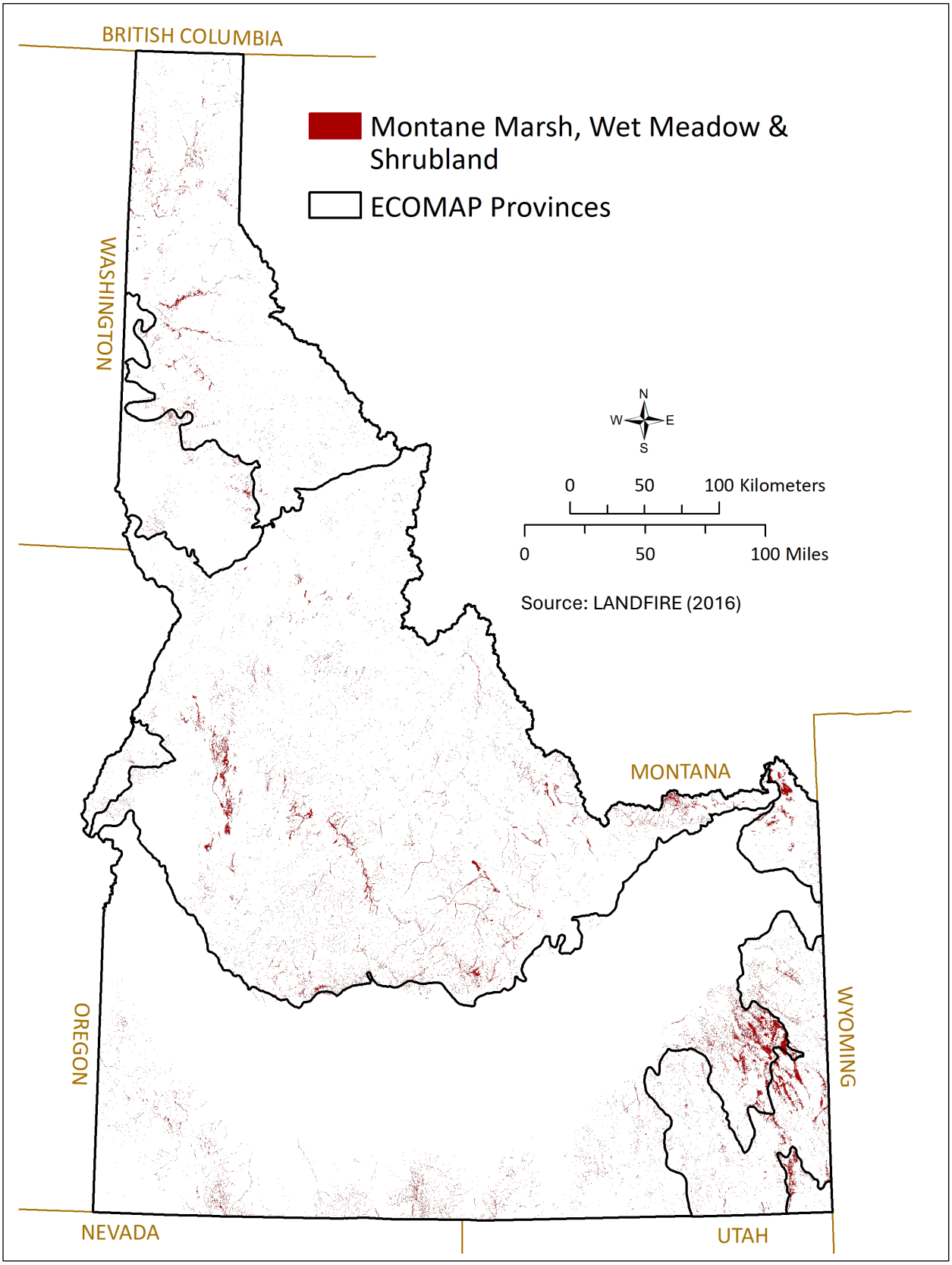
Diverse wet meadows, shrublands, and marshes in montane to subalpine areas. Shrubs dominate floodplains, terraces, and banks of streams and rivers; they often associate with North American Beaver activity. In glacial outwash basins, trough valleys, or cirques, they occur along low-gradient sinuous streams in a mosaic with wet meadows. Shrubs also occur on seep-fed slopes. Wet meadows occur in basins and troughs with high groundwater and shallow snowmelt flooding, or border springs, streams, ponds, and lakes. Soils tend to be mineral but have high organic content and hydric features.



Crane Meadow, Elk Creek, Idaho (cc) BY Chris Murphy/IDFG

Diverse and productive native wet meadows, riparian shrublands, and marshes commonly occur throughout montane watersheds and subalpine areas across Idaho. In some areas, floodplain processes necessary for sustaining meadows and shrublands have been disrupted due to various stressors. Associated, dependent, or near-obligate SWAP species include Western Toad, Northern Leopard Frog, Trumpeter Swan, Sandhill Crane, Wilson's Warbler, Moose, Western Small-footed Myotis, Northern Bog Lemming, Common Gartersnake, Western Bumble Bee, Monarch Butterfly, Bodin's Milk-vetch, and Clearwater Phlox. Montane Marsh, Wet Meadow & Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 27 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Shrubs vary in height, reflecting hydrology and elevation. Willows (Booth's, Drummond's, Geyer's, Bebb's, Lemmon's, Dusky), alders (Mountain, Sitka), Red-osier Dogwood, currants, Alder Buckthorn, Douglas's Hawthorn, Douglas's Spirea, Rocky Mountain Maple, Trapper's Tea, and Bearberry Honeysuckle are characteristic. Meadows support short-statured Bog Birch, willows (Wolf's, Diamondleaf, Eastwood's), Shrubby Cinquefoil, Sweet-berry Honeysuckle, Red Mountain-heath, and blueberries. Herbs vary depending on hydrology and soils. Dominant graminoids are sedges (Water, Southern Beaked, Mountain, Short-beaked, Woodrush, Nebraska, Woolly), Tufted Hairgrass, Bluejoint Reedgrass, Baltic Rush, Few-flowered Spike-rush, Pullup Muhly, Small-fruit Bulrush, and mannagrasses. High elevations have sedges (Black Alpine, Sheep) and rushes. Forbs can be conspicuous and include Jeffrey's Shooting Star, Globe Penstemon, Pink Elephants, lovages, bistorts, marsh-marigolds, camases, Plantainleaved Buttercup, Cleft-leaf and Arrowleaf groundsels, cinquefoils, Great Northern and Leafy-bracted asters, Flat-top Pussy-toes, false hellebores, Lyall's Angelica, Cow-parsnip, Wandering Daisy, paintbrushes, Stinging Nettle, monkshoods, Little False Solomon's Seal, Lady-fern, horsetails, Bog St. John's-wort, claytonias, Large-leaved Avens, bedstraws, and Dwarf Enchanter's Nightshade. Marshes, flooded more deeply and persistently, form around beaver ponds, lakes, and depressions. Spike-Rushes, Kellogg's and Inflated sedges, and bur-reeds are common.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Source: LANDFIRE (2016)
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Lowland–Foothill Riparian Shrubland

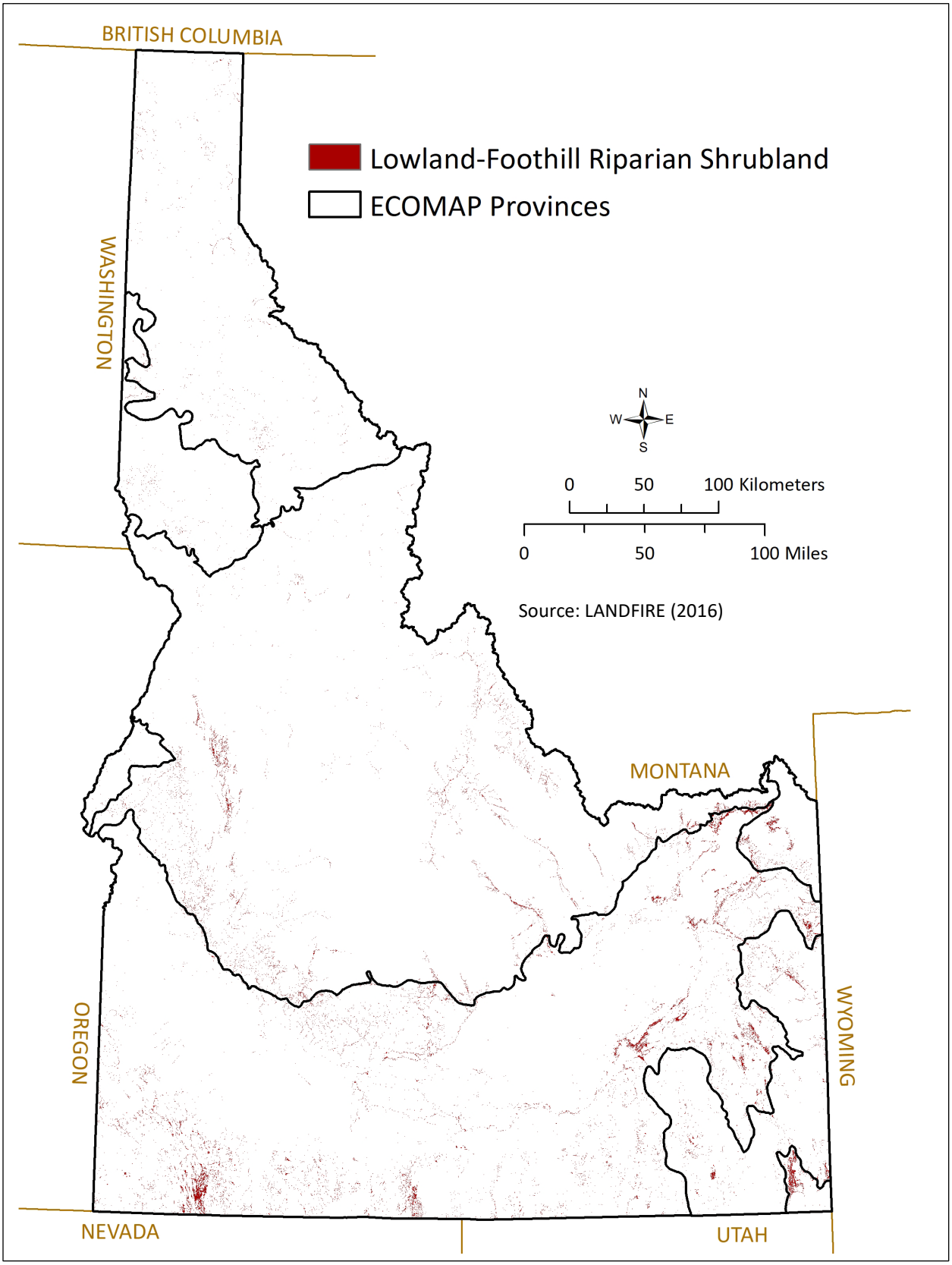
Shrublands associated with foothill, canyon, basin, and lower montane permanent, intermittent, or ephemeral streams and rivers. These habitats occur in semiarid and warm regions. Stands occur in steep, v-shaped valleys and canyons, or in broad and flat alluvial river valleys. They can be extensive on river floodplains or form narrow bands along small tributaries. Substrates are often sandy, gravelly, and cobbly alluvium found on islands, bars, banks, and terraces. Shrublands also occur around springs and seeps, along backwater and side channels, and on margins of swales, interdune depressions, beaver ponds, marshes, and wetlands. Many shrubs require flooding and bare alluvium for establishment. Most stands are maintained by annual flooding (seasonal or irregular). The water table is usually just below the surface for at least part of the growing season.



Willow Creek, South Fork Boise River
(cc) BY 2003 Ed Bottum

Many examples of functioning riparian shrublands with native vegetation occur in less-developed foothill valleys across Idaho. However, the condition of this habitat in many locations has been impacted by various human land uses, changes in hydrology, invasive plant species, and climate change. Associated or dependent SWAP species include Woodhouse's Toad, Great Basin Spadefoot, Common Nighthawk, Mountain Quail, Greater Sage-Grouse, Western Spotted Skunk, Moose, Long-legged Myotis, Common Gartersnake, Western Bumble Bee, Monarch Butterfly, Gillette's Checkerspot, Least Bladdery Milk-vetch, Indian Valley Sedge, and Ute Ladies-tresses. Lowland–Foothill Riparian Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 34 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

There is a diverse mix of shrubs (1.6 to >16 ft tall; 0.5 to >5 m tall). Frequent dominant species are willows (Coyote, Arroyo, Yellow, Whiplash, Dusky), Water Birch, Mountain Alder, Douglas's and River hawthorns, Woods' Rose, Lewis's Mock Orange, Chokecherry, Common Snowberry, Golden Currant, Red-osier Dogwood, Rocky Mountain Maple, Lemonade Sumac, Western Poison Ivy, Hairy Goldaster, sagebrushes, and introduced False Indigo. Herbs vary depending on shrub density and flood disturbance. The most abundant species are Blue Wild-rye, Fowl Mannagrass, Common Spike-rush, sedges (Kellogg's, Woolly, Dewey's, Nebraska, Sheldon's), rushes, bulrushes (Small-fruit Bulrush, Common Three-square), California Oatgrass, Stinging Nettle, goldenrods, Wild Mint, horsetails, Lady-fern, Little False Solomon's Seal, Sweet-cicely, Red Columbine, asters, Cow-parsnip, Western Mugwort, Common Willow-herb, Large-leaved Avens, and bedstraws. Less common grasses include Great Basin Wildrye, Fowl Bluegrass, and wheatgrasses. Presence of Black Cottonwood indicates succession toward riparian forest.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Source: LANDFIRE (2016)

Ruderal Marsh, Wet Meadow & Shrubland

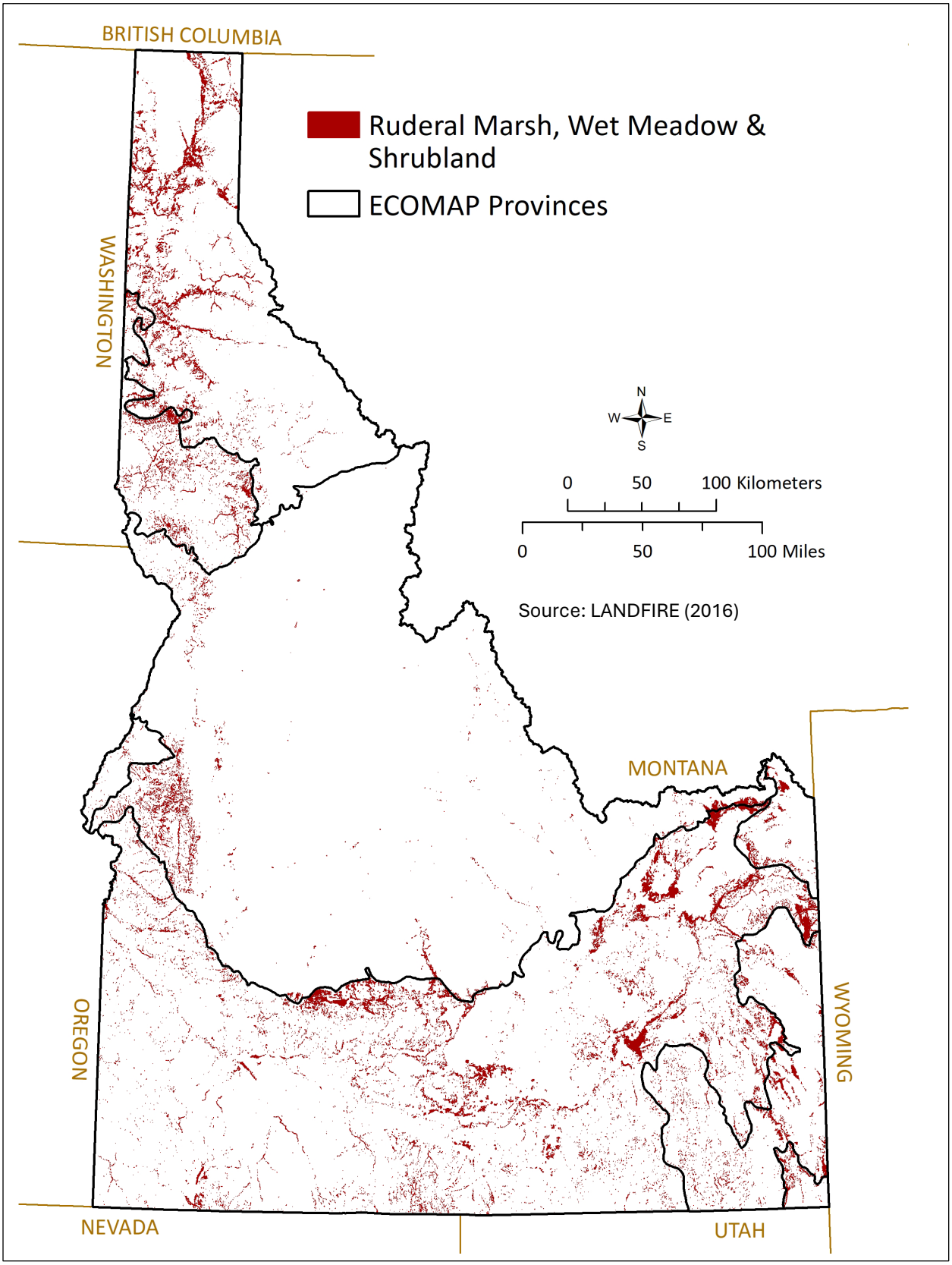
Wet meadows, marshes, and shrublands dominated by introduced weedy species and occurring in valleys across Idaho. Stands occur on disturbed river and stream terraces, in altered floodplains, adjacent to reservoirs and ponds, in created and natural marshes, around altered seeps and springs, and in irrigated agricultural areas.



Clark Fork River delta (cc) BY 2017 Mia Johnson

Associated SWAP species include Western Toad, Northern Pintail, Sandhill Crane, Moose, Common Gartersnake, Yellow and Western bumble bees, Monarch Butterfly, Indian Valley Sedge, Clearwater Phlox, and Ute Ladies-tresses. Ruderal Marsh, Wet Meadow & Shrubland has a habitat relative status (i.e., S-rank) of SNA and there are 14 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Introduced False Indigo, roses (Dog, Sweetbrier), Himalayan Blackberry, shrubby cherries, or tamarisks dominate shrub patches. If present, neither introduced nor native trees are dominant. Relict or recovering native shrubs, such as willows, hawthorns, Woods' Rose, Douglas's Spirea, or Western Poison Ivy, may be intermixed. Reed Canarygrass frequently dominates shrub understories and meadows. Other abundant or dominant introduced grasses include Meadow Foxtail, bentgrasses, Quackgrass, Smooth Brome, and Kentucky Bluegrass. Other forage grasses, such as fescues, Timothy, Orchard-grass, and Intermediate Wheatgrass, are common. Noxious and highly invasive weeds, including Common Reed, Canada Thistle, Pepperwort, Poison-hemlock, Yellow Flag, Oxeye-daisy, Purple Loosestrife, Narrow-leaved Cat-tail, Common Tansy, Common Teasel, and Common St. John's-wort, are typically present. A wide variety of other introduced herbs common to disturbed sites (often annuals) occur, such as bromes, Barnyard-grass, Switchgrass, Rabbitsfoot Grass, Curly Dock, Watercress, smartweeds, Common Yellow Sweet-clover, Catnip, clovers, Field Pennycress, Scentless Mayweed, plantains, Sheep Sorrel, Flixweed, pepperweeds, Blue Mustard, Tall Tumblemustard, Prickly Lettuce, Yellow Salsify, Fivehorn Smotherweed, Summer Cypress, Common Orache, Common Purslane, and speedwells. Native recovering, seeded, and disturbance-tolerant herbs are intermixed but not dominant. They include Common Cat-tail, bulrushes, rushes, sedges, spike-rushes, barleys, bluegrasses, wheatgrasses, Stinging Nettle, goldenrods, horsetails, milkweeds, docks, smartweeds, willow-herbs, Wild Mint, Poverty-weed, Western Mugwort, Bracken, asters, cinquefoils, and annuals. Although dominated by introduced species, these wetlands provide important ecosystem services (e.g., nutrient and sediment retention, habitat).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Source: LANDFIRE (2016)
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Alkali–Saline Marsh, Playa & Shrubland

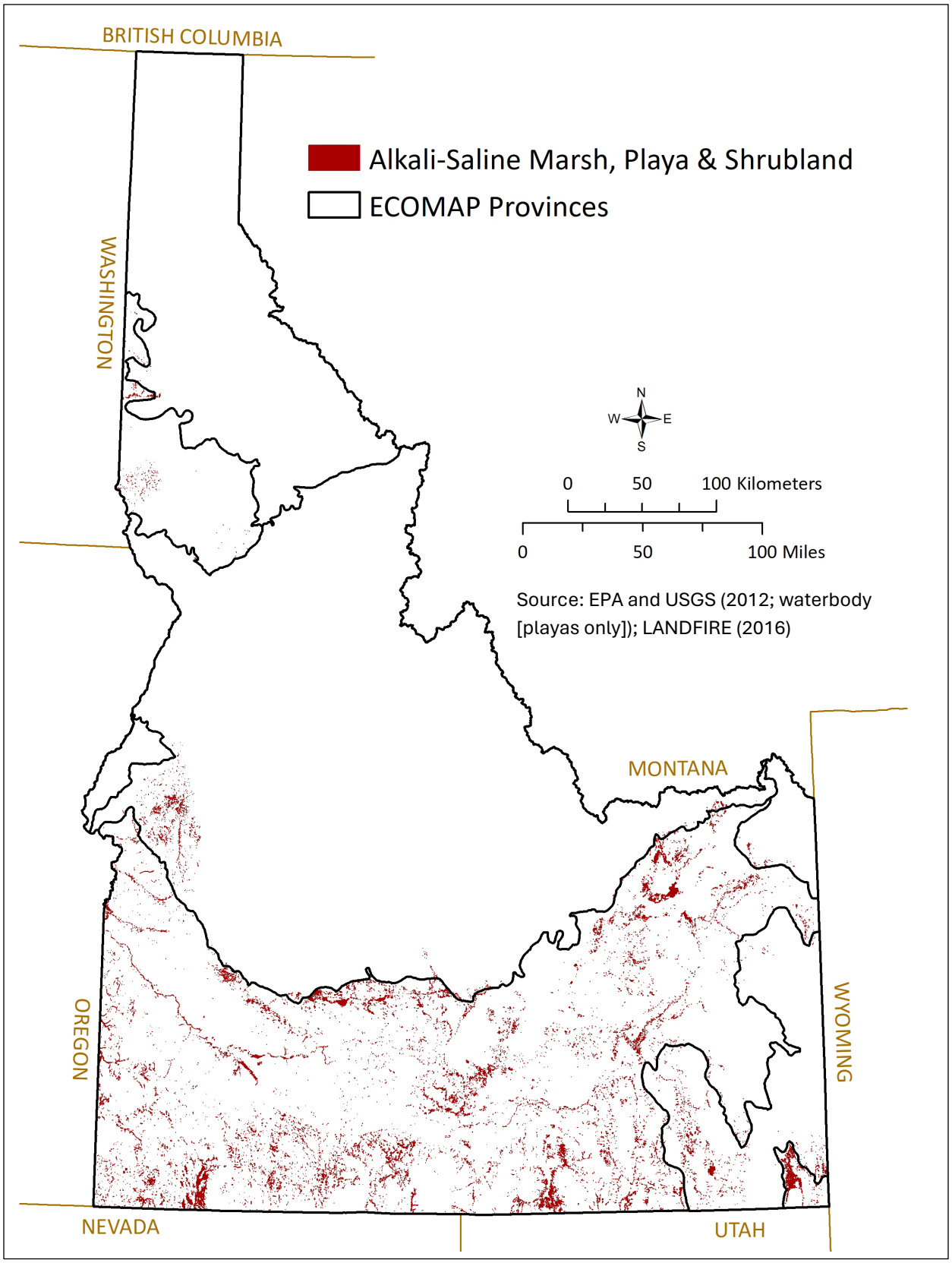
Seasonally saturated or flooded shrubland, meadows, and brackish emergent marshes. This habitat occurs where evaporation far exceeds precipitation, and groundwater and clay-rich soils are alkaline and sometimes saline. Salt crusts occur where groundwater evaporates and around drying ponds. Plant communities reflect soil moisture and are composed of species tolerant of harsh alkaline and saline soils. Most sites are gently sloping, but they also include closed depressions, alluvial flats, slopes with hot or cold springs and seeps emanating from calcareous rock, and barren playas (rare in Idaho).



Roswell Marsh Wildlife Habitat Area, Boise River (cc) BY
2012 Chris Murphy/IDFG

Although Black Greasewood is widely distributed, alkaline–saline wet meadows and marshes dominated by native vegetation are less common but can be found on some WMAs (e.g., Market Lake, CJ Strike), wildlife habitat areas (WHAs) (e.g., Roswell Marsh), or NWRs (e.g., Bear Lake). Associated or dependent SWAP species include Northern Pintail, Cinnamon Teal, Greater Sage-Grouse, Sandhill Crane, Dark Kangaroo Mouse, Kelsey's Phlox (subsp. *glandulosa*), Nevada Goldenrod, and xanthoparmelia lichen (*Xanthoparmelia norchlorochroa*). Alkali–Saline Marsh, Playa & Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 9 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Dense to open shrublands occupying sites with deeper groundwater are dominated by Black Greasewood, mixed with rabbit-brushes, Green Molly, saltbushes, Shrubby Cinquefoil (east Idaho), willows, and rarely Iodine Bush. Trees, such as Russian Olive or Limberpine, are marginal. The herbaceous understory and adjacent mesic meadows are characterized by Saltgrass, Alkali Sacaton, sedges (Freeway, Parry's), Baltic Rush, Western Wheatgrass, Beardless Wildrye, Great Basin Wildrye, Big Bluegrass, Slimstem Reedgrass, barleys, or seeded Tall Wheatgrass. Forbs are not abundant in greasewood and include Showy Milkweed, Common Yarrow, Alkali-mallow, and Poverty-weed. Seasonally flooded or saturated marshes and wet meadows are dominated by a mix of bulrushes (American Three-square, Common Three-square, Seacoast Tuberous Bulrush, Nevada Clubrush), Walking Spike-rush, Saltgrass, alkaligrasses, Alkali Muhly, Alkali Cordgrass, Short-beaked Sedge, Seaside Arrow-grass, Torrey's Rush, and Rabbitsfoot Grass. Characteristic forbs include Pahute Weed, Saltwort, Silverweed, Short-rayed Aster, Swamp Milkweed, Cut-leaved Water Parsnip, Western Centaury, and occasionally Red Glasswort and Alkali Plantain. Eastern Idaho calcareous seep-fed meadows host a suite of uncommon forbs, including the globally rare Alkaline Primrose and Meadow Milk-vetch.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Source: EPA and USGS (2012; waterbody [playas only]); LANDFIRE (2016)
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Desert & Semidesert

These habitats occur in areas with a semiarid climate, or where moisture availability is limited by topography (slope, aspect, windy ridges), landform, or soil type (coarse, thin, well-drained, erosion prone, alkaline). These habitats range from hot and dry low-elevation canyons and plains, to foothill, montane, or even subalpine southerly facing slopes and ridges. Plant cover and density varies by site. Vegetation can be sparse on harsh or unstable substrates such as sand dunes, cliffs, talus, scree, lava fields, and clay or volcanic ash badlands. Protected, mesic sites with productive soil have higher plant cover. Frequent fire is a major disturbance determining shrub cover and species composition. Shrublands (with >10% shrub cover) are often dominated by small-leaved, often evergreen, dwarf to medium-height shrubs (<7 ft; <2 m) that are adapted to extended drought and variable precipitation. The shrub understory, or open grassland where shrubs are lacking, is dominated by bunchgrasses, with abundant annual grasses in disturbed sites. Forb cover and diversity varies, but they are typically most abundant in mesic or disturbed areas. Soils vary in productivity, but are sometimes rocky, gravelly, or sandy. Areas of open bare soil or biological soil crusts may occur between plants.

Dry Shrubland & Grassland



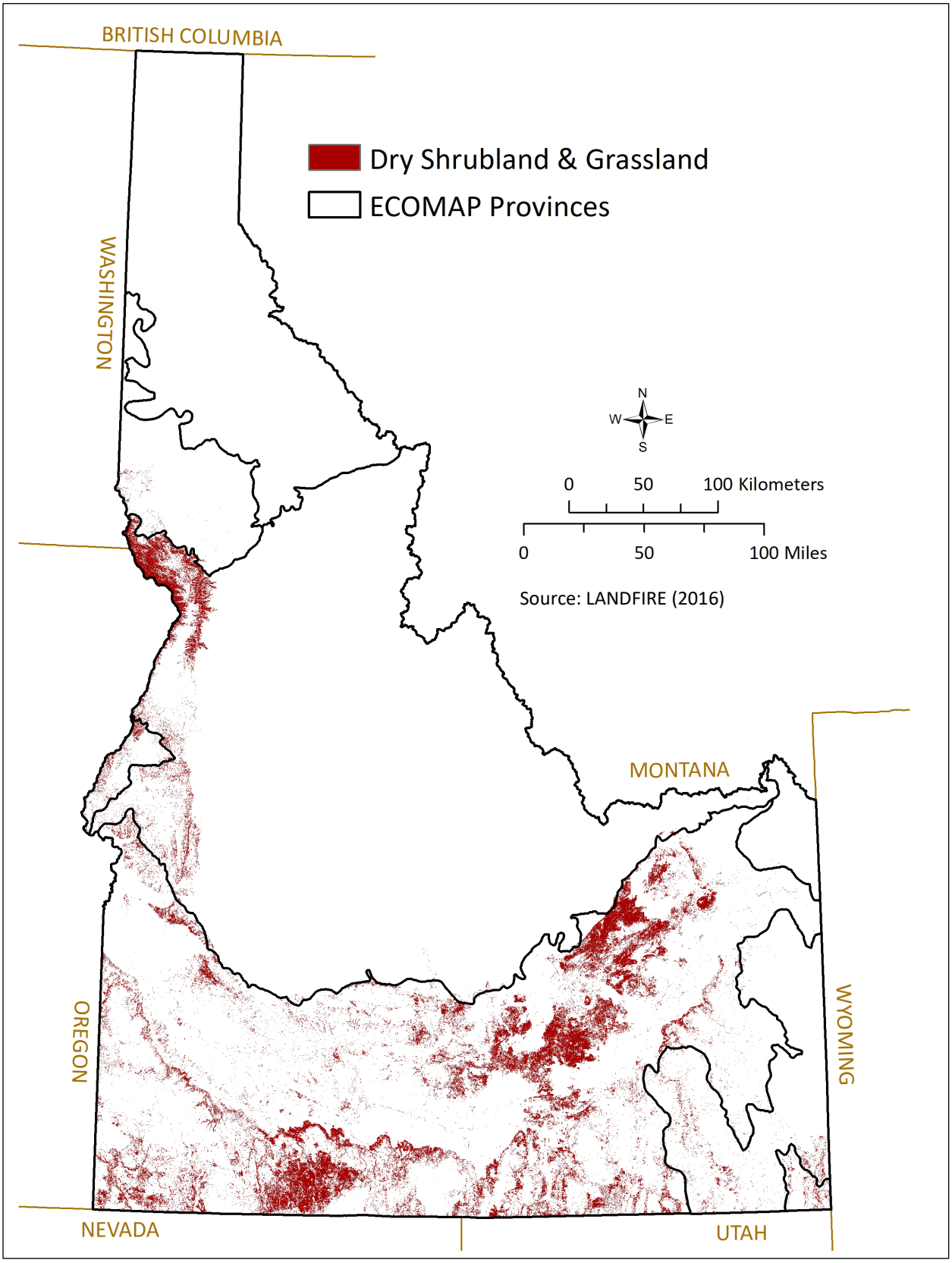
Boise Foothills (cc) BY 2007 Chris Murphy/IDFG

Low-elevation shrublands and grasslands composed of highly drought-resistant plants found in semiarid to arid settings. Stands occur on plateaus, breaklands, bluffs, foothill slopes (south to west aspects), and alluvial fans and benches, including in hot and dry river canyon bottoms. Substrates are well drained and often gravelly or rocky, with sandy or loamy soils derived from weathered bedrock, alluvium, or lakebed deposits. Other sites include stabilized dunes, ash beds, cinder, and clay. Semidesert shrublands and grasslands occupy much more xeric sites compared to more productive areas of higher soil moisture or precipitation. Soils in this habitat have relatively low cover of perennial vegetation and microbiotic crusts, making them vulnerable to erosion if disturbed.

Intact dry shrublands and grasslands dominated by native vegetation occur along major river canyons and on scattered foothills of south and central Idaho. Elsewhere, this habitat has been affected by various human land uses, invasive plants, and wildfire. Associated, dependent, near-obligate, or obligate SWAP species include Western Toad, Long-Billed Curlew, Ferruginous Hawk, Greater Sage-Grouse, Sharp-tailed Grouse, Grasshopper Sparrow, Short-eared Owl, Burrowing Owl, Pronghorn, California and Rocky Mountain bighorn sheep, Hoary Bat, Pygmy Rabbit, Dark Kangaroo Mouse, Southern Idaho Ground Squirrel, Desert Horned

Lizard, Morrison Bumble Bee, Salmon Oregonian, Cottonwood Oregonian, Pahove Sandverbena, Asotin Milk-vetch, and Macfarlane's Four-o'clock. Dry shrubland and grassland has a habitat relative status (i.e., S-rank) of S3 and there are 50 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Vegetation is a mix of shrubs or dwarf-shrubs, or grass-dominated with a sparse shrub layer, but total cover is low (10% to 30%). Frequent shrubs are Green, Common, and Truckee rabbit-brushes, Little-leaf Horse-brush, Cottonhorn, Spiny Hopsage, Wingscale, Sheepfat, Winterfat, Gray Ball Sage, Granite Prickly-phlox, Slenderbush Buckwheat, and Broom Snakeweed. Sagebrushes, bitter-brushes, greasewoods, or junipers co-occur, but rarely have >5% cover. Periodic fire prevents shrub invasion in grasslands. Characteristic grasses include Needle-and-Thread, Indian Ricegrass, Threeawn, Sand Dropseed, Salmon Wildrye, Bluebunch Wheatgrass, Sandberg's Bluegrass, Bottlebrush, and Cheatgrass. Forbs can be diverse but have low cover. Characteristic native forbs include pricklypear cactus, Arrowleaf Balsamroot, Shaggy Fleabane, milk-vetches, Northwestern Paintbrush, Hoary Chaenactis, Naked-stemmed Sunray, Thorny Skeletonweed, Hoary-aster, Pale Evening-primrose, Sand Dune Penstemon, and Bushy Stanleya. Favorable precipitation can result in a flush of annuals.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Source: LANDFIRE (2016)
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Sparsely Vegetated Dune Scrub & Grassland

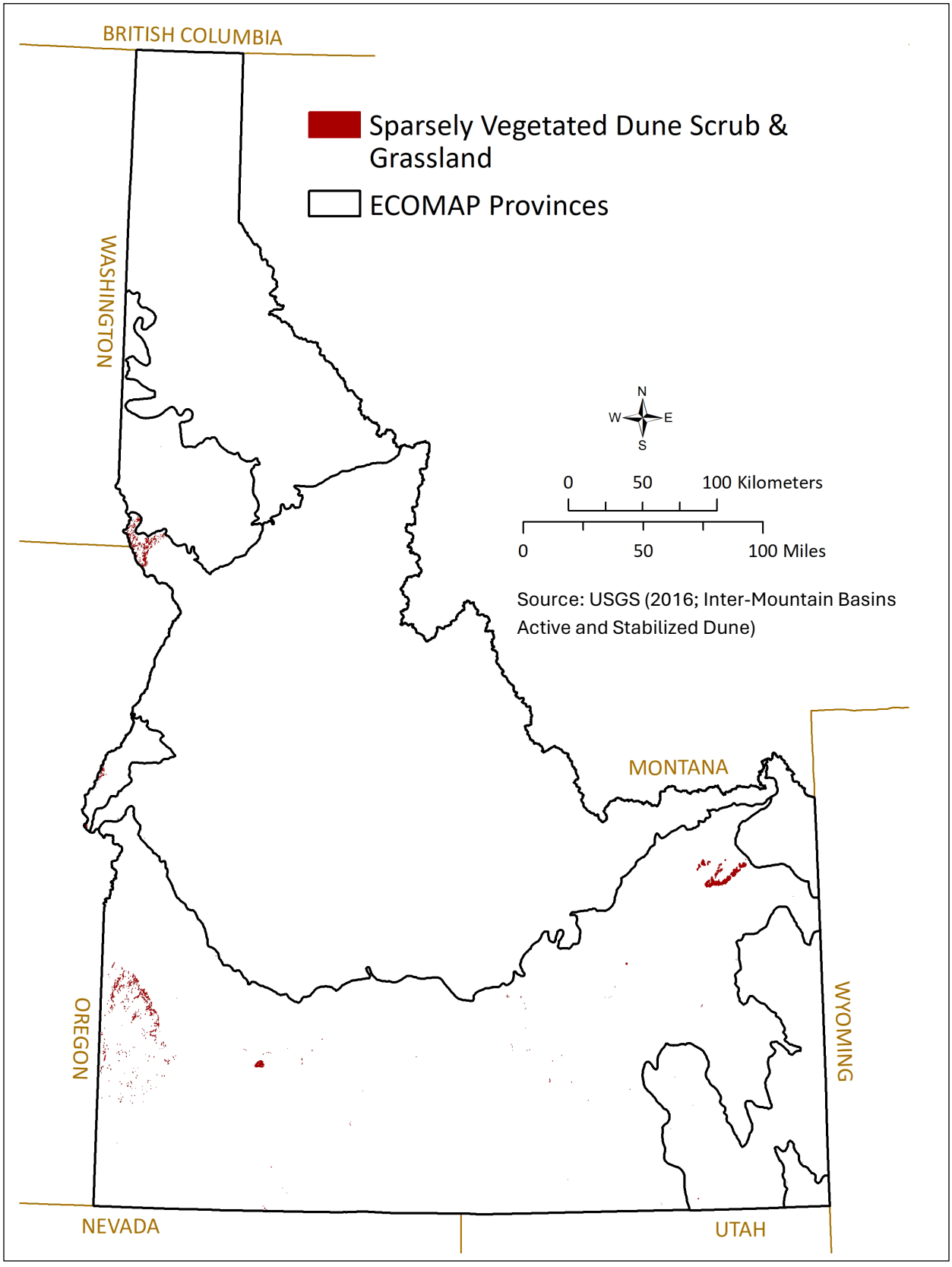
Barren to sparsely vegetated active and partially stabilized dunes and sandsheets. Species occupying these environments are adapted to shifting sand and form sparse scrub and patchy or open grasslands usually having <10% cover.



Bruneau Dunes State Park, Bruneau, Idaho (cc) BY 2007 IDFG

The large dune complexes at Bruneau Dunes State Park and remote regions of St. Anthony Sand Dunes are intact and healthy. Dunes are not unique however to the St Anthony or Bruneau complexes. For example, many smaller active dunes or dune complexes also occur on the Snake River Plain between American Falls and Dietrich, which harbor the Idaho Dunes Tiger Beetle. In some areas, dune stabilization and increased invasive plants, which promote further dune stabilization, have reduced suitable habitat for dune-obligate native species. Associated or obligate SWAP species include Western Toad, Western Spotted Skunk, Kit Fox, Yuma Myotis, ant-like flower beetle (*Amblyderus owyhee*), 3 tiger beetle SGCN (Idaho Dunes, Columbia River, Bruneau Dune), Weist's Primrose Sphinx, Lined June Beetle, and a moth (*Protogygia arena*). Sparsely Vegetated Dune Scrub & Grassland has a habitat relative status (i.e., S-rank) of S3 and there are 20 SWAP species for which this habitat is important, 8 of which are obligates (Appendix 5).

Yellow Wildrye, Indian Ricegrass, Needle-and-Thread, and Lance-leaf Scurf-pea are characteristic. Shrubs are patchy to scattered and commonly include Basin Big Sagebrush, rabbit-brushes, bitter-brushes, Chokecherry, Granite Prickly-phlox, and Wingscale. Rocky Mountain Juniper is sometimes present. Other perennial forbs with low cover include Franklin's Sandwort, White Sandverbena, Veiny Dock, Sand-lily, Booth's Mooncup, Pale Evening-primrose, Western Prairie-clover, Whiteleaf Phacelia, and Naked-stemmed Sunray. If precipitation and microsites are favorable, annuals may be abundant, including Bur Ragweed, Geyer's Milk-vetch, cryptanthas, sun cups, annual buckwheats, annual lupines, desert dandelions, White-stemmed Mentzelia, Purple Nama, Nuttall's Crinklemat, and gilias.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Sparsely Vegetated Dune Scrub & Grassland
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Source: USGS (2016; Inter-Mountain Basins Active and Stabilized Dune)
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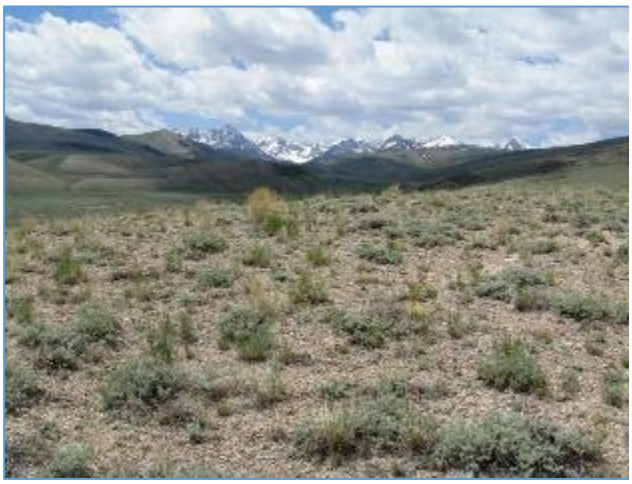
Dwarf Sagebrush Steppe & Shrubland

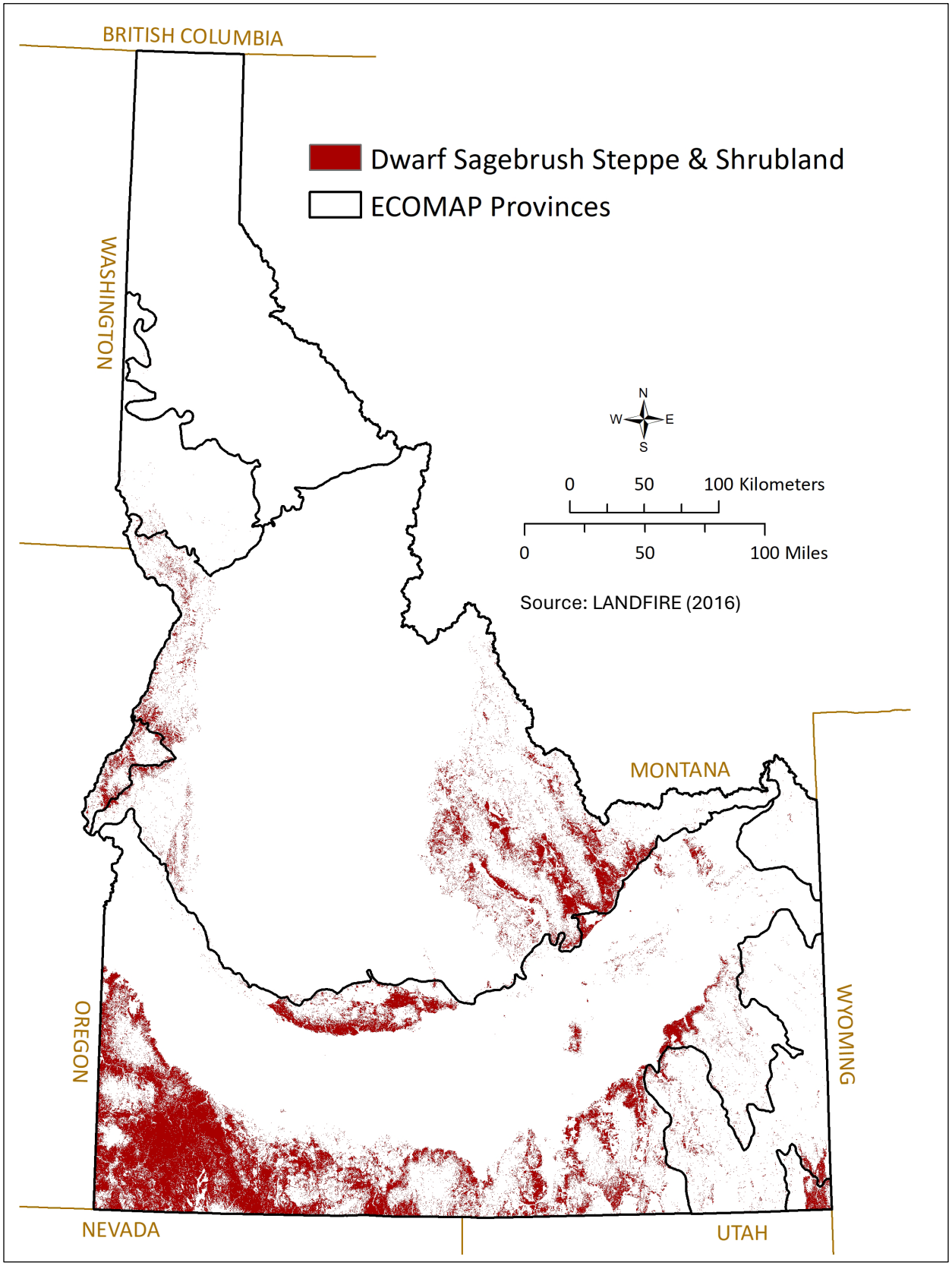
Xeric dwarf shrubland steppe found on windblown convex ridges, plateaus and benches, gravelly alluvial fans and flats, and gravelly or rocky slopes. Stands occur across drier regions of Idaho, from low elevation basins to montane and subalpine ridges. Soils are shallow over bedrock or pans, and fine textured but often with rocks and gravel intermixed. Soils are derived from alluvium or bedrock residuum (frequently basalt or rhyolite) and can be calcareous when derived from limestone.



Donkey Hills, Dry Creek, Idaho (cc) BY 2008 Beth Colket/IDFG

Extensive areas of intact habitat dominated by native species occur on plateaus, ridges, and slopes across southern Idaho. Many of these areas have rocky-clayey soils with naturally lower productivity that are resistant to annual grass invasion; however, they can be vulnerable to soil compaction. Associated, dependent, near-obligate, or obligate SWAP species include Great Basin Spadefoot, Common Nighthawk, Golden Eagle, Ferruginous Hawk, Greater Sage-Grouse, Burrowing Owl, Pronghorn, Big Brown Bat, Pygmy Rabbit, Dark Kangaroo Mouse, Southern Idaho Ground Squirrel, Great Basin Collared Lizard, Pygmy Short-horned Lizard, Idaho Point-headed Grasshopper, Yellow Bumble Bee, Columbia Oregonian, and Winward's Goldenbrush. Dwarf Sagebrush Steppe & Shrubland has a habitat relative status (i.e., S-rank) of S4 and there are 34 SWAP species for which this habitat is important, 2 of which are obligates (Appendix 5).

Dwarf sagebrush species and herb cover varies according to soil and climate. Black Sagebrush is widespread, occurring on gravelly, calcareous soils. Low Sagebrush also occurs widely, but on shallow, fine-textured soils over bedrock or pan that impedes drainage. Fringed Sagebrush can occur at higher elevations. Adapted to poor drainage and spring saturation, Low Sagebrush (subsp. *longiloba*) occurs on shallow, alkaline, clayey soils, while Stiff Sagebrush is found on shallow lithic soils over basalt in western Idaho including areas of mounded topography. On scabland sites, shrubby buckwheats (Thyme Buckwheat, Round-headed Eriogonum) are locally dominant. Other shrubs can be present or codominant, including Antelope-brush, Big Sagebrush, Spiny Hopsage, and saltbushes, especially on deep soil mounds. Herbaceous cover is lowest on scabland sites. Characteristic bunchgrasses include Sandberg's Bluegrass, Idaho Fescue, Bluebunch Wheatgrass, Indian Ricegrass, Bottlebrush, One-spike Wild Oatgrass, Thurber's Needlegrass, and introduced Bulbous Bluegrass. Forbs include cushion, woody-based, and deeply taprooted species such as Hooker's Balsamroot, Barestemmed, Gumbo, Gray's, and Wyeth biscuit-roots, Hood's Phlox, fleabanes, goldenweeds, Big-head Clover, pussy-toes, Crag Ankle-aster, Gairdner's Penstemon, onions, rockcresses, Gairdner's Yampah, paintbrushes, hawksbeards, and stonecrops. Annuals, such as knotweeds, may be seasonally common. Moss and lichen cover is high in undisturbed areas.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Dwarf Sagebrush Steppe & Shrubland
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Source: LANDFIRE (2016)
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UTAH

Tall Sagebrush Steppe & Shrubland

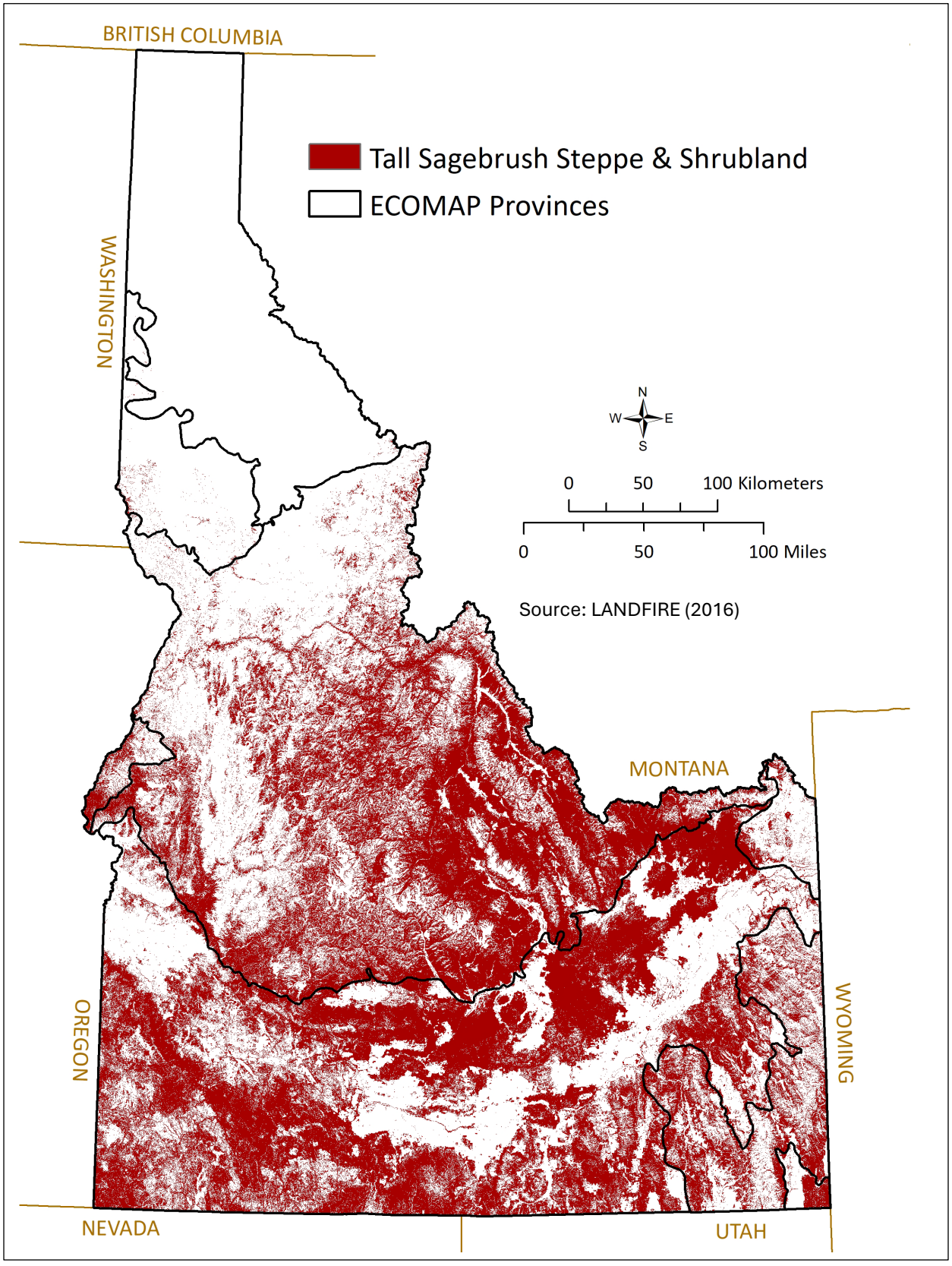
Sagebrush-steppe ranges from hot, dry canyons and plains to mesic foothills, to snowy mountains in semiarid regions. Stands occur on plateaus, badlands, alluvial fans, flats, slopes, ridges, and stabilized dunes. Soils are well drained, derived from alluvium, loess, sand, or bedrock; they vary from deep on gentle or northeast-facing slopes, to shallow and rocky on steep or southwest-facing slopes. Textures are sandy, silty, or clayey loams. Productivity and diversity increase with the amount and reliability of soil moisture (e.g., moister summers to the east, snowier at higher elevation, cooler on northeast aspects).



Boise River WMA, Lucky Peak Reservoir (cc) BY 2015
Chris Murphy/IDFG

Extensive areas of intact tall sagebrush-steppe, characterized by diverse and productive native vegetation, occur across higher elevations of the state. At lower elevations, tall sagebrushes with native understories are more likely to occur on northerly aspects or regions with higher precipitation. Elsewhere, the extent and condition of this habitat is affected by various human land uses, invasive plant species, wildfire, and climate change. Associated, dependent, near-obligate, or obligate SWAP species include Great Basin Spadefoot, Common Nighthawk, Golden Eagle, Ferruginous Hawk, Greater Sage-Grouse, Sagebrush Sparrow, Brewer's Sparrow, Loggerhead Shrike, Sage Thrasher, Short-eared Owl, Burrowing Owl, Pronghorn, Long-eared Myotis, Pygmy Rabbit, Dark Kangaroo Mouse, Wyoming Ground Squirrel (ssp. *nevadensis*), Desert Horned Lizard, Idaho Point-headed Grasshopper, Morrison Bumble Bee, Pahove Sandverbena, and Slickspot Peppergrass. Tall Sagebrush Steppe & Shrubland has a habitat relative status (i.e., S-rank) of S3 and there are 50 SWAP species for which this habitat is important, 6 of which are obligates (Appendix 5).

Wyoming Big Sagebrush dominates xeric soils; Basin Big or Threetip Sagebrush dominates mesic sites. Mountain Big Sagebrush occurs from montane basins to subalpine ridges and slopes. Wildfire reduces sagebrush. Sagebrush is often associated with Antelope-brush, rabbit-brushes, and horse-brushes. Mesic and mountain stands include Mountain Snowberry, serviceberries, cherries, and Snowbrush Ceanothus. Bunchgrasses dominate the herb layer such as Bluebunch Wheatgrass, Idaho Fescue, Sandberg's Bluegrass, and Bottlebrush. Indian Ricegrass, Needle-and-Thread, Thurber's Needlegrass, wheatgrasses, Sand Dropseed, Threeawn, and Cheatgrass occur on xeric sites. Great Basin Wildrye, Prairie Junegrass, needlegrasses, Alaska Wheatgrass, Mountain Brome, Geyer's Sedge, and Spike-fescue occur at high elevation. Forbs include fleabanes, phloxes, globe-mallows, pricklypear cactus, onions, hawksbeards, milk-vetches, Common Yarrow, sandworts, Arrowleaf Balsamroot, paintbrushes, buckwheats, biscuit-roots, beardtongues, lupines, larkspurs, stoneseeds, ragworts, cinquefoils, pussy-toes, Old Man's Whiskers, and little-sunflowers. Annuals or biological soil crusts fill gaps.


BRITISH COLUMBIA
Tall Sagebrush Steppe & Shrubland
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Source: LANDFIRE (2016)
MONTANA
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Saltbush Scrub

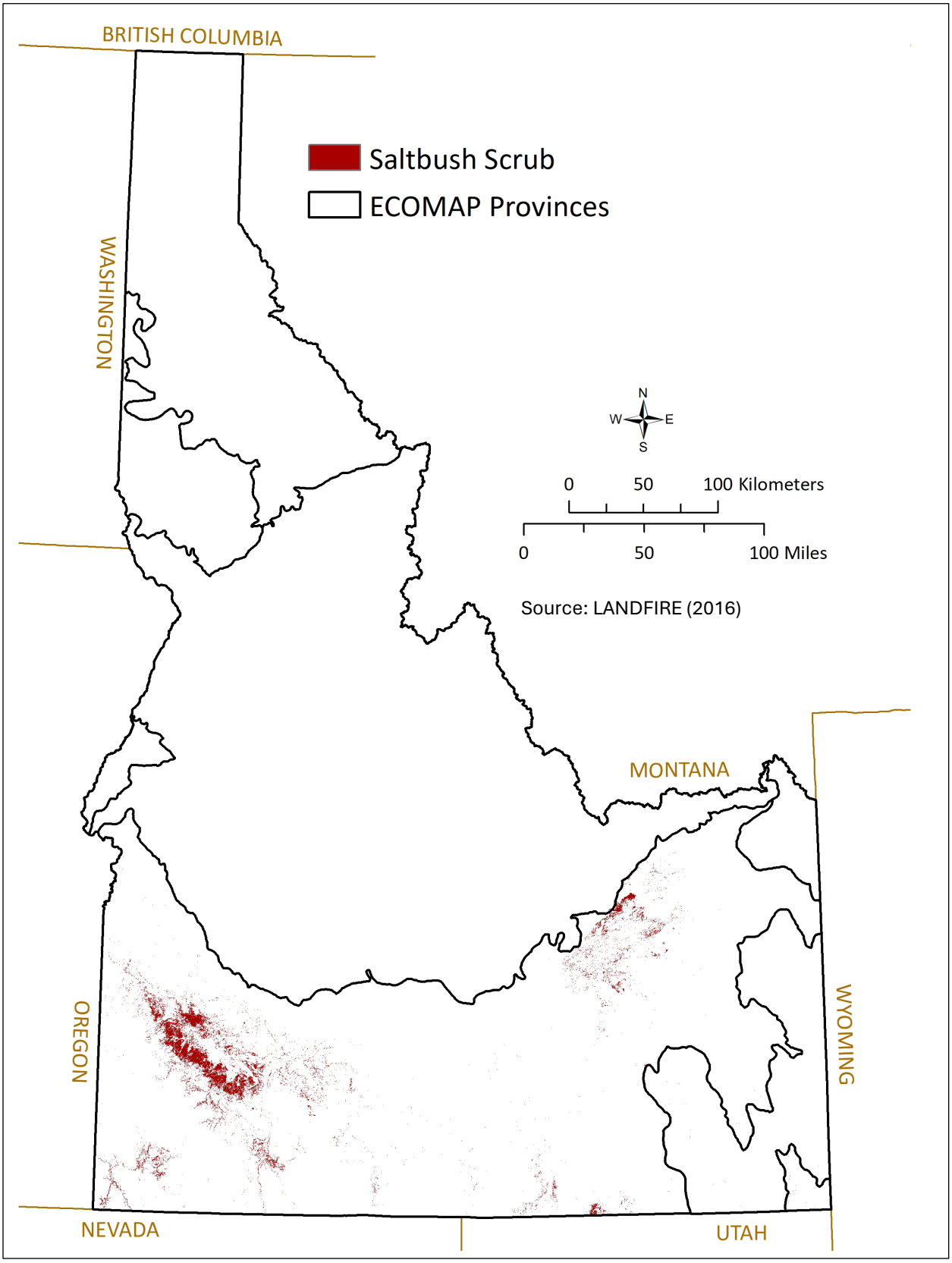


East Canyon, Lemhi Range foothills
2008 Beth Colket/IDFG

Open-canopied, xeric shrublands of basins, alluvial fans, plains, windswept bluffs, badlands, canyon slopes, and playa margins in arid and semiarid regions. Soils vary from shallow to deep and coarse-textured (gravelly, sandy) to fine-textured (silty, clayey). They tend to be alkaline-saline and derived from calcareous rock, shale, or lacustrine deposits. There may be a subsurface hardpan. In depressions or flats with poor infiltration, temporarily ponded playa-like areas may occur.

Large patches of this habitat on the Owyhee Front and in east-central Idaho are minimally altered and dominated by native species. Naturally low productivity and arid conditions tend to limit the invasion of annual grasses. However, biological soil crusts and soils with less perennial grass cover can be vulnerable to erosion, disturbance, and wildfire. Associated, dependent, or near-obligate SWAP species include Western Toad, Greater Sage-Grouse, Burrowing Owl, Pronghorn, Kit Fox, Townsend's Big-eared Bat, Dark Kangaroo Mouse, Wyoming Ground Squirrel (ssp. *nevadensis*), Western Groundsnake, Desert Horned Lizard, Hillman's Stinkweed, and Idaho Xanthoparmelia Lichen. Saltbush Scrub has a habitat relative status (i.e., S-rank) of S3 and there are 25 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Extensive dwarf shrublands dominated by Sheepfat and Bud Sagebrush often occur in mosaics with stands of Winterfat or Gardner's Saltbush (poor infiltration soil). Other stands are clearly dominated by taller Wingscale, Spiny Hopsage, or Black Greasewood. Other shrubs can be present but not codominant, including Wyoming Big Sagebrush, rabbit-brushes, horse-brushes (Cottonhorn, Little-leaf Horse-brush), Broom Snakeweed, Fringed Sagebrush, Silver Chickensage, or Low Sagebrush. The herb layer is generally sparse and there may be expanses of bare soil or lichen crusts. Perennial grasses, especially Indian Ricegrass, Bottlebrush, Sandberg's Bluegrass, Swallen's Needlegrass, and Thickspike Wheatgrass typically dominate. Salmon Wildrye, Bluebunch Wheatgrass, Western Wheatgrass, Needle-and-Thread, and Sand Dropseed also occur. Forbs rarely contribute much cover. Perennial species include Gooseberry-leaved Globe-mallow, pricklypear cactus, Bushy Stanleya, and cushion-like species such as King's Sandwort, cryptanthas, spring parsleys, fleabanes, buckwheats, Woollypod Milk-vetch, Douglas's Cusickiella, Dwarf Penstemon, Moss Phlox, Stemless Goldenweed, Hoary Chaenactis, and Fineleaf Hymenopappus. Annuals are present in years with more precipitation, such as Showy Townsend Daisy, annual buckwheats, and Nuttall's Povertyweed.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Saltbush Scrub
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Source: LANDFIRE (2016)
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Cliff, Scree & Badland Sparse Vegetation

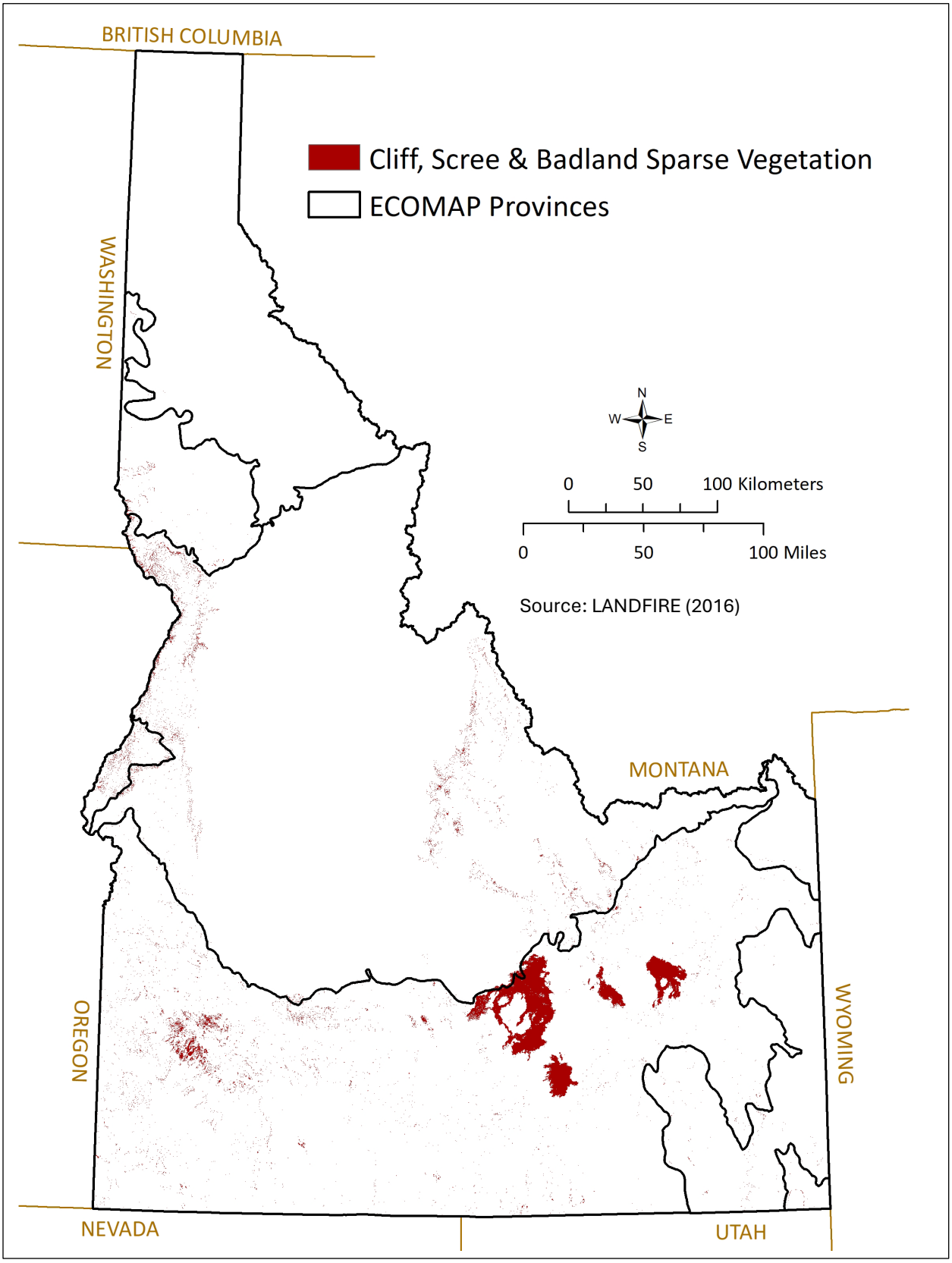
Sparsely vegetated (<10% cover) rock, slopes, and badlands occurring in arid and semiarid canyons, basins, and foothills. Landforms include cliff and canyon walls, bedrock outcrops, steep mesa and plateau breaks, scree, and talus. Sites include shale outcrops, clayey badlands, and volcanic deposits such as lava, cinder, ash, tuff, and basalt. Some substrates are alkaline or saline, which chemically limits plant growth. Badlands often have clay soils that reduce water infiltration, increasing erosion and limiting moisture and nutrient availability.



Mud Flat Oolite ACEC (cc) BY 2013 Chris Murphy/IDFG

Most occurrences of this habitat are on sparsely vegetated rock or unique soil outcrops and remain unaltered. Where soil is present in this habitat, it has minimal cover of stabilizing perennial vegetation and biological soil crusts, making it particularly vulnerable to disturbance. Associated, dependent, near-obligate, or obligate SWAP species include Western Spotted Skunk, California Bighorn Sheep, 3 bat species (Western Small-footed Myotis, Pallid Bat, Spotted Bat), American Pika, Dwarf Shrew, Great Basin Collared Lizard, a metallic wood-boring beetle (*Chrysobothris horningi*), Marbled Disc, Packard's Milk-vetch, Winward's Goldenbrush, and Nez Perce Monkey-flower. Cliff, Scree & Badland Sparse Vegetation has a habitat relative status (i.e., S-rank) of S5 and there are 35 SWAP species for which this habitat is important, 4 of which are obligates (Appendix 5).

Unique soils or geology can support endemic or uncommon plant species. Characteristic shrubs in semidesert ash, badland, and calcareous rocks include saltbushes (Wingscale, Gardner's Saltbush, Sheepfat), Spiny Hopsage, Gray Ball Sage, Slenderbush Buckwheat, and Black Greasewood. Characteristic herbs in badlands include Indian Ricegrass, Salmon Wildrye, false-yarrows, Naked-stemmed Sunray, skeletonweeds, prince's plumes, spiderflowers, buckwheats, goldenweeds, and Yellow Phacelia. Calcareous foothills of eastern Idaho also support Tufted Rockmat, Whitlow-wort, and One-flower Kelseya. Lava and cinder at CRMO support scattered Limberpine and juniper trees with Fern-bush, Dwarf Goldenbrush, rockmats, Granite Prickly-phlox, Lewis's Mock Orange, and Antelope-brush shrubs. Herbs include Needle-and-Thread, Great Basin Wildrye, needlegrasses, Sandberg's Bluegrass, Oval-leaved Eriogonum, and Hot-rock Penstemon. In addition to many of the above species, cliffs and talus in river canyons of the Snake, Clearwater, and Salmon can have Curl-leaf Mountain-mahogany, Ponderosa Pine, Big Sagebrush, brickellbushes, Common Rabbit-brush, Spiny Green-bush, Bluebunch Wheatgrass, Cheatgrass, stonecrops, biscuit-roots, and blazing-stars. Rhyolite cliffs in southwest Idaho support a unique suite of species, including Desert Gooseberry, Parish's Snowberry, Packard's Wormwood, Owyhee Forget-me-not, Pink Alumroot, Owyhee Ivesia, Rock-loving Spring Parsley, Broad Fleabane, and Simpson's Ball Cactus.


BRITISH COLUMBIA
Cliff, Scree & Badland Sparse Vegetation
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Source: LANDFIRE (2016)
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Semidesert Ruderal Scrub & Grassland

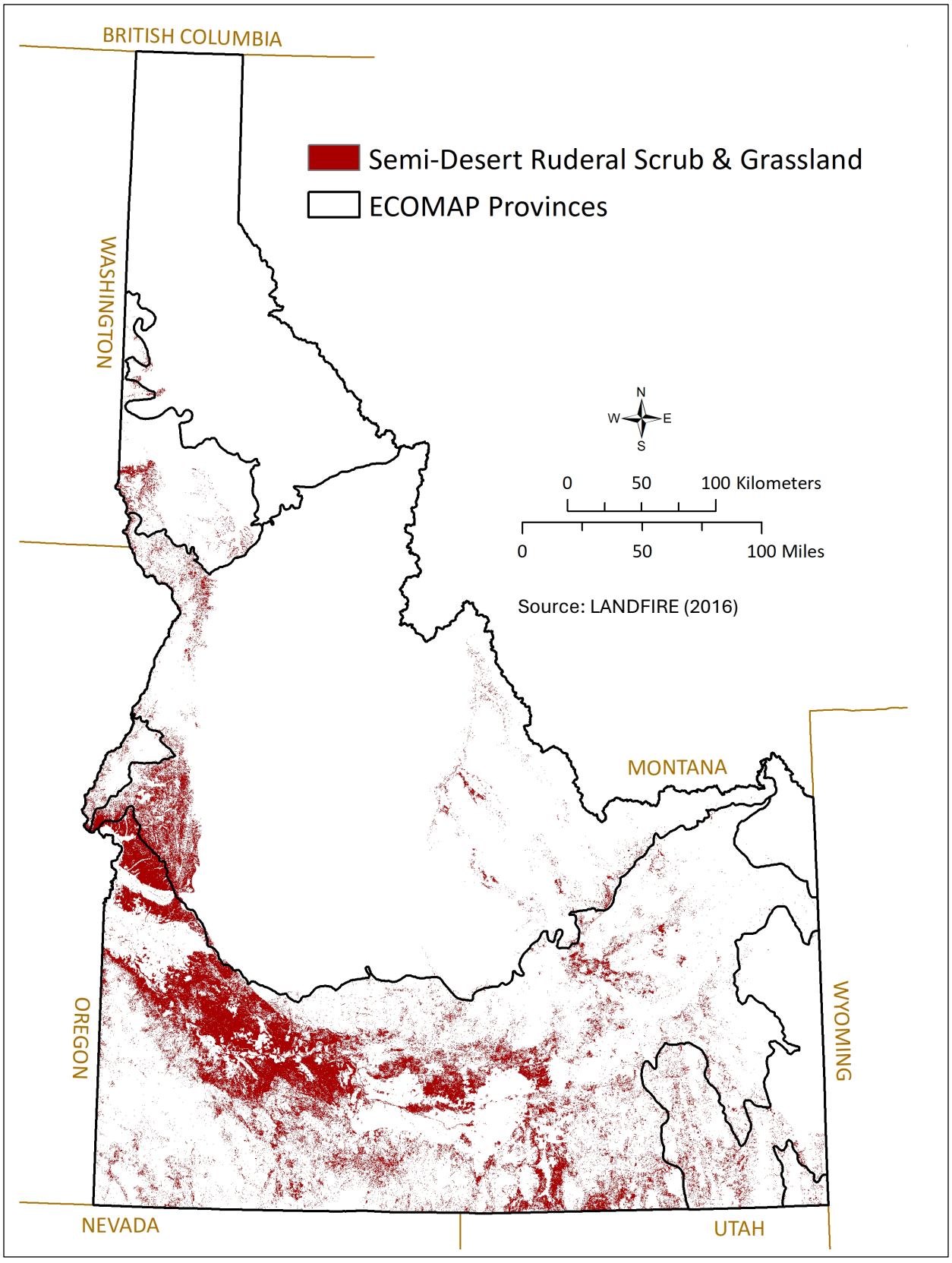
Disturbed xeric grasslands and scrub found in semidesert basins, plains, rolling uplands, and foothills. Vegetation is dominated by introduced grasses or forbs that have replaced sagebrush-steppe, semidesert shrubland, or juniper woodland. Extensive stands occur in burned areas, with smaller stands in excessively grazed areas, abandoned agricultural fields, or adjacent to roads, powerlines, and developments. Soils may be compacted and eroded with biological soil crusts absent due to severe or chronic disturbance.



Snake River Plain, New Plymouth (cc) BY 2015 IDFG

Associated or dependent SWAP species include Western Toad, Long-billed Curlew, Sharp-tailed Grouse, Pronghorn, Kit Fox, Western Small-footed Myotis, Pygmy Rabbit, Southern Idaho Ground Squirrel, Pygmy Short-horned Lizard, Yellow and Morrison bumble bees, Packard's Milk-vetch, Slickspot Peppergrass, and Macfarlane's Four-o'clock. Semidesert Ruderal Scrub & Grassland has a habitat relative status (i.e., S-rank) of SNA and there are 23 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).

Scattered to patchy relict or recovering native woody species, such as junipers, Big Sagebrush, Low Sagebrush, rabbit-brushes, Black Greasewood, saltbushes (Sheepfat, Wingscale), and Spiny Hopsage, may occur, but the understory is dominated by introduced species. Dwarf shrublands of introduced Forage Kochia, planted for wildfire prevention and browse, also occur. Vast areas of annual grasslands dominated by Cheatgrass or Medusahead (both prolific seed producers and highly invasive), or sometimes other introduced annual grasses (bromes, barleys, Cultivated Rye), are diagnostic. Extensive perennial grasslands of introduced wheatgrasses (Crested, Siberian), or less commonly Tall Wheatgrass or wild-ryes, have been seeded for forage, and to prevent erosion and annual grass invasion after wildfires. Bulbous Bluegrass widely occurs on shallow, clayey soil. Introduced annual forbs are often abundant, especially Tall Tumblemustard, Clasping Pepperweed, Flixweed, Tumbleweed, Bur Buttercup, Redstem Stork's-bill, Saltlover, Common Mullein, Blue Mustard, and Jagged Chickweed. Noxious weeds are also common, such as Rush Skeletonweed, knapweeds, Scotch Thistle, Dalmatian Toadflax, and Small Bindweed. Native ruderal, relict, or seeded herbaceous species can be intermixed with minimal cover, including wheatgrasses (Bluebunch, Snake River, Thickspike), Sandberg's Bluegrass, Great Basin Wildrye, Needle-and-Thread, Sand Dropseed, Threeawn, Bottlebrush, Western Stickseed, globe-mallows, and fiddlenecks.


BRITISH COLUMBIA
Semi-Desert Ruderal Scrub & Grassland
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Source: LANDFIRE (2016)
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Polar & High Montane Scrub, Grassland & Barrens

Alpine and tundra habitats occur above tree line on high mountain peaks. Tree line varies depending on latitude, elevation, climate (precipitation, temperature), moisture (snow accumulation, drainage), and topography (slope, aspect, landform). Plant cover and density ranges from high on snow accumulating protected sites, to sparse or patchy on boulderfields and frost-sorted or windblown gravelly ridges. Vegetation types include grass (bunchgrass or sod-forming) and forb (cushion or rosette-forming) turf and fell-fields, and creeping or matted dwarf shrublands. Moss and lichen cover is highly variable. Wind exposure is a major determinant of vegetation type and cover. Wind and topography affect the depth and duration of snow cover. Snow accumulation protects vegetation, influences growing season length, and moisture availability. Avalanches can also be an important vegetation disturbance.

Alpine Tundra

Cushion plants, turf, dwarf-shrubs, and sparsely vegetated rock at and above upper timberline throughout the Rocky Mountains. Vegetation is influenced by topography and wind (determines snow movement and retention), soils, wind desiccation, permafrost, and cold. Fell-fields develop on wind-scoured ridgetops, slopes, and saddles with shallow, stony, or gravelly lichen-covered soil. Sites can be snow free. Dry turf occurs on moderate slopes, ridges, and cirques with stable, developed soil. Dwarf-shrubland sites occupy concave areas with late-lying snow and subirrigation from upslope; soil can be organic. Dry turf forms large patches in a mosaic with sparsely vegetated bedrock and scree, fell-field, dwarf-shrubland, ice, and subalpine woodland or meadows.

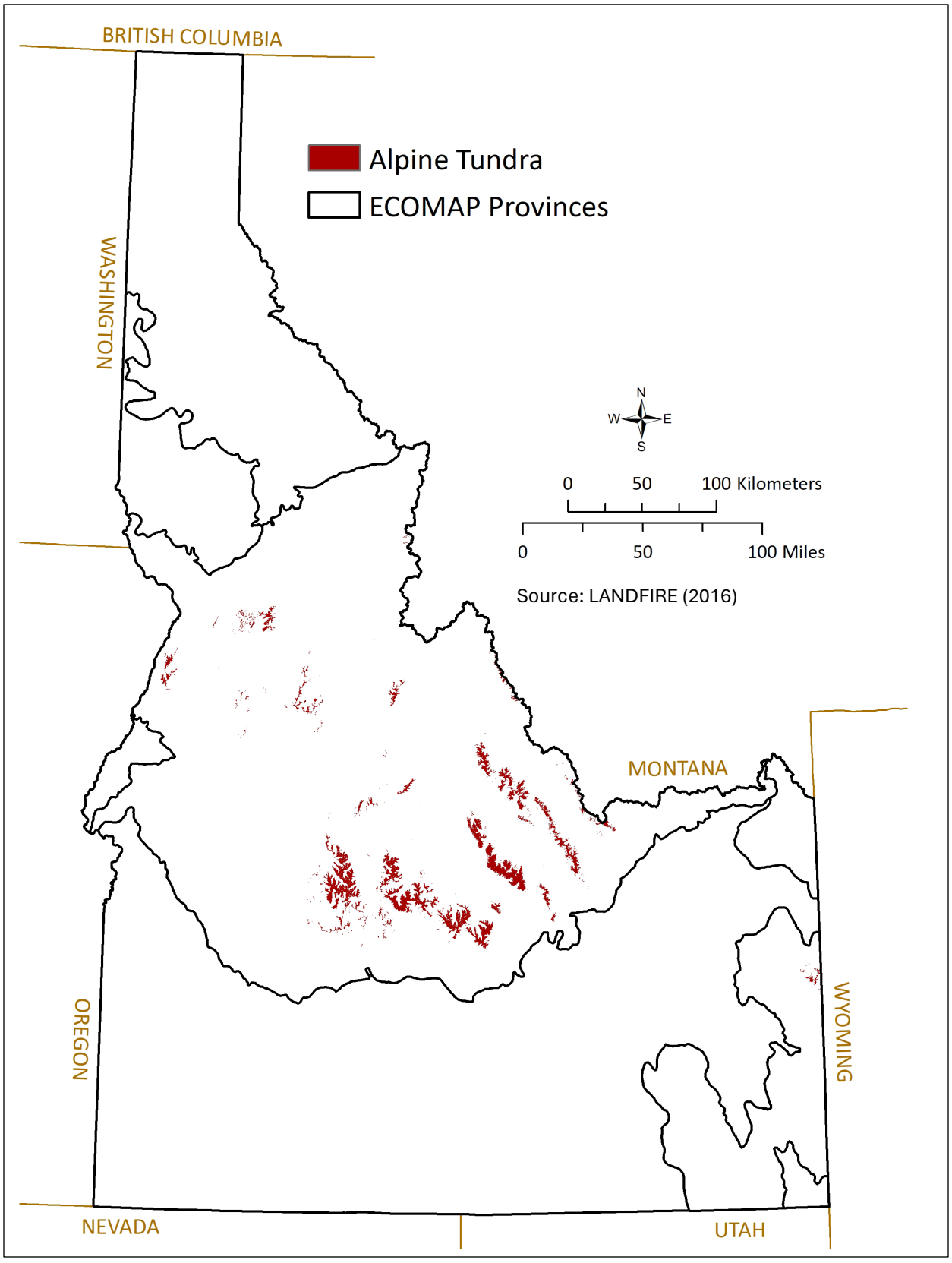


Railroad Ridge RNA, White Cloud Mountains (cc) BY
2006 Steve Rust/IDFG

Most alpine habitat is located on high peaks of east-central Idaho and is largely intact. However, this habitat is particularly vulnerable to warming temperatures, decreased snowpack, and changing snow conditions. Associated, dependent, or obligate SWAP species include Golden Eagle, Black Rosy-Finch, Gray-crowned Rosy-Finch, American Pipit, Rocky Mountain Goat, Wolverine, Hoary Bat, American Pika, Hoary Marmot, High Country Bumble Bee, Beartooth Copper, and Rocky Mountain Parnassian. Alpine tundra has a habitat relative status (i.e., S-rank) of S3 and there are 19 SWAP species for which this habitat is important, 9 of which are obligates (Appendix 5).

Turf can be dense and dominated by sod-forming sedges (Black-root, Single-spike, Curly) and Bellard's Kobresia, cushion-type forbs (e.g., Mountain Sandwort, Ross's Avens, Twinflower

Sandwort, cinquefoils, Parry's Clover), and the dwarf shrub Fringed Sagebrush. Fell-fields are dominated by hairy or thickly cutinized cushion or matted plants. Characteristic forbs include Pacific Sagewort, Cushion Phlox, Gordon's Ivesia, locoweeds (*Oxytropis* spp.), Oval-leaved Eriogonum, Moss Campion, spring parsleys, Old-man-of-the-mountain, forget-me-nots, fleabanes, Skunk Polemonium, whitlow-grasses, saxifrages, American Thorough-Wax, Alpine Hulsea, and spike-mosses. Caespitose grasses, such as Drummond's Rush, fescues (Alpine, Idaho), bluegrasses (Alpine, Glaucous), Purple Reedgrass, and Spike-fescue, occur. Heath family shrubs (e.g., Mertens's Mountain-heather, mountain-heaths, Western Bog Laurel, blueberries) or willows (Arctic, Snow; <0.5 m tall) characterize dwarf-shrublands. The herb layer includes turf and mesic species such as sedges (Dark Alpine, Payson's), Tufted Hairgrass, White Marsh-marigold, Alpine Bistort, Partridgefoot, Woolly Pussy-toes, Alpine Aster, and Creeping Sibbaldia. Patchy dwarf shrubs, namely Hooker's Mountain-avens and Shrubby Goldenbrush, occur on scree slopes with scattered bunchgrasses and forbs.


BRITISH COLUMBIA
Alpine Tundra
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Source: LANDFIRE (2016)
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Open Rock Vegetation

Sparsely vegetated cliffs, canyon walls, cirque slopes, talus, and scree slopes located throughout mountainous areas characterize this habitat. Plant cover is generally <10%. Soil development is limited and plants often grow in rock fissures. These are dry, sparsely vegetated places, where the biota reflects the surrounding area, unless it is an extreme parent material. Typically, there is high cover of spike-mosses, lichens, and, in wetter places, mosses growing on rocks. There may be small patches of dense vegetation or widely scattered trees, shrubs, and herbs, including ferns.

Cliff, Scree & Rock Vegetation

Sparsely-vegetated rock and scree located throughout mountainous areas. Plant cover is generally <10%. Sites occur from lower montane to subalpine zones on cliff faces, canyon walls, cirque and glacial trough walls, and outcrops of various igneous, sedimentary, and metamorphic bedrock types. This habitat also occurs on unstable decomposed granite, scree, and talus slopes below cliffs. Soil development is limited.

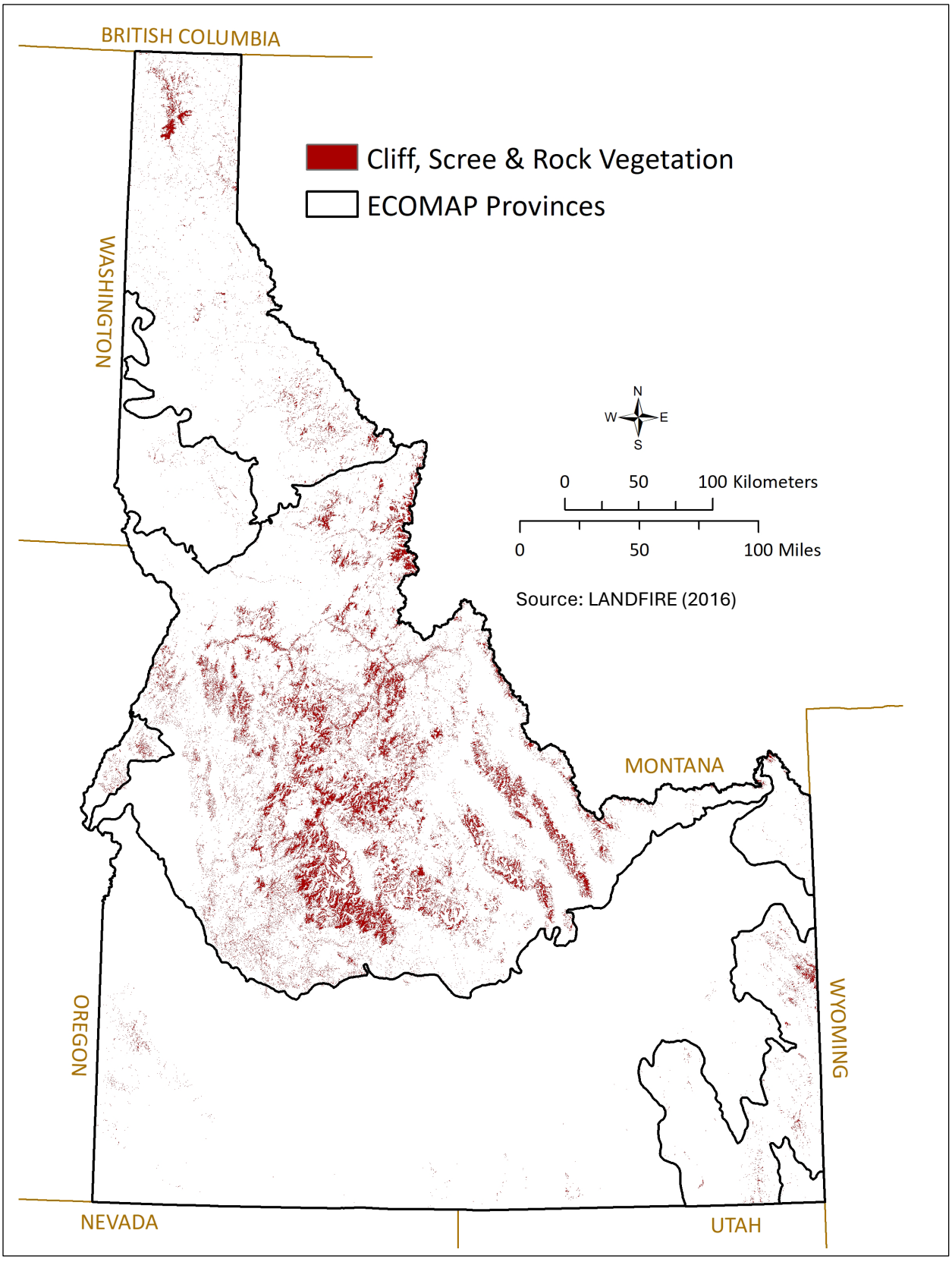


Boise Mountains, North Fork Boise River (cc) BY 2003 Chris Murphy/IDFG

Often located in steep and inaccessible mountainous areas, this habitat is generally intact with natural disturbances such as rockfalls and avalanches, which are common and can benefit adapted plants. Occasional areas are affected by disturbance, but impacts tend to be localized. Cold-adapted and moisture-requiring plant species in this habitat may be less successful with warming temperatures and changing snow conditions. Associated, dependent, near-obligate, or obligate SWAP species include Black Swift, Black Rosy-Finch, Gray-crowned Rosy-Finch, Rocky Mountain Goat, Rocky Mountain Bighorn Sheep, Spotted Bat, American Pika, Hoary Marmot, Dwarf Shrew, Northern Alligator Lizard, several grasshopper SGIN (*Argiacris keithi*, *A. militaris*, *Barracris petraea*), Beartooth Copper, Bloom Peak Douglasia, Whitebark Pine, and Idaho Stonecrop. Cliff, Scree & Rock Vegetation has a habitat relative status (i.e., S-rank) of S5 and there are 35 SWAP species for which this habitat is important, 13 of which are obligates (Appendix 5).

This habitat typically has a high cover of spike-mosses and lichens, and in wetter places, mosses. There may be small patches of dense vegetation or widely scattered trees, shrubs, and herbs. Characteristic montane to subalpine trees include Limberpine, Whitebark Pine, Subalpine Fir, Douglas Fir, Lodgepole Pine, and Quaking Aspen, with Ponderosa Pine, junipers, and mountain-mahoganies at lower elevations. Scattered shrubs may be present, such as Western Serviceberry, goldenbrushes, Spiny Green-bush, rockmats, Common Juniper, Creeping Oregon-grape, Lewis's Mock Orange, Mallow Ninebark, currants, roses, Red

Raspberry, Thimbleberry, snowberries, elderberries, and Shrubby Penstemon. Herbaceous species are diverse but have minimal cover. Grasses include Great Basin Wildrye, Bluebunch Wheatgrass, Bottlebrush, and Sandberg's Bluegrass. Xeric-site sedges and rushes may occur in the subalpine zone. Forbs often include species with long taproots or matted growth forms, such as buckwheats, Mountain Penstemon, Tufted Rockmat, alumroots, One-flower Kelseya, lewisias, Whitlow-wort, phloxes, saxifrages, stonecrops, goldenweeds, fleabanes, and horse-mints. Ferns may also be present.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Cliff, Scree & Rock Vegetation
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Source: LANDFIRE (2016)
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Agricultural Habitat

These habitats include cultivated crops, pastures, and hayfields. In this plan, it also includes developed vegetation such as lawns, gardens, and recreational vegetation occurring in urban, suburban, and rural communities. Cultivated crops include annual vegetables, grains, oil seeds, and horticultural commodities. This habitat is characterized by annual plowing, planting, and management (e.g., irrigation, fertilization, pest and weed management, erosion prevention) that determines structure and growth. Pastures and hayfields are perennial herbaceous agricultural fields used for livestock forage production. They are managed and harvested (e.g., mowed, grazed) on a perennial cycle and characterized by purposely seeded nonnative perennial grasses or legumes (e.g., alfalfa). Pastures and hayfields dominated or codominated by native species are classified as grassland, mesic meadow, or wet meadow habitats. Agricultural production is heavily dependent on irrigation (e.g., sprinkler and flood irrigation), especially in drier regions.

Agricultural Vegetation and Lawn, Garden & Recreational Vegetation



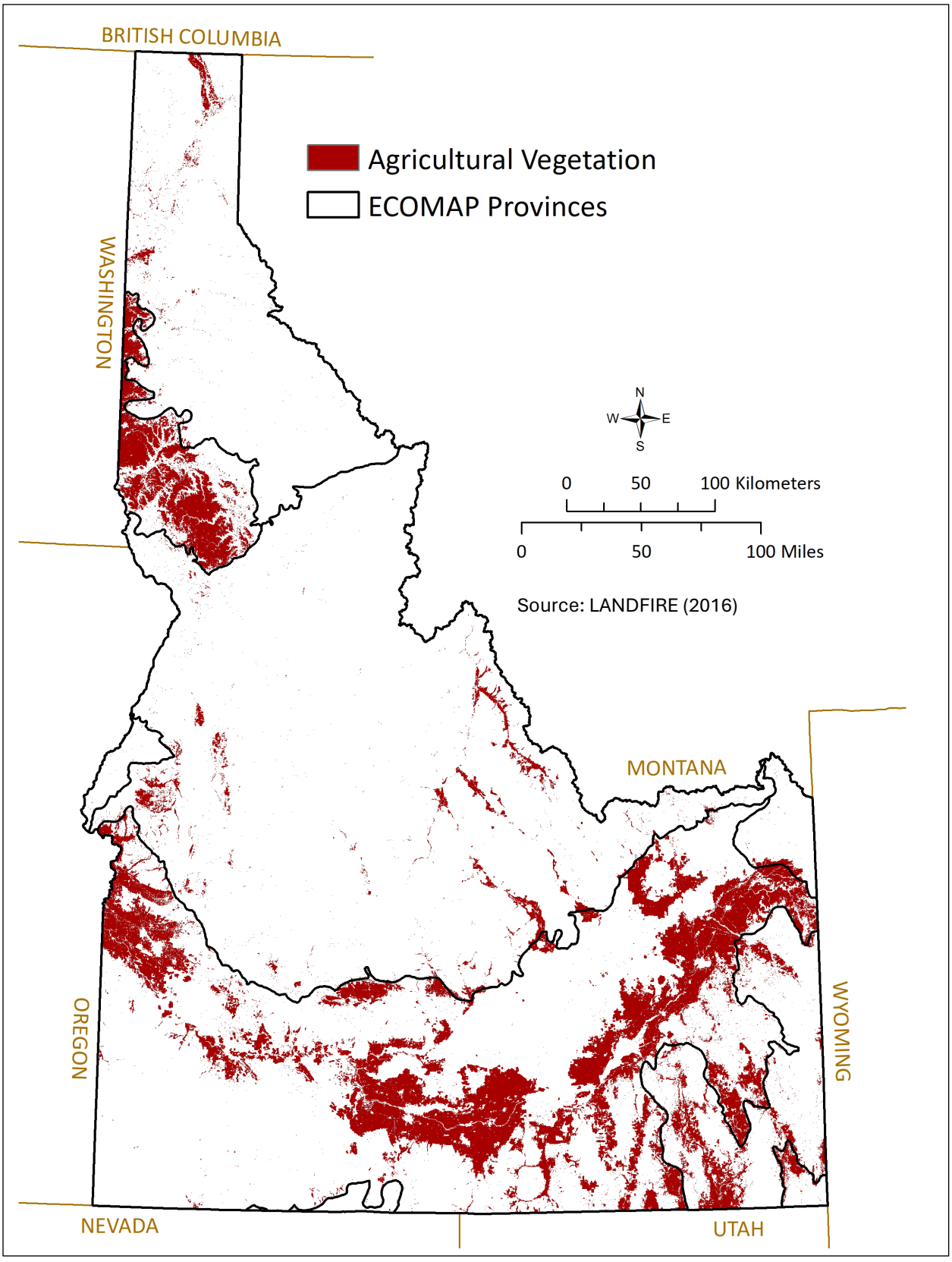
Agricultural land, southwest Idaho (cc) BY Rita Dixon/IDFG

Agricultural Vegetation includes cultivated crops, pastures, and hayfields and comprises 50% of herbaceous agricultural acreage. This habitat is characterized by rows of plants with annual plowing, planting, and management (e.g., irrigation, fertilization, pest and weed management, erosion prevention) that determines structure and growth. Pastures and hayfields are perennial agricultural fields used for livestock forage production. Cultivated cropland often occurs on deep, well-drained loamy or loess soils of plains or rolling terrain. Pastures and hayfields are more common on alluvial soils of valleys but may occur anywhere from plains to montane basins. Agriculture is heavily dependent on irrigation, especially in drier regions. About 80% of cultivated cropland and most alfalfa is irrigated, with most nonirrigated land being grain, legume, and oilseed farms. Most cropland is irrigated by sprinkler or drip systems, while pastures and hayfields often use flood irrigation. Flood-irrigated fields can provide foraging habitat for resident and migratory birds, while residual crops in cultivated fields can support migratory or wintering waterfowl and other birds.

Lawn, Garden & Recreational Vegetation occurs in developed areas. Vegetation includes designed, managed, and maintained grassy lawns, open woodlands, and shrub patches planted for recreation and aesthetics, and erosion control. This habitat occurs in parks, landscaped gardens, open space, and golf courses; around schools, institutions, homes, and commercial development; and along greenbelts, recreational trails, and stormwater detention ponds. Vegetation is characterized by nonnative, often ornamental plants, but may also

include native, wetland, or xeriscape gardens that may provide habitat for pollinators. A wide variety of structure and growth forms may occur and provide habitat for a variety of SWAP species. Plants vary in spatial distribution, often fragmented by trails and infrastructure. This habitat is distinguished by frequent, repeated intensive management and maintenance, including mowing, clipping, pest and weed control, fertilization, and irrigation.

Associated, dependent, near-obligate, or obligate SWAP species include Woodhouse's Toad, Trumpeter Swan, Black Tern, Franklin's Gull, White-faced Ibis, Ferruginous Hawk, Sandhill Crane, Bobolink, Loggerhead Shrike, Wilson's Warbler, Western Spotted Skunk, Moose, Silver-haired Bat, Common Gartersnake, Morrison and Western bumble bees, and Monarch Butterfly. Agricultural Vegetation has a habitat relative status (i.e., S-rank) of SNA and there are 34 total SWAP species for which this habitat is important, 1 of which is an obligate. Lawn, Garden & Recreational Vegetation has a habitat relative status (i.e., S-rank) of SNA and there are 15 SWAP species for which this habitat is important, none of which are obligates (Appendix 5).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Source: LANDFIRE (2016)
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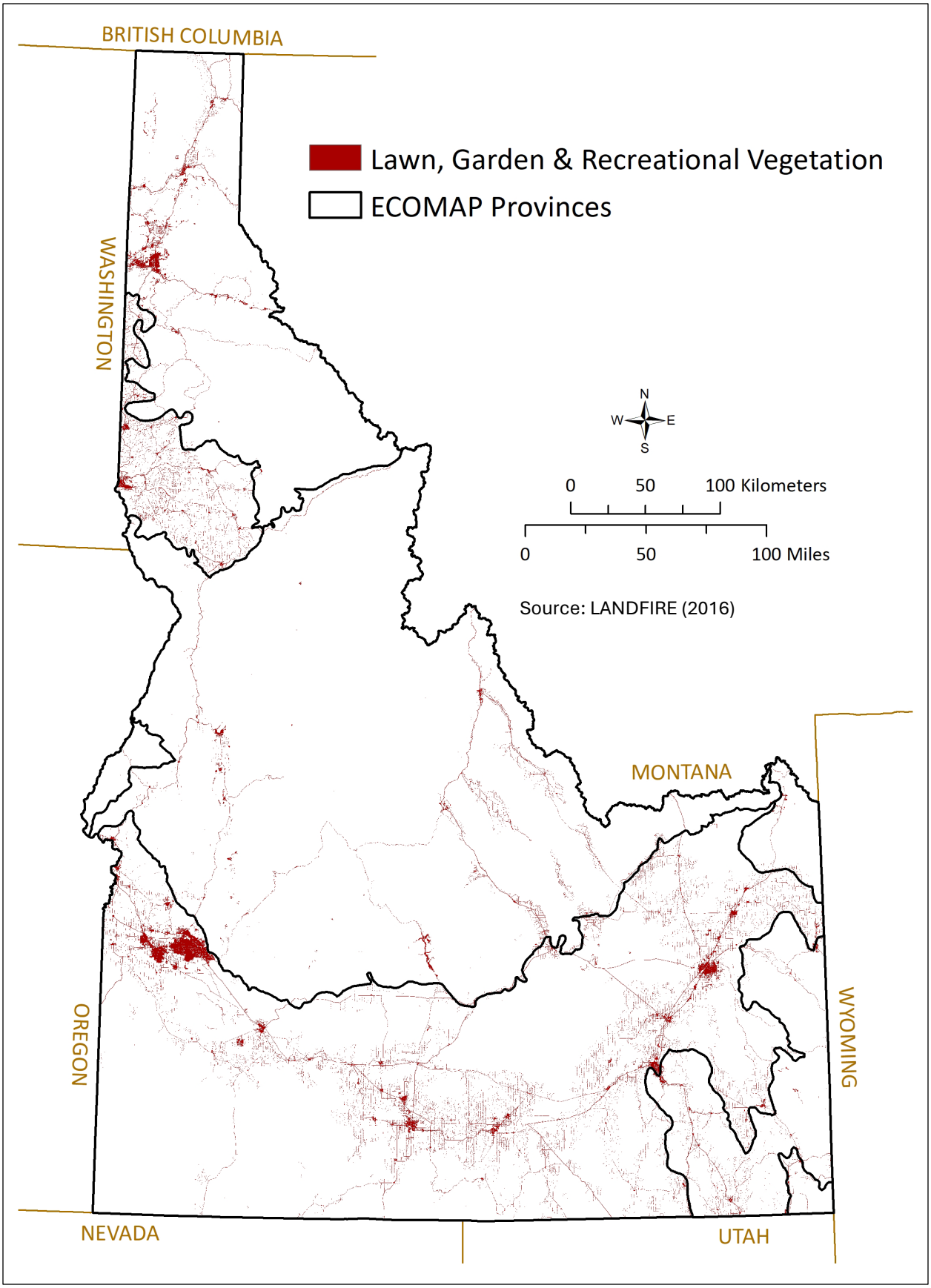
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Source: LANDFIRE (2016)

Aquatic Vegetation & Freshwater Habitat

Aquatic habitats typically occur in permanently or semipermanently flooded waterbodies that vary in depth, magnitude of water fluctuation, and size. Habitats include groundwater-fed springs, flowing rivers and streams, and lakes, ponds, and reservoirs. These occur from low to high elevations across all climatic regions of the state. Runoff from snowmelt and precipitation is the primary hydrologic source for flowing and nonflowing aquatic habitat. The exception is springs, which are groundwater supported habitats characterized by relatively constant water temperatures (hot to cold) and water chemistry that reflects the local geology. Lakes, ponds, and reservoirs are typically nonflowing open water habitats with <30% vegetative cover. Lakes and ponds occupy topographic depressions while reservoirs occur behind dams on streams and rivers. Aquatic habitats of rivers and streams are complex and vary depending on size (i.e., stream order), seasonal flow duration (perennial or intermittent) and volume, topography (e.g., location in watershed, gradient, valley width), channel width and depth, floodplain processes (e.g., channel meandering, sediment transport), physical inputs (sediment, woody debris, nutrients), and human modifications. Flood pulses of snowmelt are important natural disturbances and drive many ecological processes. Groundwater usually supports stream and river flows after surface runoff declines. Shallow ponds, lakeshores, and slow-moving rivers may support aquatic vegetation consisting of floating, submerged, or emergent species tolerant of persistent, deep flooding. Aquatic plant diversity and productivity reflects nutrients, water chemistry, sunlight penetration, temperature, and disturbance.

Freshwater Aquatic Vegetation

Aquatic vegetation is found in permanently to semipermanently flooded reservoirs, lakes, ponds, and marshes, and slow-moving rivers, streams, and ditches. It occurs from semiarid low elevations to subalpine lakes. Vegetation consists of floating, submerged, or emergent species that are tolerant of persistent, deep flooding. Aquatic plant community composition and productivity reflects nutrients, water chemistry (pH, salinity, conductivity), light penetration (turbidity, depth), temperature, and disturbance. Open water that supports aquatic vegetation often occurs in a mosaic with tall emergent vegetation. Without periodic water drawdown, which promotes decomposition of organic matter and disturbance to slow expansion of cat-tails and bulrushes, emergent vegetation may eventually limit aquatic plants.

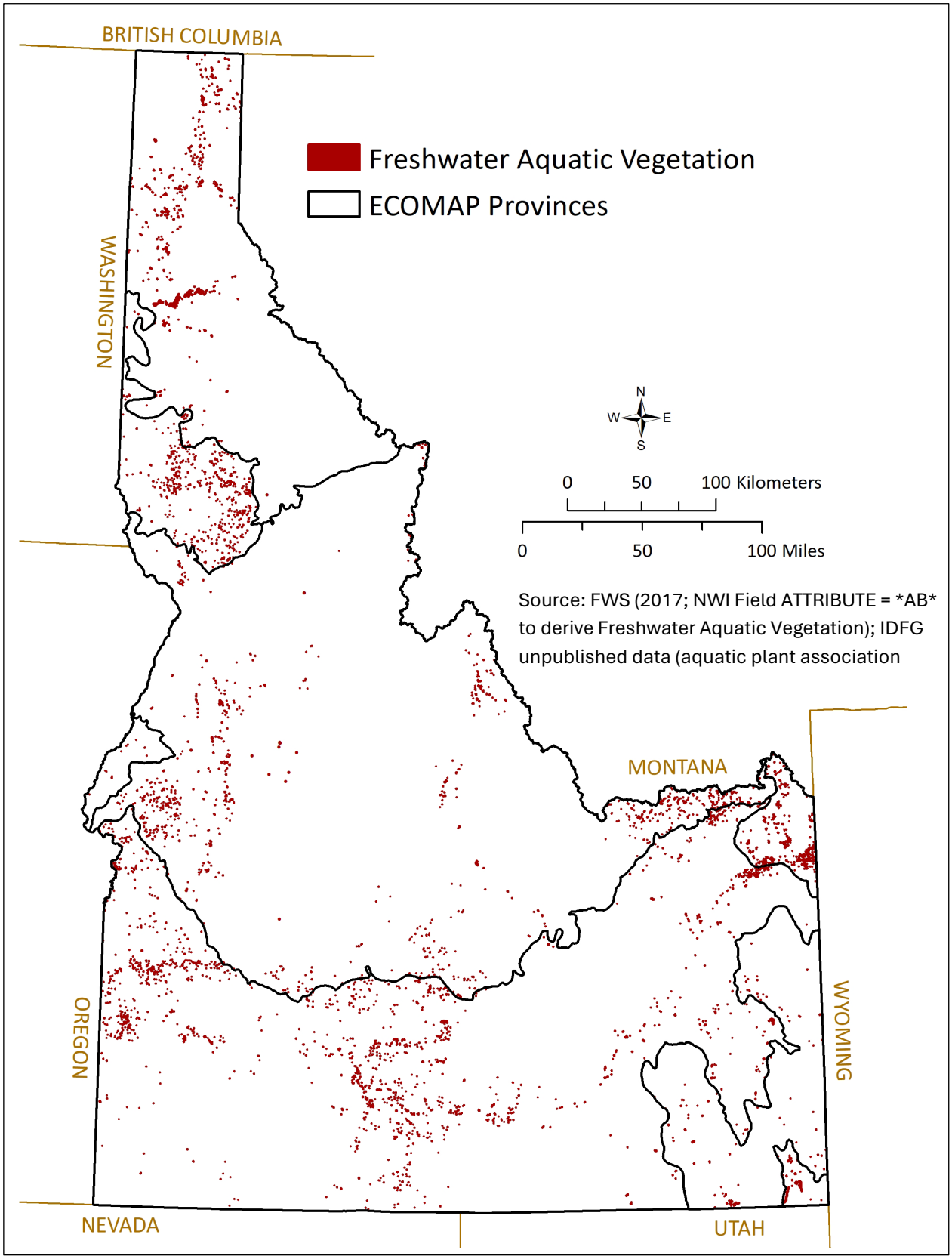


Warm Lake, Idaho (cc) BY 2008
Chris Murphy/IDFG

Patches of native aquatic vegetation are widely distributed and often found in a mosaic pattern with emergent marshes. In some areas, the condition of native aquatic vegetation is negatively affected by stable hydrology, lack of disturbance, increasing

temperature, pollution, and invasive fish and plants. Associated, dependent, or obligate SWAP species include Northern Pintail, Cinnamon Teal, Trumpeter Swan, Black Tern, Franklin's Gull, American Bittern, White-faced Ibis, Sandhill Crane, 3 grebe SGCN (Clark's, Western, Eared), and Moose. Freshwater Aquatic Vegetation has a habitat relative status (i.e., S-rank) of S3 and there are 12 SWAP species for which this habitat is important, 7 of which are obligates (Appendix 5).

Floating leaf and rooted species may dominate at high elevations and in northern Idaho, such as Spatterdock, Water-shield, Broad-leaf Pondweed, and bur-reeds (Narrowleaf, Small). Free-floating species, such as mosquito-ferns, duckweeds, and Greater Duckweed, are abundant in nutrient rich water. Abundant submerged aquatic species include early seral Sago Pondweed, water-nymphs, Beaked Ditch-grass, water-starworts, and waterworts, and mid- to late-seral Hornwort, Northern Water-milfoil, waterweeds (Canada, Nuttall's), pondweeds (Leafy Pondweed most common; also Grass-leaved, Richardson's, and Robbin's pondweeds), Common Bladderwort, Horned Pondweed (in alkaline water), and White Water-buttercup (in slow moving streams). Macroalgae (stoneworts; both *Chara* spp. and *Nitella* spp.) are locally abundant and may act as a nutrient sink. Awlwort, Water Pygmy-weed, quillworts, Needle Spike-rush, and other short herbs tolerant of extended flooding grow on temporarily exposed mud. Aquatic bryophytes, such as fontinalis mosses and Floating Crystalwort, also occur. Rare aquatic species include Water Howellia and Water Bulrush.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Freshwater Aquatic Vegetation
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Source: FWS (2017; NWI Field ATTRIBUTE = *AB* to derive Freshwater Aquatic Vegetation); IDFG unpublished data (aquatic plant association
MONTANA
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NEVADA
UTAH

Rivers (5th order and higher)

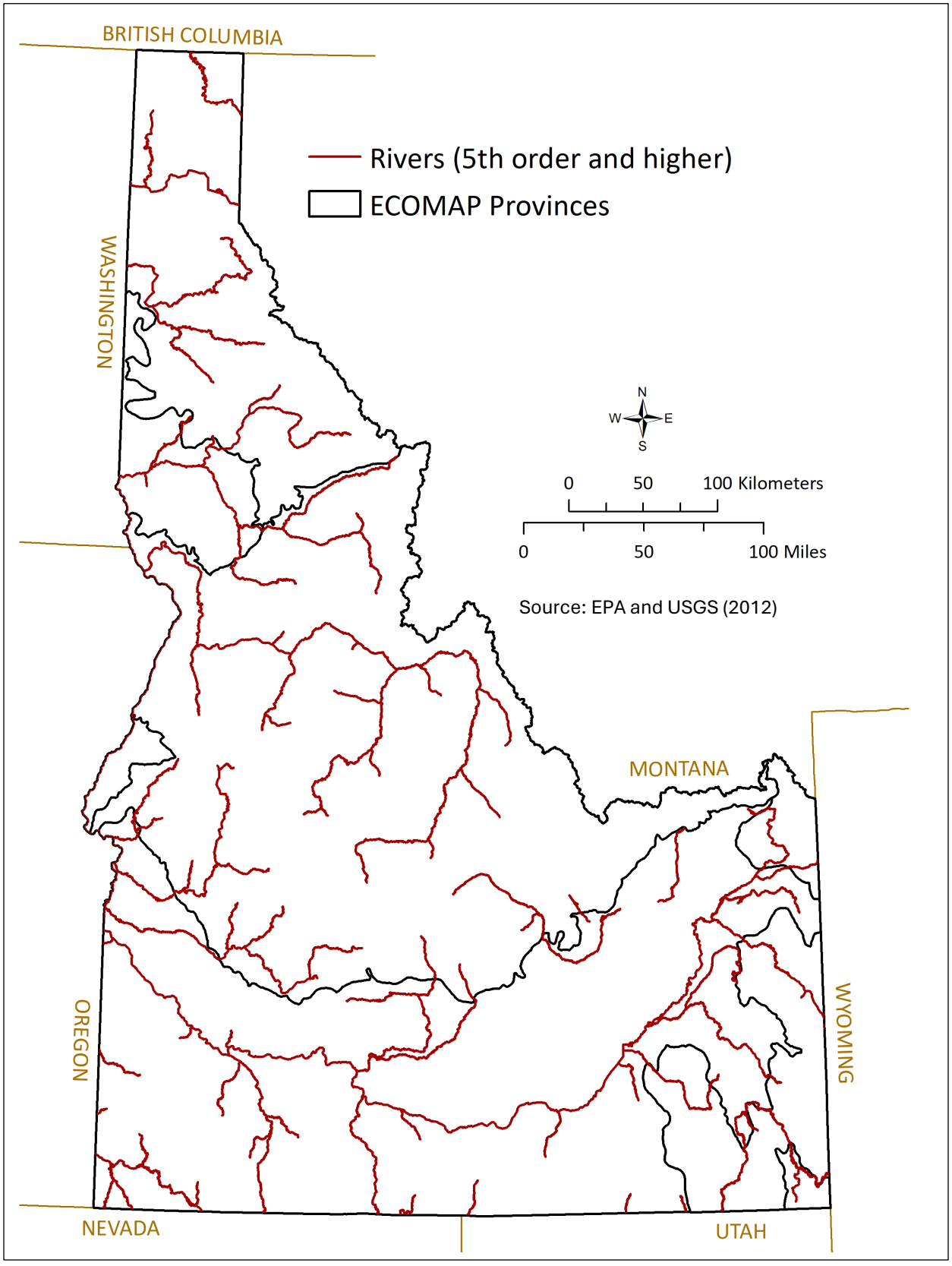


Selway River, Idaho (cc) BY 2006 Chris Murphy/IDFG

This habitat includes all mainstem rivers and their major forks with an average channel width of >49 ft (>15 m) and a depth of >1.3 ft (>0.4 m). Flows are characterized by high-volume spring and early summer flooding from snowmelt, although fall rains, rain-on-snow, or ice-damming can cause flooding in other seasons. Summer baseflows are sustained by groundwater and perennial tributaries.

Idaho has numerous rivers with intact, diverse aquatic habitats (e.g., Salmon, Bruneau, and Selway). Associated, dependent, near-obligate, or obligate SWAP species include Woodhouse's Toad, Trumpeter Swan, Harlequin Duck, Caspian Tern, Common Loon, American White Pelican, Yuma Myotis, Mountain Whitefish, Wood River Sculpin, White Sturgeon, Burbot, steelhead (Snake River Basin DPS), Yellowstone Cutthroat Trout, Salmon River Pebblesnail, Western Ridged Mussel, Western Pearlshell, Snake River Pilose Crayfish, Snake River Physa, and Bliss Rapids Snail. Rivers (5th order and higher) has a habitat relative status (i.e., S-rank) of S3 and there are 53 SWAP species for which this habitat is important, 13 of which are obligates (Appendix 5).

Foothill and lower montane rivers with moderate gradients have boulder and cobble rapids and riffles, cobble and gravel runs, and large pools with sand, gravel, and silt. In valleys unconfined by topography or levees, rivers form wide, dynamic floodplains with complex aquatic habitats and diverse cottonwood forest, shrubland, and herbaceous riparian zones. Rivers meander in these valleys, depositing alluvium on low-energy bars, while overhanging banks shelter aquatic habitat on outside bends. High flows move sediment and raft woody debris, forming side and braided channels, backwaters, oxbow ponds, and wetlands. Groundwater in these alluvial valleys creates an important subterranean aquatic habitat. Canyon rivers tend to have rapids created by large boulder inputs from side-canyon fans and cliffs, followed by large and deep pools or glides, and sandy beaches in eddies. Floodplains are narrower and often dominated by shrubs, herbaceous vegetation, and upland trees. After spring floods move sediment through the system, rivers tend to run clear, except where tributaries deliver high sediment loads. Summer water temperatures average <68 °F (<20 °C), except where flows are sluggish (e.g., Snake River) or during extreme heat events. Rivers with lower water temperatures can have high macroinvertebrate diversity (e.g., stoneflies, caddisflies, or mayflies) and freshwater mussels, and support productive native and nonnative cold-water fisheries.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Rivers (5th order and higher)
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Source: EPA and USGS (2012)
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Large Streams (3rd, 4th order)

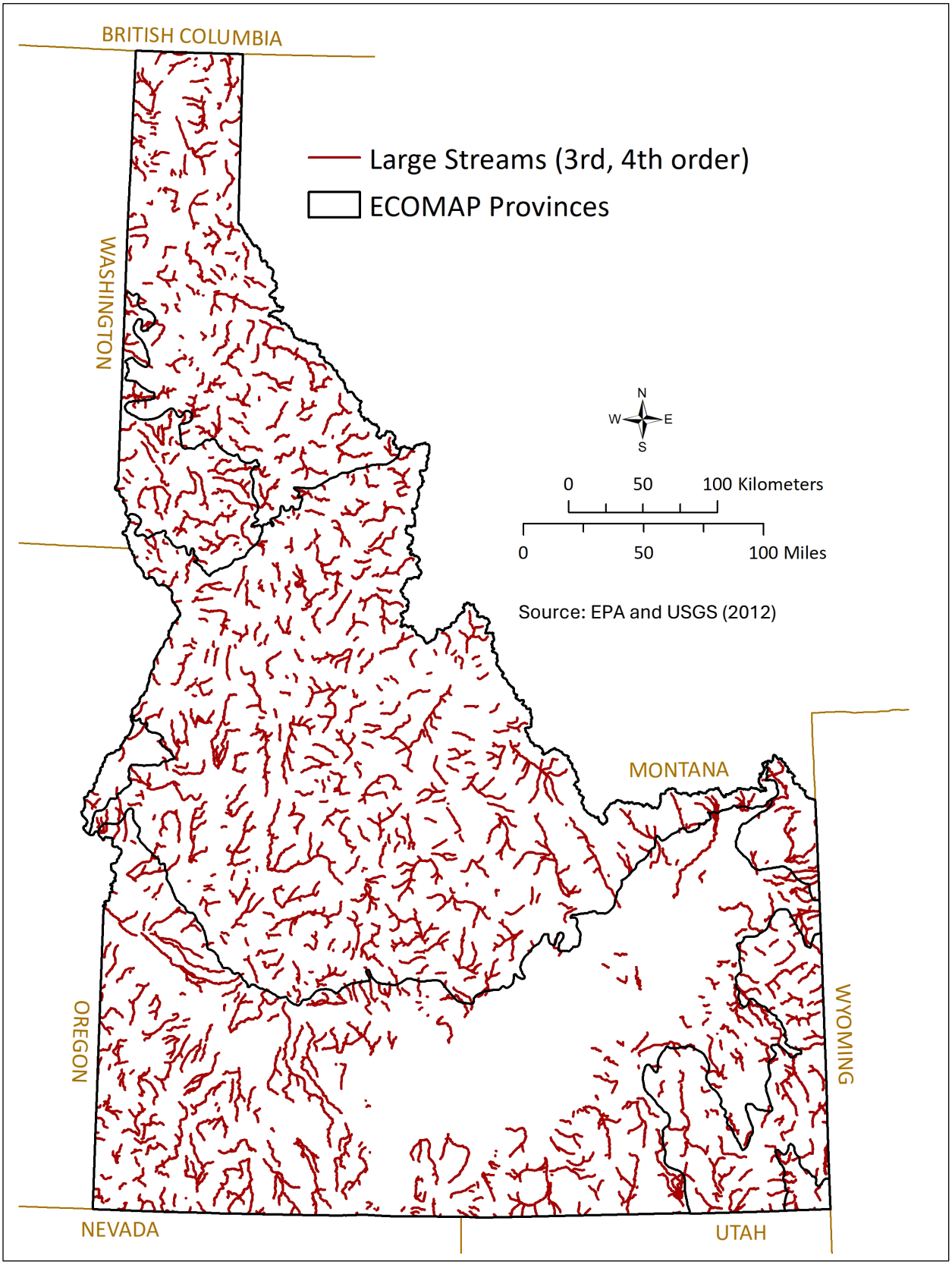
As low-order streams coalesce in wide montane and foothill valleys, larger streams form. They tend to have wider channels (16 to 23 ft [5 to 7 m] mean width) and lower gradients than tributaries, although floodplain extent depends on topography. Spring and winter snowmelt flood pulses can be large, moving sediment and large woody debris through the system. Debris flows in tributaries occasionally add large amounts of sediment. Summer baseflows can be low but are sustained by groundwater.



Elk Creek, Idaho (cc) BY 2005 Ed Bottum/IDFG

Intact large-stream aquatic habitats occur within minimally-altered watersheds across mountainous portions of Idaho. Associated, dependent, near-obligate, or obligate SWAP species include Rocky Mountain Tailed Frog, Harlequin Duck, American White Pelican, Yuma Myotis, Mountain Whitefish, Wood River Sculpin, Pacific Lamprey, Bull Trout, Sockeye Salmon (Snake River ESU), Cedar Sculpin, Idaho Snowfly, Columbia River Tiger Beetle, Tiny Forestfly, Pilose Crayfish, Umatilla Willowfly, and Boise Snowfly. Large Streams (3rd, 4th order) has a habitat relative status (i.e., S-rank) of S3S4 and there are 47 SWAP species for which this habitat is important, 8 of which are obligates (Appendix 5).

In narrower valleys, streams are step-pool habitats dominated by boulders, cobbles, and gravel or sand in pools. In glacial troughs and broad alluvial valleys, streams have greater meandering, which allows floodplain features such as alluvial bars, side channels, and overhanging banks to develop. Aquatic habitat in these streams is typically composed of cobble riffles, sand and gravel runs, and pools. These are often critical spawning habitats for Chinook Salmon and other fish species. Riparian habitats can be diverse and productive, and include forests, shrublands, and meadows. Large woody debris from adjacent forests provides fish cover and is an important substrate for macroinvertebrates. North American Beavers are sometimes able to build dam and pond complexes. These streams and rivers are generally cold (<59 to 68 °F [<15 to 20 °C]), providing habitat for diverse native and nonnative cold-water fish, although temperatures can rise higher during summer. Macroinvertebrate communities are characterized by mayfly, stonefly, caddisfly, and dipterans that require cold, clear water. Freshwater mussels may be present.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Large Streams (3rd, 4th order)
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Source: EPA and USGS (2012)

Small Streams (1st, 2nd order) – Intermittent

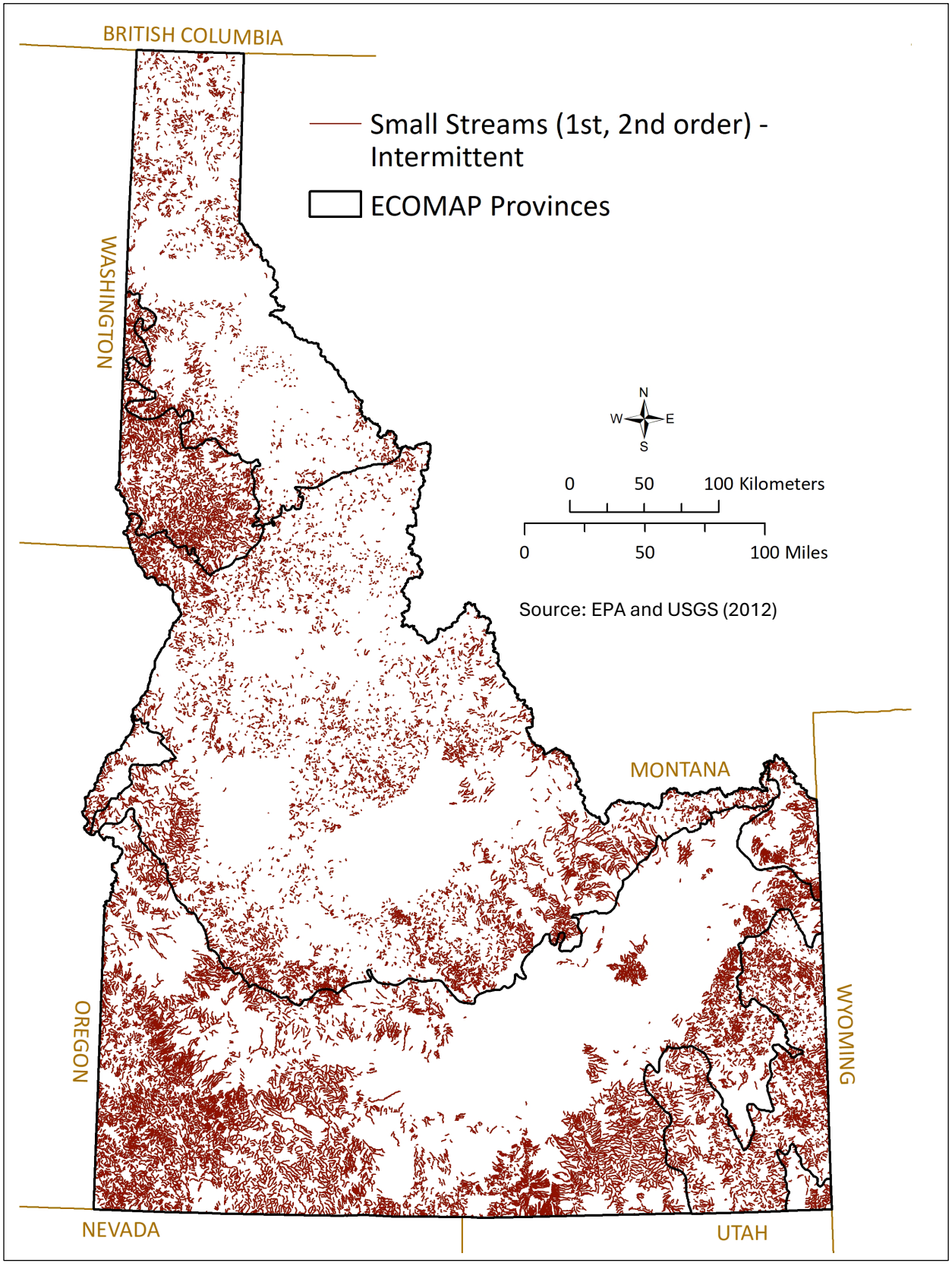


Road Gulch, Idaho (cc) BY 2007 IDFG

These are small, often headwater streams that flow only seasonally from snowmelt and seeps, or temporarily from precipitation runoff. Flows are disrupted when sources become insufficient to sustain flows lost to groundwater infiltration and evaporation. Water from the recharged shallow aquifer occasionally discharges back into the channel, creating small pools, seeps, or short-flowing reaches.

Intact intermittent streams occur across the state. Associated, dependent, or obligate SWAP species include Columbia Spotted Frog (Great Basin population), Idaho Giant Salamander, Greater Sage-Grouse, Little Brown Myotis, Yuma Myotis, Duckhead Snowfly, and a liverwort (*Sphaerocarpos hians*). Small Streams (1st, 2nd order) – Intermittent has a habitat relative status (i.e., S-rank) of S3 and there are 28 SWAP species for which this habitat is important, 1 of which is an obligate (Appendix 5).

Although this habitat occurs statewide, intermittent streams are most frequently found in semiarid regions or small watersheds where they represent ribbons of aquatic and riparian habitat in otherwise less-productive lands. Gradients tend to be moderate to high with boulder or cobble substrates. Sand and silt may accumulate where flushing flows are lacking. Habitats are riffle and run dominated with occasional temporary pools. When water is present, temperature varies by elevation and source (precipitation compared with groundwater). Turbidity can be high during short but intense runoff periods. Most streams are fishless, although groundwater-supported pools may provide refuge for small fish moving upstream during seasonal flows. Pools also provide amphibian breeding and rearing habitat. Macroinvertebrate communities are characterized by species adapted to lengthy dry periods.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Small Streams (1st, 2nd order) - Intermittent
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Source: EPA and USGS (2012)
MONTANA
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Small Streams (1st, 2nd order) – Perennial

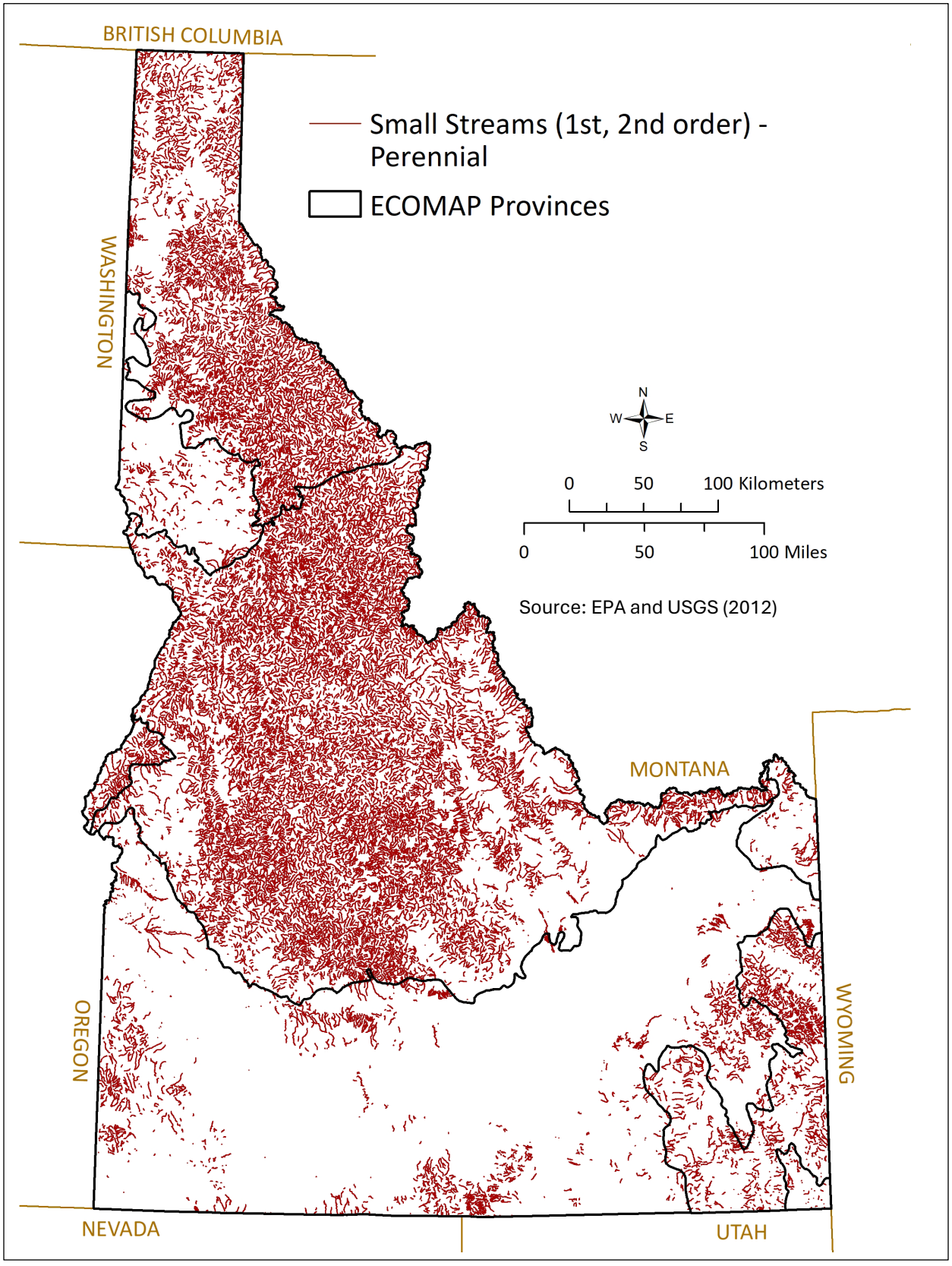


Little French Creek, Idaho (cc) BY 2009
Chris Murphy/IDFG

Low-order perennial streams occur across the state. They range from subalpine headwaters fed by snowmelt to montane streams with both snow and spring sources, to foothill spring-fed streams. These subalpine and montane streams are cold (<54 °F [<12 °C]) and narrow (<7 ft [<2 m]), with flows ranging from spring pulses to minimal groundwater-supported flows in summer. Streams often originate at lakes or ponds in subalpine cirques. Other streams are sustained by springs.

Many small perennial streams in montane and subalpine locations remain minimally altered by human activities. However, changes in precipitation and hydrologic regimes may decrease the condition of these habitats and negatively affect cold-water-dependent biotic communities. At lower elevations, various stressors may reduce aquatic habitat extent and condition. Associated, dependent, near-obligate, or obligate SWAP species include Rocky Mountain Tailed Frog, Coeur d'Alene Salamander, Harlequin Duck, Black Swift, Olive-sided Flycatcher, Silver-haired Bat, 4 sculpin species (Wood River, Slimy, Shoshone, Cedar), Green Sucker, Leopard Dace, Chinook Salmon (Snake River spring/summer-run ESU), Harvestman genus *Acuclavella* species group, numerous species of snowfly and caddisfly, Pilose Crayfish, and Idaho Amphipod. Small Streams (1st, 2nd order) – Perennial has a habitat relative status (i.e., S-rank) of S3 and there are 58 SWAP species for which this habitat is important, 19 of which are obligates (Appendix 5).

These streams are often high gradient, with step-pool habitat, low sinuosity, and substrates of bedrock, boulders, cobbles, and gravel. Debris flows are system-altering events, especially after wildfires. Lake outflow and meadow streams are low gradient and often sinuous, with fine-textured substrates. Large woody debris from adjacent forests increase habitat complexity. Many streams are fishless due to natural barriers. In broad valleys, channel width increases, gradients lessen, and substrates include riffles, runs, and pools. Streams can be suitable for beaver dam building. Habitat complexity, warmer temperatures, and accessibility increase fish diversity, spawning, and productivity. Macroinvertebrates are characterized by taxa that require cold, clear, water. In contrast, spring-fed streams often have wider channels, lower gradients, more stable flows and temperatures, and less turbidity. Substrates include occasional riffles, long runs, and pools. Spring-fed streams can be high in dissolved minerals and pH, which favors submerged aquatic vegetation growth. This habitat supports native and nonnative cold-water fish highly valued by anglers. Constant cool water in spring-fed streams can provide thermal refuge for fish during the summer and winter months. Macroinvertebrates, including snails, are abundant, but diversity is low.


BRITISH COLUMBIA
Small Streams (1st, 2nd order) - Perennial
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Source: EPA and USGS (2012)
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Lakes, Ponds & Reservoirs

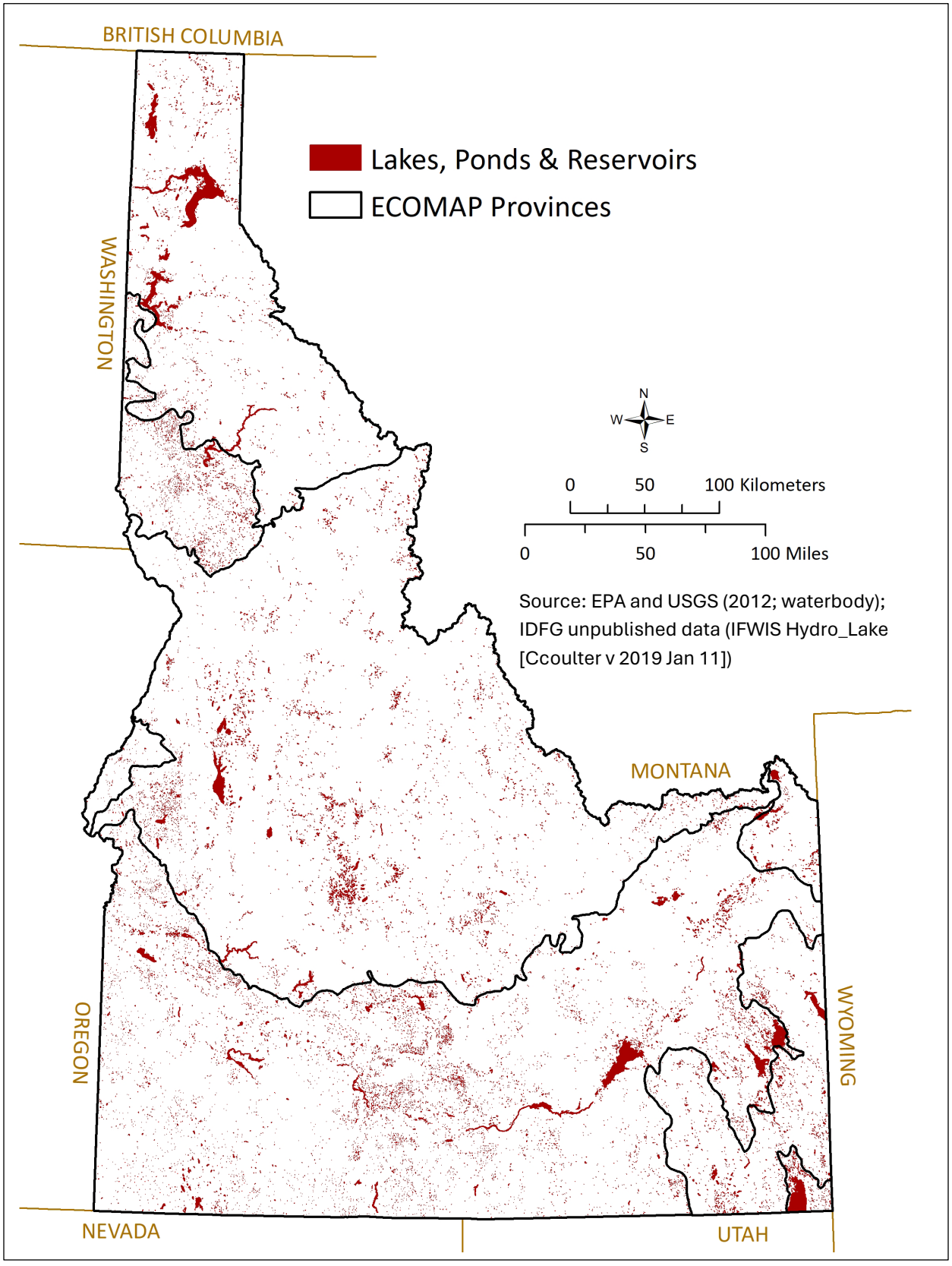


Payette Lake, Idaho (cc) BY 2019 Chris Murphy/IDFG

These are nonflowing (or minimally flowing in run-of-river reservoirs) open water habitats with <30% vegetative cover. Lakes and ponds occupy topographic depressions. They encompass a range of sizes, depths, and origins. They include lakes and ponds in subalpine cirques, montane lakes contained by glacial moraines, kettle ponds, oxbow ponds, and spring-fed ponds. Reservoirs occur in river and stream channels, or on natural lakes impounded by dams, with their size and shape determined by topography. They also occupy depressions created by dikes or excavation (mining). They range from expansive reservoirs on rivers to small livestock ponds, wildlife habitat ponds, or urban stormwater basins.

Most remote, subalpine lakes and ponds are minimally altered by human activities. Lower elevation lakes, ponds, and reservoirs vary in condition. Associated, dependent, near-obligate, or obligate SWAP species include Northern Leopard Frog, Northern Pintail, Black Tern, Caspian Tern, American Bittern, Common Loon, American White Pelican, Clark's and Western grebes, Fringed Myotis, 3 whitefish species (Pygmy, Bonneville, Bear Lake), Lake Chub, Bull Trout, Bear Lake Sculpin, Raptor Fairy Shrimp, and Columbia Primitive Minnow Mayfly. Lakes, Ponds & Reservoirs has a habitat relative status (i.e., S-rank) of S4 and there are 54 SWAP species for which this habitat is important, 20 of which are obligates (Appendix 5).

Lakes are at least 20 acres (8 ha) in size, have wave-formed or bedrock shorelines, and have depths of >8.2 ft (2.5 m) in their deepest parts (i.e., limnetic deepwater habitat). Larger reservoirs share many features of lakes, including thermal stratification. In contrast, ponds are <20 acres (8 ha) in size, <8.2 ft (2.5 m) deep (i.e., littoral habitat where sunlight can reach the bottom or emergent vegetation may persist), have waves <12 in (30 cm) in height, and have relatively uniform water temperatures. Most lakes, and many ponds and reservoirs, are permanently or semipermanently flooded. Emergent vegetation often occupies the littoral zones of lakes, ponds, and reservoirs, but these habitats are classified as "Freshwater Marsh" where cover exceeds 30%. Waterbodies that are intermittently, temporarily, or seasonally flooded are classified as "Vernal Pool" or "Freshwater Marsh" habitats if they are <8.2 ft (2.5 m) deep and support at least 30% cover of annual or perennial vegetation across the basin. If emergent vegetation in such a shallow depression is confined to margins, then the habitat is a pond. Nonturbid lakes, ponds, and reservoirs often support submerged or floating aquatic vegetation. If cover is >30%, then the habitat is classified as "Freshwater Aquatic Vegetation."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Lakes, Ponds & Reservoirs
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Source: EPA and USGS (2012; waterbody); IDFG unpublished data (IFWIS Hydro_Lake [Ccoulter v 2019 Jan 11])
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Springs

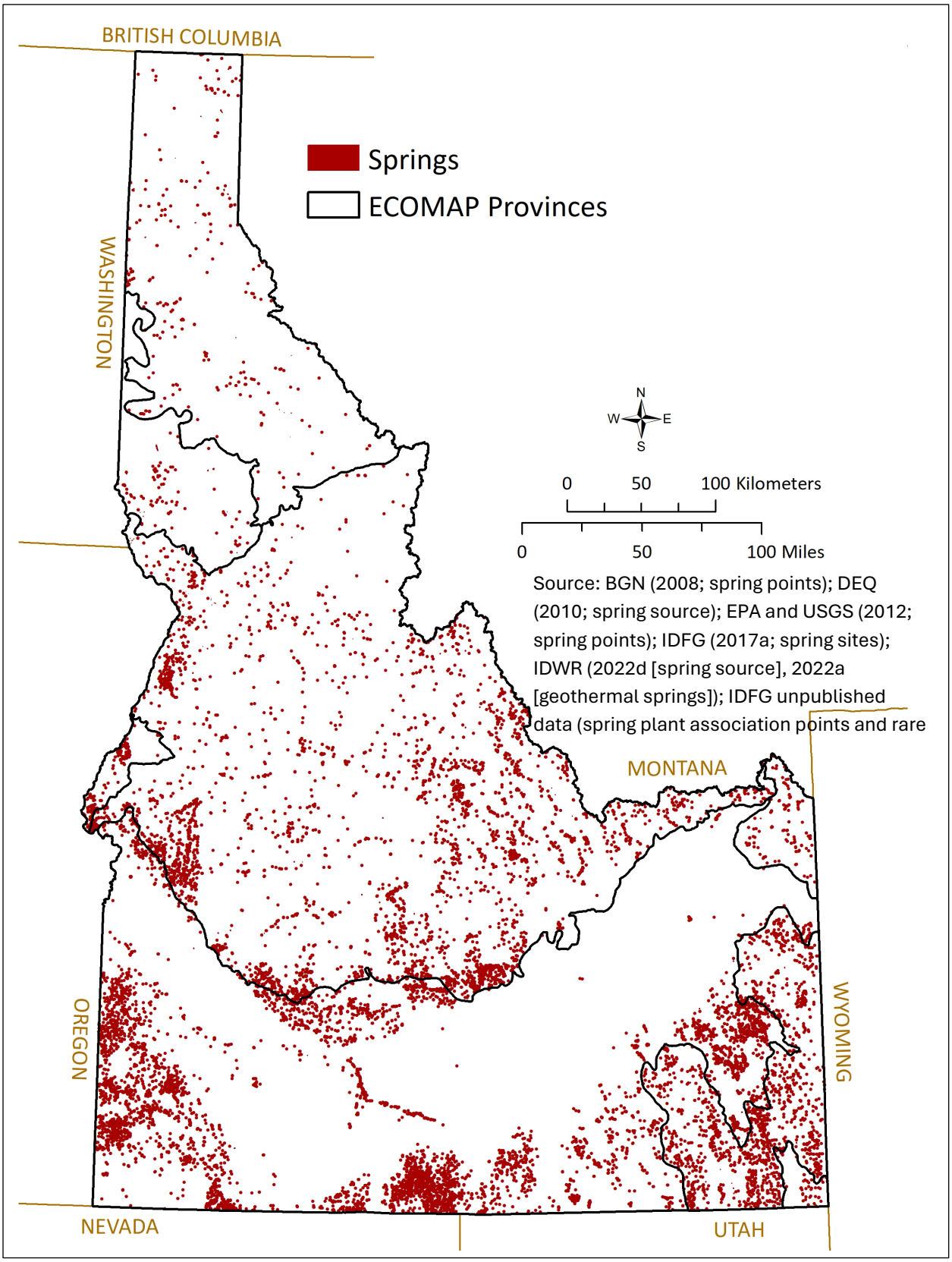
Springs are groundwater-dependent ecosystems formed where water flows from the ground. They support unique communities of aquatic biota, including plants. Productive riparian and wetland habitats are associated with springs. The aquifers supplying springs are recharged by surface water and precipitation. Springs occur where water discharges from slopes at faults and rock fractures or when forced to the surface by impermeable layers, or thermal or pressure gradients (artesian springs).



Devils Corral Spring, Snake River Canyon, Idaho (cc) BY
2019 Chris Murphy/IDFG

Springs occur across the state, varying greatly in size, physical and chemical characteristics, and condition. Most Idaho springs are small and locally important, but larger, high-volume springs also occur and support unique aquatic ecosystems. In some areas, the extent and condition of springs has been diminished due to various stressors, including changes in precipitation and hydrologic regimes, surface and ground water availability, disturbance, and human land uses. Associated, dependent, near-obligate, or obligate SWAP species include Columbia Spotted Frog (Great Basin population), Greater Sage-Grouse, Sandhill Crane, Little Brown Myotis, Shoshone Sculpin, Columbia Oregonian, Banbury Springs Limpet, Cascades Needlefly, Bruneau Hot Springsnail, Bliss Rapids Snail, Beautiful Bryum Moss, and Nevada Goldenrod. Springs has a habitat relative status (i.e., S-rank) of S2 and there are 28 SWAP species for which this habitat is important, 6 of which are obligates (Appendix 5).

Spring-fed aquatic habitat is unusual because water temperatures are relatively constant, and chemistry closely reflects the geologic formation through which the groundwater flows. Water temperatures vary from colder to much warmer than the air temperature. Warm and hot springs (geothermal springs) commonly have unusual chemistry characterized by low dissolved oxygen, high or low pH, and high dissolved minerals. Geothermal springs often support specialized aquatic organisms adapted to extremes of temperature and water chemistry (e.g., *Hydroscapha redfordi*). Springs emanating from carbonate rocks can be high in dissolved calcium carbonate, the precipitation of which results in travertine formation. The physical habitats formed from spring sources can be diverse, from deep pools (limnocrenes), diffuse flows in marshes and fens (helocrenes), distinct channels (rheocrenes), or a combination of these. The extent of spring habitat depends on flow volume and permanence. Large springs, fed by the Snake River Plain aquifer, emerge from basalt walls and alcoves on the north side of the Snake River canyon. These springs provide habitat for endemic snails that require cool water and gravelly substrates with minimal fine sediment. Springs on the Yellowstone Plateau are major sources of the Henrys Fork River. Travertine springs occur in southeast Idaho.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Source: BGN (2008; spring points); DEQ (2010; spring source); EPA and USGS (2012; spring points); IDFG (2017a; spring sites); IDWR (2022d [spring source], 2022a [geothermal springs]); IDFG unpublished data (spring plant association points and rare
MONTANA
OREGON
WYOMING
NEVADA
UTAH

Other

Caves & Subterranean Habitats



Lucile Cave, Idaho (cc) BY 2009 Jim Kennedy/IDFG

Caves & Subterranean Habitats (not mapped due to the sensitivity of locations) include both natural caves as well as abandoned mines. Because many of the abandoned mines have not been active for the past 50 to 100 years, and provide many of the same features as natural caves, a diverse array of wildlife species (especially bats) have colonized them. Most caves occur in the southern part of the state. Idaho does not have much karst (limestone region marked by sinks, abrupt ridges, irregular protuberant rocks, caverns, and underground streams) habitat. Most caves are lava tube caves, formed by volcanic eruptions where the low pressure lava developed a thick, hard crust. These types of caves occur in south-central Idaho across the Snake River Plain. Some Idaho caves are ice caves.

Many of these areas are relatively pristine and because their location is not public knowledge, may be reasonably safe from disturbance. However, caves and lava tubes are highly sensitive and unique environments, making them particularly vulnerable to overuse and misuse as well as changes in climate (Mammola et al. 2019). Associated, dependent, or obligate SWAP species include Western Toad, 11 bat species, a cave obligate mite (*Flabellorhagidia pecki*), Blind Cave Leiodid Beetle, Idaho Lava Tube Millipede, and 2 cave obligate harvestman species (*Speleomaster lexi*, *S. pecki*). Caves & Subterranean Habitats has a habitat relative status (i.e., S-rank) of S3 and there are 17 SWAP species for which this habitat is important, 5 of which are obligates (Appendix 5).

Caves & Subterranean Habitats provide critical habitat to invertebrate cave-obligate SGIN such as the Blind Cave Leiodid Beetle, rhagidiid mite (*Flabellorhagidia pecki*), Idaho Lava Tube Millipede, and cladonychiid harvestmen (*Speleomaster lexi* and *S. pecki*). In addition, caves and abandoned mines provide important roosting (both summer and winter) habitat for near-obligate to dependent bat species such as Townsend's Big-eared Bat, Western Small-footed Myotis, Little Brown Myotis, Fringed Myotis, and Yuma Myotis. Many caves and abandoned mines in Idaho occur on state or federally-managed lands and are managed through either a recreation program or an abandoned mine lands program. Agencies such as the BLM, FS, NPS, and Idaho National Laboratory regulate cave entry for many caves. In addition to their value to wildlife, many caves in Idaho are culturally significant to American Indian tribes.

Chapter 3 Challenges & Actions

Of the "Eight Required Elements" for a SWAP described in Chapter 1, Chapter 3 addresses Elements 3 (stressors) and 4 (actions) (FWS 2017). Element 3 refers to stressors as problems that negatively affect SWAP species or their habitats (see Chapter 2). Element 4 requires that necessary actions be identified to conserve SWAP species and their habitats.

Chapter 2 defines 2 categories of SWAP species:

- species of greatest conservation need (SGCN)—species known to be declining or at-risk from stressors or emerging issues
- species of greatest information need (SGIN)—species potentially at-risk but for which the scientific knowledge or expert understanding is lacking with respect to taxonomy, distribution, or ecology

The SWAP establishes a strategic program, or road map, to coordinate efforts of stakeholders engaged in conserving Idaho's fish, wildlife, and plants and the habitats they depend on. Most importantly, the SWAP creates opportunities for all stakeholders to collaborate in proactive, voluntary, and community-oriented conservation partnerships. The purpose of Chapter 3 is to identify priority conservation actions (hereafter actions), ideally implemented collaboratively by stakeholders, that might alleviate potential stressors associated with negative effects to SGCN or their key habitats and address information needs for SGIN. All are considered a priority and IDFG plans to conduct additional prioritization internally to capitalize on changing opportunities and resources.

Stressors potentially cause undesirable effects or resulting conditions. Human activities, including land and water resource uses, can be sources of stressors for SWAP species. However, other sources of stressors can also negatively affect both SWAP species and human activities, particularly those that rely on natural resources including water, soil, timber, and forage. Common stressors that can negatively affect both SWAP species and human activities include prolonged drought, invasive species, unnaturally large and frequent wildfire, erosion, and water pollutants.

Consequently, many stressors can create challenges for both conserving SWAP species and sustaining landscapes that are crucial for Idaho's natural resource-based economy and the culture and heritage of Idaho's communities. Stressors that negatively affect both SWAP species and human activities can create opportunities for stakeholders to collaborate on identifying joint goals to address stressors and partner in implementing conservation actions for mutually beneficial results. Chapter 3 actions are therefore intended to facilitate and incentivize broad-based stakeholder participation, collaboration, and partnerships. All SWAP proposed actions are voluntary and can include conservation programs, projects, or BMPs. Ideally, all conservation partners, including industry, American Indian tribes, private

landowners, government entities, and NGOs, will collaboratively implement the SWAP's voluntary actions.

Chapter 3 prioritizes actions that include opportunities for stakeholders to collaborate on actions that simultaneously benefit Idaho's SWAP species, natural resource-based economies, and local communities. Per the SWAP's statewide strategic approach, voluntary actions are generally designed to be comprehensive and apply to a wide variety of circumstances in which stressors could occur across Idaho's large and diverse landscapes over the next 10 years.

To provide additional context, Chapter 3's comprehensive actions often include examples of more detailed corresponding actions that might be implemented as part of a specific conservation program, project, or BMP. The SWAP's strategic approach is intended to provide the flexibility to adapt widely applicable comprehensive actions as needed to address stressors under site-specific circumstances as might occur into the future. To illustrate this strategic approach, the following is an example of a potential stressor (invasive species and wildfire) negatively affecting key SGCN habitats (Desert & Semidesert) and a comprehensive voluntary action with examples of more detailed actions that could be implemented by a SWAP stakeholder depending on specific circumstances and needs:

- effect—rangeland health and productivity are decreased by invasive species infestation and destructive wildfire
- voluntary action—improve rangeland health to benefit SGCN and livestock management (e.g., invasive species control, erosion prevention and control, rangeland restoration, and desirable vegetation planting and management)

Chapter 3 is organized into sections based on "challenge" categories. The term challenge refers to a category of natural or human-caused activity (e.g., Agriculture & Aquaculture) or a grouping of relatively similar human-influenced stressors (e.g., Pollution). Each challenge section identifies potential negative effects to SWAP species or their habitats, caused by stressors, and proposes voluntary actions to address these stressors for the benefit of conserving SGCN, filling knowledge gaps for SGIN, and sustaining human resource uses. This chapter includes the following sections based on applicable categories from the Conservation Measures Partnership *Direct Threats Classification* (CMP 2016a) and modified for use in the SWAP:

3.1 Residential & Commercial Development
3.2 Agriculture & Aquaculture
3.3 Energy Production & Mining
3.4 Transportation & Service Corridors
3.5 Biological Resource Use
3.6 Human Intrusions & Disturbance
3.7 Natural System Modifications
3.8 Invasive & Problematic Species, Pathogens & Genes
3.9 Pollution
3.10 Geological Events
3.11 Climate Change
3.12 Insufficient Species & Conservation Information

While many stakeholders may be interested in all of Chapter 3, some may have a narrower focus on a subset of challenge sections. For example, mining stakeholders might be less

interested in Biological Resource Use. Therefore, each challenge section is intended to be independent to facilitate stakeholder focus, which results in duplication when stressors and actions are applicable to multiple challenges.

Each challenge section has the following subsections as applicable:

- Overview
- Overarching Effects & Actions
- Habitat-Specific Effects & Actions
- Species-Specific Effects & Actions

The subsection Overarching Effects & Actions applies to potential stressors causing undesirable conditions for many SWAP species or habitats. Habitat-Specific Effects & Actions addresses stressors causing undesirable conditions for individual habitats or groups of habitats, with an emphasis on negative effects to the quantity, quality, or connectivity of key SGCN habitats. Species-Specific Effects & Actions addresses stressors causing undesirable conditions for individual species or groups of SGCN. Chapter 2 (Tables 2.1 and 2.2) provides a list of SWAP species and Appendix 5 attributes species by the habitats essential to their conservation. Proposed voluntary actions include monitoring described in Chapter 4.

Each habitat-specific and species-specific action proposed in Chapter 3 is a priority for implementation during the next 10 years based on estimates of feasibility and likelihood of being effective to address stressors negatively affecting SGCN or to fill information needs for SGIN. Habitat-specific actions are proposed within each challenge section to address potential negative effects of stressors on key habitats and their related SGCN. Like priority actions, key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats not addressed within a challenge section's habitat-specific actions are presently considered of lower priority. Priority actions implemented will depend on opportunities that occur. Actions in Chapter 3 are also not exhaustive and additional priority actions will be implemented if needed to conserve SWAP species and key habitats in the future.

3.1 Residential & Commercial Development

Overview

Residential & Commercial Development (hereafter development) consists of Housing & Urban Areas, Commercial & Industrial Areas, and Tourism & Recreation Areas (CMP 2016a). In recent decades, Idaho has had one of the fastest growing populations in the US, primarily from people relocating to the state (Fig. 3.1). For example, Idaho was the second-fastest growing state in the nation between 2010 and 2020, increasing over 17%. The projected statewide growth rate is 1.1% annually through 2029, when the state's population will approach 2 million (IDOL 2021).

A thriving economy, relatively low cost of living, rural community lifestyle, and cultural perceptions have been key factors attracting people to Idaho. Expanded telecommunication infrastructure and evolving workplace cultures are also increasingly facilitating employees to live and work remotely in rural states such as Idaho. In addition, people are attracted to Idaho's expansive public lands and associated outdoor recreation. These lands have abundant fish and

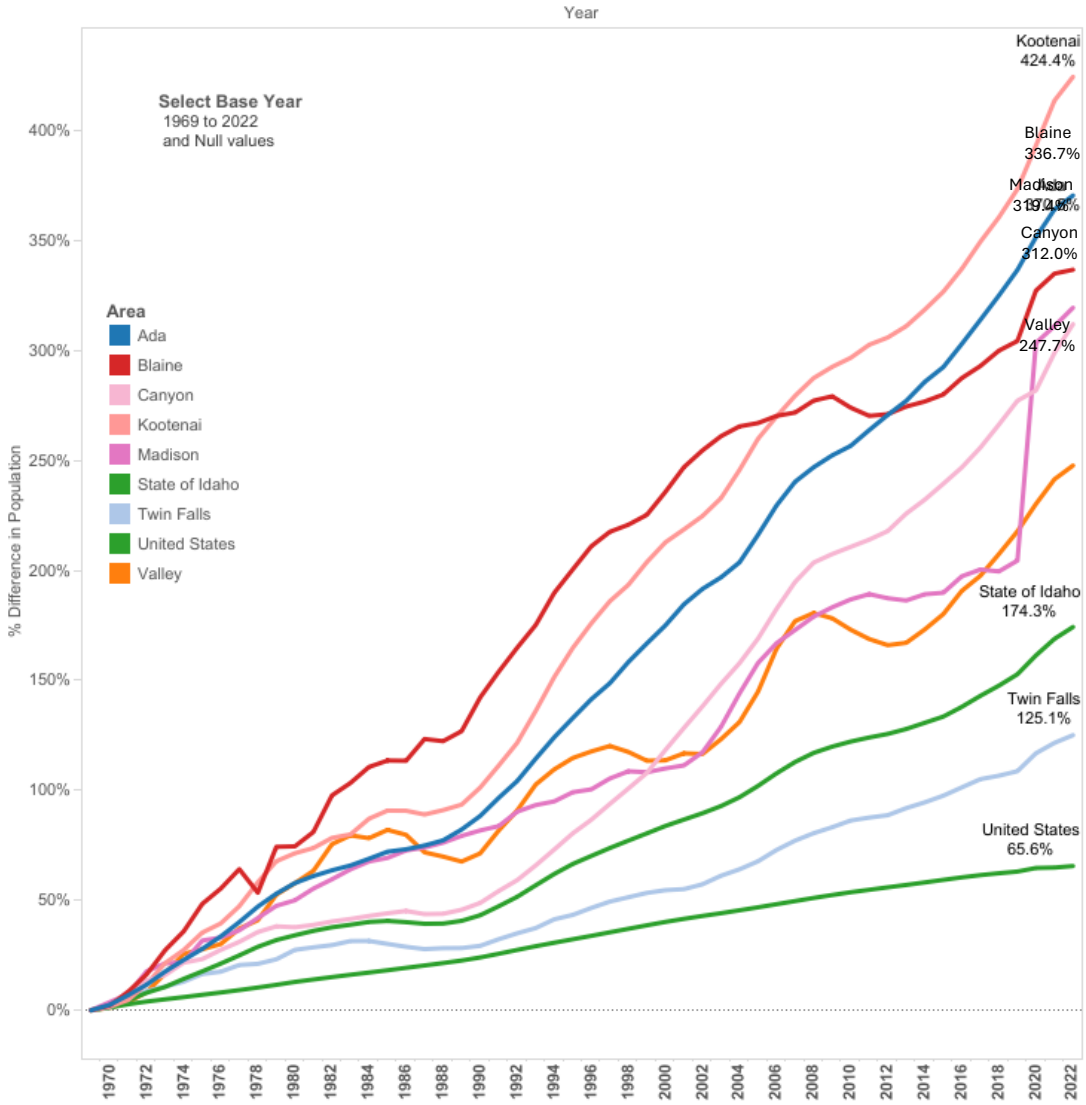


Fig. 3.1 Population growth rates of select counties, the State of Idaho, and the US, expressed as a percentage from base year (1969). US Census population estimates 1969–2022. Source: US Census Bureau, Population Estimates Program (IDOL 2023).

wildlife-related recreation important to Idaho's economy, rural communities, and culture and heritage.

An increasing population creates demand for development, consisting of various buildings, structures, infrastructure, and associated human activities. For example, the number of housing units in Idaho increased by 12.5% from 2010 to 2019 (IDOL 2020). Population growth has disproportionately occurred in urban and suburban areas. Madison, Kootenai, and Ada Counties (containing the cities of Rexburg, Coeur d'Alene, and Boise, respectively) were the 3 fastest growing counties from 2010 to 2020 (US Census Bureau 2021). However, low-density, rural-residential housing is also expanding in nonmetropolitan portions of Idaho (US Census Bureau 2021).

Idaho's abundant public lands generally preclude development. However, rural private lands are experiencing urban, suburban, and rural–residential development. In particular, development is affecting working agricultural lands, rangelands, and forests near metropolitan areas. These private lands also contribute greatly to Idaho's abundant fish, wildlife, and plants, including SGCN. Private landowners have always been and will continue to be conservation stakeholders and partners in Idaho.

Development in rural private lands can be a source of stressors that negatively affect SGCN in some circumstances by reducing habitat quality, quantity, or connectivity. However, opportunities exist to reduce negative effects of development when stakeholders collaborate on community-driven solutions and partnerships. Moreover, opportunities exist to partner in efforts that will mutually benefit SGCN and development, such as reducing wildfire risks with fuel treatments in wildland urban interface (WUI) areas and providing open space for the Monarch Butterfly and other pollinators. Considering Idaho's population is expected to continue growing into the foreseeable future, expanding collaborative partnerships with incentivized and voluntary approaches will be essential for meeting development needs while sustaining Idaho's SGCN, resource-based economies, and community culture and heritage.

Overarching Effects & Actions

A range of factors influence the location and extent of development including public demand, construction costs, local zoning and land-use regulations, access to public services and infrastructure, and environmental amenities such as outdoor recreation. Although often complex, development can negatively affect SGCN by changing existing habitat into nonhabitat consisting of housing subdivisions, commercial buildings, infrastructure, and managed landscaping. Additional stressors commonly associated with development can include reduced water supplies and water quality, introduction and spread of invasive species, and wildfire ignitions in the WUI.

Development can also negatively affect amenities valued by communities such as clean water, open space, healthy lakes, rivers, and wildlands, and access to outdoor recreation. These same community amenities also benefit SGCN. Therefore, collaborating with communities, landowners, and developers during forward-thinking comprehensive planning and zoning processes can help optimize the benefits of development while reducing its negative effects. Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and

productivity of lands and waters important for Idaho's SGCN, economic vitality, and communities:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with local governments, resource managers, and other stakeholders to develop and implement actions that incentivize development in areas with low SGCN value and high development value for landowners and local communities.
- Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
- Support community, business, and industry efforts to implement mitigation for habitats affected by development.
- Incentivize landowners to conserve and manage strategic parcels to benefit priority SGCN populations or habitats and sustain Idaho's natural resource-based economy, culture and heritage, and community amenities (e.g., Forest Legacy Program and Forest Stewardship Program).
- Include land trusts as key partners in development of conservation easements in SGCN habitats that prevent development incompatible with SGCN and habitats.
- Promote open space and landscaping in development planning to provide SGCN habitat including parks, gardens, and golf courses for bird SGCN and beneficial pollinator SGCN (e.g., Monarch Butterfly) (WAFWA 2019).
- Encourage xeriscaping and native plants in landscaping and gardens to benefit Monarch Butterfly, bumble bees, and other beneficial pollinators.
- Support efforts to reduce risks of destructive wildfire in the WUI and adjacent areas prone to wildfire.

Voluntary Actions Related to Information and Knowledge Gaps

- Assist county and municipal planning and zoning processes and provide information about opportunities to reduce negative effects on SGCN while sustaining Idaho's economy, culture and heritage, and community amenities.
- Identify knowledge gaps, proactively develop information, support comprehensive master planning, and evaluate development projects for SGCN conservation opportunities.
- Promote inventorying pollinators relative to weather conditions and patterns.
- Provide technical assistance to inform development siting and planning efforts about opportunities to avoid or minimize negative effects on SGCN while benefiting local community values.
- Develop and distribute information and BMPs for avoiding negative effects of development on water supplies and water quality (e.g., EPA 2023a).
- Encourage the use of wildlife-friendly building materials (e.g., glass products that minimize the number of birds hitting windows) and wildlife-friendly fencing designs.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Participate with communities, local governments, and development stakeholders in local comprehensive planning processes to share SGCN conservation goals and opportunities.
- Partner with communities and local governments to create guidelines and BMPs designed to reduce human–wildlife conflict resulting from activities such as wildlife feeding, free-ranging pets, landscaping, and unsecured garbage (e.g., IUCN 2023).
- Conduct community outreach events to provide information about coexisting with wildlife in urban, suburban, and rural–residential settings.
- Promote pollinator-friendly landscaping where appropriate to benefit pollinators including Monarch Butterfly and bumble bees (e.g., flowering plants, appropriate nesting habitat, nest-building materials, and appropriate landforms).
- Develop and distribute information for landowners about landscaping plants that are poisonous to wildlife (e.g., ornamental yews such as Japanese, Common, Chinese, and Canada yews).
- Encourage landscaping with plants that are not edible where wildlife is unwelcome.
- Participate in collaborative programs that involve stakeholders in resource stewardship including SGCN conservation.

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats described in Chapter 2 form the organizational structure of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with development. Ideally, SGCN conservation will be mutually beneficial for responsible development.

Forest & Woodland

Privately owned Forest & Woodland habitat is highly valued for Idaho's growing communities and economy and is therefore particularly appealing for suburban and rural–residential development. Consequently, development is expanding into Forest & Woodland habitats that surround many communities across the state and is changing land uses (e.g., along the US-95 corridor in northern Idaho and recreation-based communities of McCall and Island Park). In addition to changing land uses, other stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, disease and insect outbreaks, and the introduction and spread of invasive species. These interacting stressors also elevate wildfire risks and consequences for communities, especially along expanding forested WUIs.

Development that expands WUIs can also worsen the condition of SGCN habitat caused by other Forest & Woodland habitat stressors. Actions that conserve SGCN by comprehensively addressing Forest & Woodland habitat stressors can also benefit communities (e.g., by protecting open space for outdoor recreation and reducing wildfire risks in the WUI). Depending on circumstances, the Idaho Department of Water Resources (IDWR) and US Army Corps of Engineers (USACE) might regulate development in riparian forests per the Idaho Stream Channel Protection Act (ISCPA) and US Clean Water Act (CWA), respectively (see IDWR 2022b). Therefore, development in riparian forests might need state and federal permits that could include protective measures for SGCN.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by development include Wolverine, Rocky Mountain Goat, Moose, Yellow-billed Cuckoo, Great Gray Owl, Lewis's Woodpecker, Clark's Nutcracker, Cassin's Finch, Western Bumble Bee, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation, responsible development, and valued community amenities, are listed in Table 3.1.1.

Table 3.1.1 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane-Foothill Forest Mesic Lower Montane Forest Subalpine–High Montane Forest Aspen Forest & Woodland Pinyon–Juniper Woodland	Forest habitats are changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority forests to benefit Idaho's SGCN, forest products economy, and communities (e.g., Forest Legacy Program and Forest Stewardship Program).
	Forest habitats are harmed by destructive wildfire. Fire-resistant mature forest characteristics are decreased by improper vegetation management. Bird nesting habitat is decreased by vegetation management.	Reduce risks of destructive wildfire in WUI and adjacent wildfire-prone forests (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Restore WUI forests negatively affected by destructive wildfire (e.g., erosion control, strategic salvage logging, desirable vegetation planting and management, and invasive species control).
		Improve forest health (e.g., plant desirable vegetation and selectively keep various tree ages, sizes, and types, snags, woody debris, and other important types of vegetation).

Table 3.1.2 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	SGCN movements or migrations are hindered by fences. SGCN survival decreases from colliding with or becoming entangled in fencing.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
Subalpine–High Montane Forest	SGCN are disturbed or displaced by facilities, infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's sustainable recreation economy and communities.
		Manage forests to benefit SGCN while benefiting access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreational trail routing, erosion prevention and control, and information and education).
Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Shorelines and floodplains are changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority riparian forests to benefit Idaho's SGCN and community amenities (e.g., cottonwood stands).
	Shorelines and floodplains are harmed by vegetation removal. Riparian vegetation regeneration is prevented by water management, levees, streambank stabilization, or channelization.	Manage riparian forests to benefit SGCN and community amenities (e.g., access management, buffers/setbacks, targeted riparian fencing, streambank and floodplain restoration, desirable vegetation planting and management, invasive species control, and erosion prevention and control).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
	North American Beavers are removed to prevent infrastructure and property damage.	Implement incentive-based programs and BMPs to reduce beaver conflicts with private property and infrastructure (e.g., Beavers Northwest 2023; Clark Fork Coalition 2023; Shockey 2023).

Shrub & Herb Wetland

Shrub & Herb Wetland habitats provide important amenities for communities including water sources, pollutant filtration, water storage, open space, and outdoor recreation. Development has the potential to affect Shrub & Herb Wetland habitats near Idaho's growing urban, suburban, and rural communities around the state. In addition to development, other stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, water diversions, pollutants decreasing water quality, and the introduction and spread of invasive species. These interacting stressors can further affect both SGCN habitat and important amenities that Shrub & Herb Wetland habitats provide to Idaho communities.

Depending on circumstances, IDWR and USACE might regulate development in Shrub & Herb Wetland habitats per the ISCPA and CWA, respectively (see IDWR 2022b). Therefore, development in wetlands and riparian zones might need state and federal permits that could include protective measures for SGCN. Idaho's water allocation and distribution processes administered by IDWR regulate the diversion of public waters for domestic, municipal, and commercial use. Pollutant discharges to public waters from stormwater, commercial/industrial facilities, and wastewater treatment facilities are also regulated through state and federal permitting requirements including the Idaho Pollutant Discharge Elimination System (IPDES) administered by the DEQ (DEQ 2022b) and National Pollutant Discharge Elimination System (NPDES) administered by the Environmental Protection Agency (EPA) (EPA 2022b) under the CWA (EPA 2022a). IDPES and NPDES permits include measures to meet water quality standards.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by development include Northern Leopard Frog, Little Brown Myotis, Hoary Bat, Silver-haired Bat, Moose, Trumpeter Swan, Northern Pintail, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Indian Valley Sedge. Proposed voluntary actions intended to address negative effects of stressors if occurring, and thus benefit SGCN conservation, responsible development, and valued community amenities, are listed in Table 3.1.2.

Table 3.1.2 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh	Wetlands and riparian zones are changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority wetlands and riparian zones to benefit Idaho's SGCN, natural resource-based economy, and communities.

Table 3.1.2 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Ruderal Marsh, Wet Meadow & Shrubland Alkali–Saline Marsh, Playa & Shrubland	Domestic, municipal, or commercial water diversions change wetland water supplies and productivity. Domestic, municipal, or commercial discharges decrease water quality. Wetlands and riparian zones are harmed by vegetation management. Wetland and riparian vegetation regeneration is prevented by water management, levees, streambank stabilization, erosion, or channelization.	Improve wetlands and riparian zones to benefit SGCN and community amenities (e.g., buffers/setbacks, desirable vegetation planting and management, moist-soil and shallow-water management, targeted riparian fencing, access management, erosion prevention and control, streambank and floodplain restoration, and invasive species control).
		Manage wetlands and riparian zones to benefit SGCN and water supplies, water quality, and other community amenities (e.g., buffers/setbacks, less water-intensive landscaping, water reuse, improved stormwater management, and upgraded water treatment facilities).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
	SGCN are disturbed or displaced by facilities, infrastructure, and human activities.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's economy and communities.
		Manage wetlands and riparian zones to benefit SGCN while benefiting access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreational trail routing, erosion prevention and control, and information and education).
Lowland Marsh, Wet Meadow & Shrubland	Habitat value reduced for SGCN marshbirds, songbirds, and amphibians.	Minimize continued conversion of wet meadow and marsh to deeper, open water ponds in developments (e.g., housing, golf courses, recreational fishing ponds) that become water storage and conveyance bodies with minimal habitat value to SGCN marshbirds, songbirds, and amphibians.

Desert & Semidesert

Desert & Semidesert habitats support economies including ranching and mining and provide lifestyle amenities such as outdoor recreation and access to open space, particularly on public lands. Privately owned Desert & Semidesert habitat surrounding Idaho's growing communities is therefore appealing for suburban and rural–residential development due to its relative ease and the supporting commercial and industrial infrastructure and services (e.g., energy distribution and municipal waste disposal facilities). Consequently, development is expanding into Desert & Semidesert habitats surrounding many population centers, which can change traditional land uses and SGCN habitat. Within the Snake River Plain, notable examples of expanding development include the urban centers of Boise, Twin Falls, and Idaho Falls.

In addition to development, other stressors potentially affecting Desert & Semidesert habitats include prolonged drought, changing precipitation and snowpack trends, natural resource development, the introduction and spread of invasive species, and unnatural wildfire frequency (total number of fires), extent (total land burned), and severity (degree of damage that fires cause to the landscape). These interacting stressors can further affect both SGCN habitat and important amenities that Desert & Semidesert habitats provide to Idaho communities. For example, Cheatgrass infestations and unnatural wildfire have significantly decreased and fragmented the extent and productivity of lower elevation sagebrush-steppe. These interacting stressors have elevated wildfire risks for communities, especially along expanding WUIs. Development that expands WUIs can also worsen SGCN habitat effects caused by other Desert & Semidesert habitat stressors.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by development include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, and Slickspot Peppergrass. Proposed voluntary actions intended to address negative effects of stressors if occurring, and thus benefit SGCN conservation, responsible development, and valued community amenities, are listed in Table 3.1.3.

Table 3.1.3 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland	Shrublands and grasslands are changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority shrublands and grasslands to benefit Idaho's SGCN, natural resource-based economy, and communities.

Table 3.1.3 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland	Shrublands and grasslands are harmed by destructive wildfire from increased wildfire ignitions worsened by invasive species.	Reduce risks of destructive wildfire in WUIs and adjacent fire-prone shrublands and grasslands (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, desirable vegetation planting and management, and information and education).
		Restore WUI shrublands and grasslands negatively affected by destructive wildfire (e.g., erosion control, desirable vegetation planting and management, and invasive species control).
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
	SGCN are disturbed or displaced by facilities, infrastructure, or human activities.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's economy and communities.
		Manage shrublands and grasslands to benefit SGCN while benefiting access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreational trail routing, erosion prevention and control, and information and education).
	SGCN movements or migrations are hindered by fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in fencing.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.

Agricultural Habitat

Development associated with Idaho's expanding urban, suburban, and rural communities often includes conversion of surrounding Agricultural Habitat to buildings, infrastructure, and managed landscaping. The Treasure Valley and Magic Valley are examples of urban and suburban development substantially changing Idaho's agricultural lands. High property values compared to commodity prices is a driver for development of agricultural land near growing population centers. For example, 11 million acres (4.5 million ha) of US agricultural lands, including 4.4 million acres (1.8 million ha) of "Nationally Significant" farmland, were changed to nonagricultural uses between 2001 and 2016 (Freedgood et al. 2020), which reduced the many benefits these lands provided society.

In addition to development, other potential stressors affecting the sustainability of Agricultural Habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and the introduction and spread of invasive species. Agricultural Habitat also provides opportunities for SGCN conservation. Therefore, development of Agricultural Habitat can reduce SGCN habitat and potentially worsen other stressors affecting sustainable agriculture.

Examples of SGCN occurring in Agricultural Habitat and potentially influenced by development include Pronghorn, Greater Sage-Grouse, Sharp-tailed Grouse, Sandhill Crane, White-faced Ibis, Yellow Bumble Bee, Morrison Bumble Bee, Western Bumble Bee, and Monarch Butterfly. Proposed voluntary actions intended to address negative effects of stressors if occurring, and thus benefit SGCN conservation, responsible development, and valued community amenities, are listed in Table 3.1.4.

Table 3.1.4 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of Agricultural Habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Agricultural Habitat	Agricultural Habitat and waters are changed to nonhabitat by development.	Incentivize landowners and resource managers to conserve priority agricultural lands and waters to benefit Idaho's SGCN, agricultural economy, culture and heritage, and rural communities.
		Assist planning and zoning processes and inform development siting processes about opportunities to avoid and reduce negative effects on SGCN while sustaining Idaho's agricultural economy, culture and heritage, and rural communities.

Aquatic Vegetation & Freshwater Habitat

Development in Idaho's growing urban, suburban, and rural communities is often associated with Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat), which can be important sources of water for domestic, municipal, and commercial uses, irrigation, and outdoor recreation. Development has the potential to reduce the quantity and quality of aquatic habitat near communities. In addition to development, other stressors potentially affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, pollutants decreasing water quality through stormwater runoff and facility discharges, surface water and groundwater diversions, and the introduction and spread of invasive species. These interacting stressors can further affect both SGCN habitat and important amenities that aquatic habitat provides to communities. Shoreline and in-water development can also reduce SGCN habitat and worsen other potential stressors negatively affecting aquatic habitat for communities.

Depending on circumstances, IDWR, IDL, and USACE might regulate development in aquatic habitat per the ISPCA, Idaho Lake Protection Act, and CWA, respectively. Therefore, development in aquatic habitat might need state and federal permits that could include protective measures for SGCN. Idaho's water allocation and distribution processes administered by IDWR regulate the diversion of public waters for domestic, municipal, and commercial use. Pollutant discharges to public waters from stormwater, commercial/industrial facilities, and wastewater treatment facilities are also regulated through state and federal permitting requirements including the IPDES administered by the DEQ (DEQ 2022b) and NPDES administered by EPA (EPA 2022b) under the CWA (EPA 2022a). IDPES and NPDES permits include pollutant measures to meet water quality standards.

Examples of SGCN occurring in aquatic habitat and potentially influenced by development include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Columbia Spotted Frog, Moose, Northern Pintail, Harlequin Duck, Western Grebe, Ring-billed Gull, Caspian Tern, and Bruneau Hot Springsnail. Proposed voluntary actions intended to address negative effects of stressors if occurring, and thus benefit SGCN conservation, responsible development, and valued community amenities, are listed in Table 3.1.5.

Table 3.1.5 Voluntary actions intended to benefit SGCN and responsible development if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Aquatic habitat is changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority aquatic habitat to benefit Idaho's SGCN, natural resource-based economy, and communities.
	Domestic, municipal, or commercial water diversions change aquatic habitat inflows and water levels. Domestic, municipal, or commercial discharges decrease water quality. Changed water flows, shoreline stabilization, vegetation removal, and stream channelization decrease riparian productivity, floodplain regeneration, and instream fish cover.	Manage aquatic habitat to benefit SGCN and water supplies, water quality, and other community amenities (e.g., buffers/setbacks, less water-intensive landscaping, water reuse, erosion prevention and control, lake bed and shoreline restoration, invasive species control, improved stormwater management, and upgraded water treatment facilities).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
	SGCN are disturbed or displaced.	Plan and site facilities and infrastructure to reduce negative effects on SGCN while sustaining Idaho's economy and communities.
		Manage aquatic habitat to benefit SGCN while benefiting access to outdoor community amenities (e.g., access management, erosion prevention and control, and information and education).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.1.6 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit responsible development.

Table 3.1.6 Voluntary actions intended to benefit SGCN and responsible development by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bat SGCN Insect-eating bird SGCN including: Yellow-billed Cuckoo Common Nighthawk	Abundance is reduced from declines in food sources from pest control.	Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on food sources for insect-eating species (USDA 2022).
Pollinating insect SGCN including: Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee Monarch Butterfly	Abundance is reduced by pest control.	Implement the *Idaho Pollinator Protection Plan* (ISDA 2016).
		Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on beneficial pollinators (USDA 2021, 2022).
	Abundance is reduced from loss of plants providing pollen and nectar.	Promote open space, landscaping, and BMPs that provide native pollen- and nectar-producing plants in parks, gardens, and golf courses beneficial for pollinating insect SGCN (WAFWA 2019).
Amphibian SGCN	Abundance is reduced by pest control.	Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on amphibians (USDA 2022).
Little Brown Myotis Yuma Myotis Townsend's Big-eared Bat	Abundance is reduced from loss of roosting habitat in buildings and other structures.	Implement programs, projects, and BMPs to provide artificial roosting habitat (e.g., White-nose Syndrome Conservation and Recovery Working Group 2015; Holroyd et al. 2023).

Table 3.1.6 Voluntary actions intended to benefit SGCN and responsible development by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Grizzly Bear	Abundance is reduced by control actions needed in response to human–bear conflict.	Participate in Grizzly Bear conservation and management actions in coordination with the Interagency Grizzly Bear Committee (e.g., human–bear conflict and human-caused bear mortality reductions, providing secure habitat, information and education, and technical assistance).
		Implement BMPs to reduce human–bear conflicts by managing food sources and other bear attractants (e.g., garbage, animal feeds, gardens, and fruit trees) (e.g., Lackey et al. 2018; Can 2020; IGBC 2023).
		Provide human–bear conflict management staffing capacity and assign staff to strategic locations in the state to perform proactive and responsive conflict-bear management.
		Provide information and education to communities about bear safety precautions and BMPs (e.g., Lackey et al. 2018; Can 2020; IGBC 2023).
Plant SGCN including: Ute Ladies-tresses Indian Valley Sedge	Abundance and distribution are reduced by habitat loss, human activities, trampling, or improper herbicide use.	Provide technical assistance to inform development siting and planning efforts about opportunities to avoid or minimize negative effects on plant SGCN while benefiting local community values.
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to development (e.g., siting, buffers/setbacks, access management, targeted protective fencing or other barriers, and information and education).
		Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to conserve plant SGCN populations associated with development (e.g., species identification, conservation practices, and proper herbicide application methods).
		Transplant or propagate plant SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.

3.2 Agriculture & Aquaculture

Overview

Agriculture & Aquaculture (hereafter agriculture) consists of Annual & Perennial Non-Timber Crops, Wood & Pulp Plantations, Livestock Farming & Ranching, and Freshwater Aquaculture (CMP 2016a). Agriculture is vital to Idaho's economy, communities, and overall way of life. Annually generating approximately $20 billion, agriculture is one of the largest contributors to Idaho's economy, producing more than 185 commodities that account for 17% of the state's total economic output. In addition, agriculture accounts for approximately 17% of statewide sales and 12.5% of Idaho's gross domestic product (ISDA 2022).

Idaho's approximately 25,000 farms and ranches cover 11.5 million acres (4.7 million ha) (ISDA 2022). Idaho also has about 115 permitted aquaculture businesses producing sturgeon, catfish, trout, steelhead, salmon, and tilapia (Aquatic Network 2018). Idaho's thriving agricultural economy is associated with increasing global food demands from an expanding human population. Global food security needs could increase up to 70% by 2050 (Bodirsky et al. 2015; FAO 2017; Searchinger et al. 2019). Agricultural producers must therefore increase productivity, which could unintentionally cause issues for conserving natural resources such as SGCN.

Idaho's agricultural economy and abundant fish, wildlife, and plants are all important to the rich culture and heritage of the state's communities. Public lands, private lands, and public waters that support agriculture provide society with many important renewable products and services including healthy soils, clean water, crops, livestock forage, forest products, pollination, flood control, and outdoor recreation (WGA 2020, 2021a). These same lands and waters also provide crucial habitat for fish, wildlife, and plants across Idaho.

Agriculture's sustainable production of renewable products and services for society can be compatible with SGCN conservation when stakeholders collaborate in community-driven problem solving (Bothwell 2019). The Western Governors' Association (WGA) Policy Resolution 2021-03, *National Forest and Rangeland Management* (WGA 2021a), emphasizes the importance of collaboration and strategic planning among stakeholders. Many long-standing partners associated with agriculture are already contributing greatly to conserving the state's fish, wildlife, and plants. Established relationships among agricultural partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-based solutions to meet the world's increasing food demands while conserving SGCN. Collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, vital agricultural-based economy, and community culture and heritage.

Overarching Effects & Actions

Natural resources provided by healthy lands and waters, both publicly and privately owned, sustain the state's agricultural economy and communities. These lands and waters also provide

habitat for fish, wildlife, and plants, including SGCN. Therefore, conserving Idaho's lands and waters can benefit both agriculture and SGCN.

The connection between natural resources supporting agriculture and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing effects of stressors that have the potential to negatively affect the health and productivity of lands and waters important to agriculture, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with agricultural producers, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and sustainable agriculture goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and agriculture goals and objectives for managing stressors (e.g., forest and rangeland health, soil health, water supplies, and water quality).
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and agricultural-related planning.
    - Assess the status of stressors related to SGCN and agriculture goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential agriculture-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs (e.g., NRCS 2023) on public and private lands that benefit joint SGCN and agriculture goals and objectives (Fig. 3.2.1). The following are examples of voluntary actions:
    - Implement soil and water conservation projects and BMPs to benefit water supplies, water quality, and soil health (e.g., USDA ARS 2021; NRCS 2023).
    - Improve rangeland health (e.g., Pronghorn, California and Rocky Mountain bighorn sheep).
    - Construct and upgrade livestock fencing to wildlife-friendly specifications that facilitate big game movements, reduce bird collisions, and protect plant SGCN populations (e.g., Macfarlane's Four-o'clock).

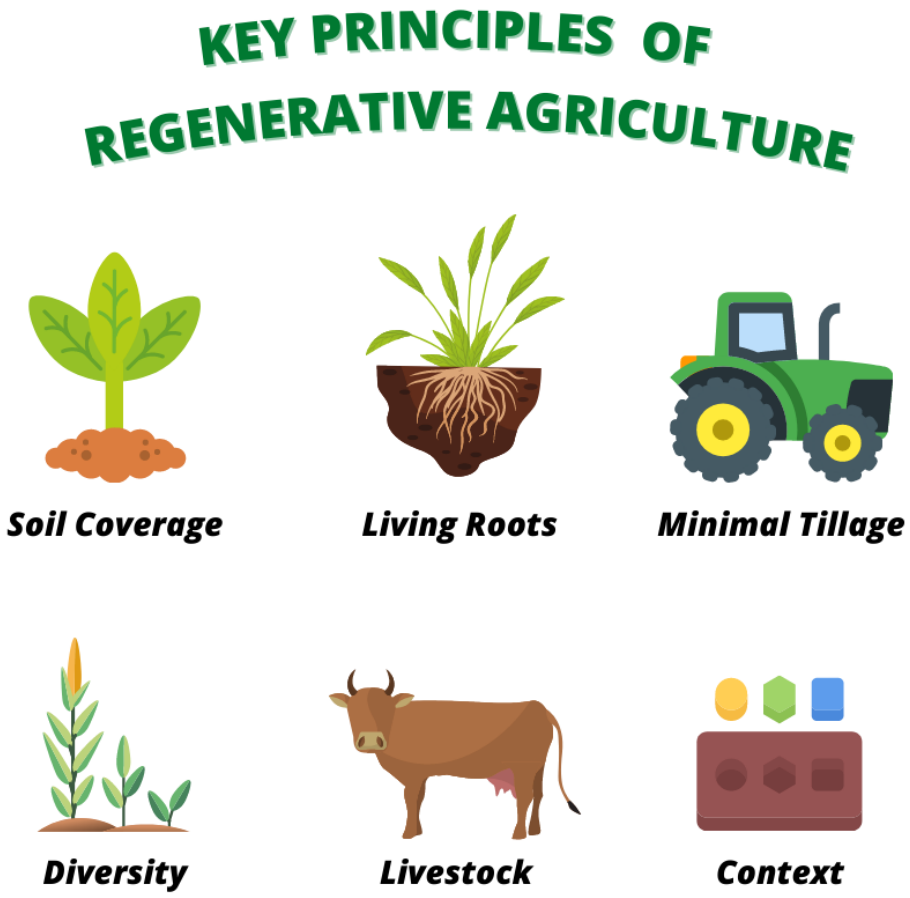


Fig. 3.2.1 Regenerative agriculture sustains Idaho farming and ranching livelihoods while improving soil richness, improving watershed health, and reducing greenhouse gas emissions (TNC 2019).

- Implement sustainable agricultural BMPs including conservation tillage, crop rotations, cover cropping, and erosion prevention and control (e.g., Rehman et al. 2022).
- Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
- Conserve SGCN pollinators and benefit agriculture with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (e.g., Yellow

Bumble Bee, Western Bumble Bee, and Monarch Butterfly) (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
    - Manage pollution per the *Idaho Agricultural Pollution Abatement Plan* (Resource Planning Unlimited 2003).
    - Conserve high-priority SGCN populations and habitat, and agricultural lands and waters, with collaborative agreements (e.g., land exchanges, conservation easements, and water banking and trading).
- Collaborate with agricultural producers, private landowners, and resource managers to use existing agricultural programs and incentivize voluntary soil, water, and SGCN conservation projects such as BMPs, technology upgrades, and conservation of working agricultural lands (e.g., Cheatgrass Challenge, Conservation Reserve Program, Farm and Ranch Lands Protection Program [FRPP], Agricultural Conservation Easement Program [ACEP], Wetland Reserve Easement [WRE], State Acres for Wildlife Enhancement, Regional Conservation Partnership Program [RCPP], Environmental Quality Incentives Program [EQIP], and Sage Grouse Initiative).
- Partner with willing private landowners and resource managers on projects to benefit both SGCN and agriculture goals and objectives across federal, state, and private landownerships (e.g., voluntary cooperative agreements with landowners to conserve private timber and agricultural lands and Northern Idaho Ground Squirrel habitat).
- Partner with livestock producers, in collaboration with permitting authorities as appropriate, to implement livestock management strategies and upgrade rangeland infrastructure (e.g., watering and fencing) to aid livestock and SGCN goals and objectives (e.g., collaborative and flexible outcome-based grazing approach to improve livestock distribution and stocking rates based on changing on-the-ground conditions such as drought or wildfire; Fig. 3.2.2).



Fig. 3.2.2 Through the Outcome-based Grazing Project, the BLM is taking steps with partners to improve its administration of grazing regulations on public lands (BLM 2020a).

Voluntary Actions Related to Information and Knowledge Gaps

- Inform agricultural producers, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between the IDFG, Idaho Governor's Office of Species Conservation (OSC), IDL, Idaho State Department of Agriculture (ISDA), Idaho Department of Parks and Recreation (IDPR), IDWR, DEQ, and Idaho Governor's Office of Energy and Mineral Resources (OEMR).
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and agriculture.
- Collaborate with agricultural producers, industry, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs beneficial to both SGCN and agriculture.
- Encourage and incentivize agricultural producers, industry, resource managers, and universities to develop collaborative agricultural programs and BMPs that benefit SGCN and support agriculture, adaptive management, and monitoring.
- Assist agricultural project proponents, resource managers, and other stakeholders with information to address project effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and recommend measures to offset negative effects.
    - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in sustainable agriculture programs, projects, and BMPs that also benefit SGCN conservation (e.g., USDA 2023).
- Establish collaborative working groups as appropriate including local community members, agricultural producers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, improve the sustainability of agriculture, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into agriculture.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of agriculture and SGCN conservation needs.

- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with agriculture. Ideally, SGCN conservation will be mutually beneficial for sustainable agriculture.

Forest & Woodland

Public and private lands livestock grazing is the primary agricultural use of Forest & Woodland habitats. Livestock grazing is well managed today when monitored with adaptive management practices to achieve forest and rangeland health objectives (Hansen 1993; Anderson and McCuistion 2008; Brunson and Huntsinger 2008). However, legacy effects of past improper livestock management can persist, and in some cases, result in cascading effects to SGCN and their habitats as well as forest and rangeland health (Schieltz and Rubenstein 2016; Filazzola et al. 2020). Additional stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, disease and insect outbreaks, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can also impair forest and rangeland health and negatively affect SGCN.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by livestock management include Western Toad, Fisher, Moose, Yellow-billed Cuckoo, Great Gray Owl, White-headed Woodpecker, Pinyon Jay, Western Bumble Bee, and Ute Ladies-tresses. Proposed voluntary actions intended to address negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.1.

Table 3.2.1 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Aspen Forest & Woodland	Aspen stands are harmed by improper livestock management.	Manage aspen stands to benefit SGCN and livestock management (e.g., targeted fencing or other barriers, removal of invading conifer trees, and prescribed burning as appropriate).
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Pinyon–Juniper Woodland	SGCN movements or migrations are hindered by livestock fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in livestock fences.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Riparian forests are harmed by improper livestock management. Vegetation productivity is decreased by invasive plant infestation and soil erosion.	Manage riparian forests (e.g., cottonwood stands) to benefit SGCN and livestock management (e.g., invasive species control, targeted fencing or other barriers, grazing rotations, riparian pasture management, and off-site livestock watering infrastructure). Conserve SGCN by implementing soil and water conservation projects and BMPs (e.g., invasive species control, instream flows, erosion prevention and control, streambank and floodplain restoration, and desirable vegetation planting and management) (e.g., NRCS 2023).

Temperate & Boreal Grassland & Shrubland

Public and private lands livestock grazing is the primary agricultural use of Temperate & Boreal Grassland & Shrubland habitats. Livestock grazing is well managed today when monitored with adaptive management practices to achieve forest and rangeland health objectives (Hansen 1993; Anderson and McCuistion 2008; Brunson and Huntsinger 2008). However, the legacy of past and improper livestock management and other isolated circumstances can be ongoing stressors affecting SGCN habitat and rangeland health. Additional stressors potentially affecting Temperate & Boreal Grassland & Shrubland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can also impair rangeland health and negatively affect SGCN.

Examples of SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by livestock management include Rocky Mountain Goat, Rocky Mountain Bighorn Sheep, Northern Idaho Ground Squirrel, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Yellow Bumble Bee, Western Bumble Bee, Monarch Butterfly, and Spalding's Catchfly. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.2.

Table 3.2.2 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Montane–Foothill Grassland & Shrubland	Rangeland health and productivity are decreased by invasive plant species infestation and soil erosion.	Improve rangeland health to benefit SGCN and livestock management (e.g., invasive species control, erosion prevention and control, rangeland restoration, and desirable vegetation planting and management).
	Rangeland productivity is decreased by improper livestock management.	Manage rangelands to benefit SGCN and livestock management (e.g., targeted fencing, grazing rotations, pasture management, and off-site livestock watering infrastructure).

Table 3.2.2 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	SGCN movements or migrations are hindered by livestock fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in livestock fences.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
Subalpine–High Montane Mesic Meadow	Mesic meadows may be harmed by improper livestock management that results in erosion, lowering of the water table, and a shift toward upland trees and shrubs.	Manage meadows to benefit SGCN and livestock management (e.g., targeted meadow restoration, protection of water sources, erosion prevention and control, invasive species control, removal of invading conifer trees, and desirable vegetation planting and management).

Shrub & Herb Wetland

Public and private lands livestock grazing is the primary agricultural use occurring in Shrub & Herb Wetland habitats. The generally limited and patchy distribution of wetlands typically provides relatively little livestock grazing opportunity compared to abundant rangelands. Although limited in distribution, wetlands can be sensitive to livestock grazing when not accompanied with proper livestock management and protective BMPs (Hansen 1993). Properly managed livestock grazing can also contribute to healthier wetlands for SGCN by removing decadent vegetation, increasing vegetation productivity, improving plant diversity, and reducing invasive plants (Tesauro 2001; Allen-Diaz et al. 2004; Marty 2005; Michaels et al. 2022). Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, the introduction and spread of invasive species, and inputs of water pollutants. These interacting stressors can also impair wetland and riparian health and negatively affect SGCN.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by livestock management include Northern Leopard Frog, Little Brown Myotis, Silver-haired Bat, Moose, Trumpeter Swan, Cinnamon Teal, Northern Pintail, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Ute Ladies-tresses, and Indian Valley Sedge. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.3.

Table 3.2.3 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Alkali–Saline Marsh, Playa & Shrubland	Wetland health is decreased by decadent wetland vegetation buildup. Wetland and riparian vegetation productivity is decreased by invasive plant infestation and soil erosion. Water quality is reduced by agricultural runoff. Vegetation productivity is decreased by improper livestock management.	Improve wetland health to conserve SGCN with targeted livestock grazing and prescribed burning as appropriate (e.g., dead vegetation removal, desirable vegetation regeneration, and invasive species reduction).
		Improve wetlands and riparian zones to benefit SGCN and soil and water conservation (e.g., invasive species control, water supply and instream flows, soil health management, erosion prevention and control, streambank and floodplain restoration, vegetated buffers, and desirable vegetation planting and management).
		Manage wetlands and riparian zones to benefit SGCN and livestock management (e.g., targeted fencing or other barriers, grazing rotations, riparian pasture management, and off-site livestock watering infrastructure).

Desert & Semidesert

Public and private lands livestock grazing is the primary agricultural land and water use occurring in Desert & Semidesert habitats. Livestock grazing is well managed today when monitored with adaptive management practices to achieve rangeland health objectives (Hansen 1993; Anderson and McCuistion 2008; Brunson and Huntsinger 2008). Portions of

Desert & Semidesert habitats have also been converted for other agricultural purposes, including irrigated cropland and pastureland (Burkhardt 1996).

Historically, unmanaged livestock grazing and invasive plant species introductions, and subsequent nonnative forage management, affected the composition and structure of native grasses, forbs, and shrubs in some Desert & Semidesert habitats. This legacy of past improper livestock management and other isolated circumstances can be ongoing stressors affecting both existing SGCN habitat and rangeland health. Additional stressors potentially affecting Desert & Semidesert habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, the introduction and spread of invasive species, nonagricultural land uses, habitat conversion, and unnatural wildfire frequency, extent, and severity. These interacting stressors can also impair rangeland health and negatively affect SGCN. For example, Cheatgrass infestations and wildfire have decreased the quantity and productivity of lower elevation sagebrush-steppe. In addition, changing wildfire patterns have also allowed junipers to expand downslope into higher-elevation sagebrush-steppe.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by livestock management include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, Slickspot Peppergrass, and Macfarlane's Four-o'clock. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.4.

Table 3.2.4 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Sparsely Vegetated Dune Scrub & Grassland Dwarf Sagebrush Steppe & Shrubland	Rangeland health and productivity are decreased by invasive species infestation and destructive wildfire. Rangeland productivity is decreased by improper livestock management.	Improve rangeland health to benefit SGCN and livestock management (e.g., invasive species control, erosion prevention and control, rangeland restoration, and desirable vegetation planting and management).
		Manage rangelands to benefit SGCN and livestock management (e.g., targeted fencing, grazing rotations, pasture management, and livestock watering infrastructure).
		Conserve SGCN by reducing wildfire risks (e.g., fuel reduction treatments, ignition risk reduction, fire mitigation and response planning, firefighting resources, wildfire response and suppression, and information and education).

Table 3.2.4 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Tall Sagebrush Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation	SGCN movements or migrations are hindered by livestock fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in livestock fences.	Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
		Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage (e.g., Pronghorn), marking fences to reduce bird collisions (e.g., Greater Sage-Grouse), capping pipe fenceposts, and removing unnecessary fences.
		Implement the *Idaho Action Plan (V5.0) – Improving Big Game Winter Range and Migration Routes* (IDFG 2023a).

Agricultural Habitat

Lands and waters composing Agricultural Habitat are crucial for sustaining Idaho's economy, culture, and heritage, particularly for rural communities. Agricultural Habitat also provides opportunities for SGCN conservation. Potential stressors affecting Agricultural Habitat include conversion to nonagricultural land uses, prolonged drought and decreased snowpack, loss of soil health, and the introduction and spread of invasive species. Development associated with Idaho's expanding urban, suburban, and rural communities often includes conversion of surrounding Agricultural Habitat to nonagricultural land uses. High property values compared to commodity prices is a driver for the conversion of agricultural land near growing population centers. For example, many societal benefits were lost when 11 million acres (4.5 million ha) of US agricultural lands were converted to nonagricultural uses between 2001 and 2016 (Freedgood et al. 2020). Protecting lands and waters for sustainable agriculture can be mutually beneficial for conserving SGCN and sustaining Idaho's agricultural economy and communities.

Examples of SGCN occurring in Agricultural Habitat include Pronghorn, Greater Sage-Grouse, Sharp-tailed Grouse, Sandhill Crane, White-faced Ibis, Yellow Bumble Bee, Morrison Bumble Bee, Western Bumble Bee, and Monarch Butterfly. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.5.

Table 3.2.5 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Agricultural Habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Agricultural Habitat	Agricultural Habitat is changed to nonhabitat.	Incentivize agricultural producers and resource managers to conserve priority agricultural lands to benefit Idaho's SGCN, natural resource-based economy, culture and heritage, and rural communities.
	Suitability of Agricultural Habitat for SGCN is affected by agricultural practices, soil and water management, and reduced water supplies.	Conserve soil and water to benefit SGCN and Agricultural Habitat (e.g., regenerative/sustainable agriculture BMPs, soil health management, conservation tillage, cover cropping, soil moisture retention, erosion prevention and control, vegetated buffers, pollution prevention and control, less water-intensive crops, irrigation efficiencies as appropriate, water supply and storage improvement, aquifer recharge, and raise water tables and retention time) (USDA AFSIC 2022).
		Improve water supplies to benefit SGCN and agriculture with water projects and BMPs to upgrade/modernize water management infrastructure (e.g., delivery system, impoundments, storage structures, conveyances, control structures, irrigation equipment, livestock watering, wildlife escape ramps, and stormwater management) (e.g., NRCS 2023).
		Incentivize Agricultural Habitat projects and BMPs to enhance agricultural productivity and benefit SGCN (e.g., hayfield and hay meadow restoration and maintenance; vegetated wetland, riparian, and field buffers; cover crops and buffers with diverse native vegetation; SGCN-friendly flood irrigation as appropriate; and tillage, burning, planting, and harvest timing to protect nesting bird SGCN) (e.g., NRCS 2023).

Table 3.2.5 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Agricultural Habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Incentivize pasture management and increase agricultural productivity with projects and BMPs to benefit SGCN and sustainable livestock management (e.g., rotation intervals, grazing season, stocking rates, invasive species control, wet meadow and riparian pastures, and desirable vegetation planting and management) (e.g., NRCS 2023).
	Agricultural Habitat is harmed by invasive species infestation and crop diseases.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).

Aquatic Vegetation & Freshwater Habitat

Cultivated agriculture, livestock production, and aquaculture are the primary agricultural uses affecting Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat). Agriculture-related stressors include the use of surface water and groundwater and the release of water quality pollutants through irrigation returns and facility discharges (DEQ 1997; Hellerstein et al. 2019; EPA 2022c). Additional stressors potentially affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, nonagricultural water pollutants, and the introduction and spread of invasive species. These interacting stressors can reduce water supplies and impair water quality, which can negatively affect SGCN and agricultural and aquacultural productivity.

Idaho's water allocation and distribution processes administered by the IDWR regulate the diversion of public waters for agriculture and aquaculture. State and federal permitting also regulate pollutant discharges to public waters from agricultural and aquacultural facilities including the IPDES administered by DEQ (DEQ 2022b) and NPDES administered by EPA (EPA 2022b) under the CWA (EPA 2022a). IDPES and NPDES permits include measures to meet water quality standards. Water conservation and soil health programs and BMPs can further improve agricultural operational efficiencies, which can reduce water diversions and pollutants (Bowman et al. 2016; Savage and Ribaudo 2016; NRCS 2022).

Examples of SGCN occurring in aquatic habitat and potentially influenced by agriculture include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Western Grebe,

Ring-billed Gull, Caspian Tern, and White-faced Ibis. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and agriculture, are listed in Table 3.2.6.

Table 3.2.6 Voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Water supplies and streamflow are reduced by surface water and groundwater diversions. Water quality is reduced by agricultural runoff. Waterbodies and streams are harmed by invasive plant species infestations. Streambeds, banks, and shorelines are harmed by improper livestock management.	Improve aquatic habitat to benefit SGCN and conserve water supply and water quality for agriculture (e.g., instream flow conservation, erosion prevention and control, streambank and shoreline restoration, invasive species control, and improved stormwater management).
		Conserve SGCN by improving water conservation for agriculture and aquaculture (e.g., less water-intensive crops, conservation tillage, cover cropping, invasive species control, soil health management, SGCN-friendly irrigation practices, reduced pesticide and fertilizer use, and upgraded water management infrastructure).
		Manage Aquatic Habitat to conserve SGCN and help meet water quality standards of associated waterbodies (e.g., upgraded water management and containment infrastructure, pollution prevention and control, erosion prevention and control, and vegetated wetland buffers).
		Improve water conservation to benefit SGCN and agriculture and aquaculture with improved water use BMPs, increased efficiencies, and upgraded/modernized water management infrastructure (e.g., delivery systems, impoundments, storage structures, conveyances, and control structures) (e.g., NRCS 2023).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.2.7 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit agriculture.

Table 3.2.7 Voluntary actions intended to benefit SGCN and sustainable agriculture by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Steelhead Sockeye Salmon Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot	Abundance is reduced by invasive species or diseases released from an aquaculture facility.	Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Develop, implement, and maintain measures to prevent the release or spread of diseases, undesirable aquaculture products, and invasive species from an aquaculture facility (Meyer 1991; Kennedy et al. 2016).
		Provide technical assistance and support biosecurity, good husbandry, and facility BMPs (e.g., NRCS 2023).
		Incentivize development and production of aquaculture products that cannot successfully breed with wild populations.
		Assist aquacultural producers with the design, implementation, and maintenance of containment at facilities.
		Support the collaborative development of disease resistant aquaculture products/species, disease vaccines, disease surveillance methods and tools, and treatments that do not rely on antibiotics (Meyer 1991; Kennedy et al. 2016).
	Abundance is reduced from inadequate support for aquaculture programs and facilities performing SGCN conservation.	Support the operation of aquaculture programs and facilities performing SGCN conservation.
Greater Sage-Grouse Sharp-tailed Grouse	Abundance is reduced from disturbance or displacement during lekking or nesting season.	Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
		Implement the *Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho 2015–2025* (IDFG 2015b).

Table 3.2.7 Voluntary actions intended to benefit SGCN and sustainable agriculture by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
California Bighorn Sheep Rocky Mountain Bighorn Sheep	Abundance is reduced by harmful diseases.	Implement the *Idaho Bighorn Sheep Management Plan 2022–2027* (IDFG 2022a).
		Reduce risk of disease transmission by implementing BMPs and maintaining spatial or temporal separation with livestock (e.g., IDFG and ISDA 2008; WAFWA 2012).
		Provide information and education to agricultural producers about livestock disease transmission and preventive BMPs (e.g., IDFG and ISDA 2008; WAFWA 2012).
Pollinating insect SGCN including: Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee Monarch Butterfly Gillette's Checkerspot	Abundance is reduced by pest control.	Implement the *Idaho Pollinator Protection Plan* (ISDA 2016).
		Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (WAFWA 2019; USDA 2021, 2022).
Bat SGCN Insect-eating bird SGCN including: Greater Sage-Grouse Sharp-tailed Grouse Yellow-billed Cuckoo Common Nighthawk Bobolink	Abundance is reduced from pest control decreasing food source.	Implement Integrated Pest Management principles to reduce the negative effects of pest control on food sources for insect-eating SGCN (USDA 2022).
	Abundance is reduced from pesticides decreasing survival.	Increase the understanding of potential pesticide-related stressors on the survival and abundance of insect-eating bird and bat SGCN.
		Identify, develop, prioritize, and implement feasible and practical actions to offset potential negative effects if occurring on insect-eating bird and bat SGCN.

Table 3.2.7 Voluntary actions intended to benefit SGCN and sustainable agriculture by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Grizzly Bear	Abundance is reduced by control actions needed in response to human–bear conflict.	Participate in Grizzly Bear conservation and management actions in coordination with the Interagency Grizzly Bear Committee (e.g., human–bear conflict and human-caused bear mortality reductions, providing secure habitat, information and education, and technical assistance).
		Implement BMPs to reduce human–bear conflicts by managing food sources and other bear attractants (e.g., livestock feed, crops, and fruit trees) (e.g., Lackey et al. 2018; Can 2020; IGBC 2023).
		Provide human–bear conflict management staffing capacity and assign staff to strategic locations in the state to perform proactive and responsive conflict-bear management.
		Provide information and education to agricultural producers about bear safety precautions and BMPs (e.g., Lackey et al. 2018; Can 2020; IGBC 2023).
Plant SGCN including: Idaho Xanthoparmelia Lichen Packard's Milk-vetch Slickspot Peppergrass Spalding's Catchfly Macfarlane's Four-o'clock Winward's Goldenbrush Ute Ladies-tresses Indian Valley Sedge	Abundance and distribution are reduced by improper livestock management, decreasing plant survival and reproduction (e.g., grazing, trampling, and soil erosion).	Provide technical assistance to livestock producers and resource managers about opportunities to avoid or minimize negative effects on plant SGCN populations.
		Manage forests and rangelands to protect plant SGCN and benefit livestock management (e.g., invasive species control, proper herbicide application practices, grazing rotations, pasture management, and livestock watering infrastructure).
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to improper livestock management (e.g., targeted protective fencing and information and education).
		Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to conserve plant SGCN populations associated with livestock management.

3.3 Energy Production & Mining

Overview

Energy Production & Mining consists of Oil & Gas Drilling, Mining & Quarrying, and Renewable Energy (CMP 2016a). Energy and mineral demand are increasing as the human population grows locally, nationally, and globally. WGA issued policy resolutions 2022-01, *Energy in the West* (WGA 2022a) and 2022-08, *National Minerals Policy* (WGA 2022b) recognizing priorities to develop sustainable energy and responsible mineral resources to benefit the nation and other modern and developing societies around the world (Fig. 3.3.1).

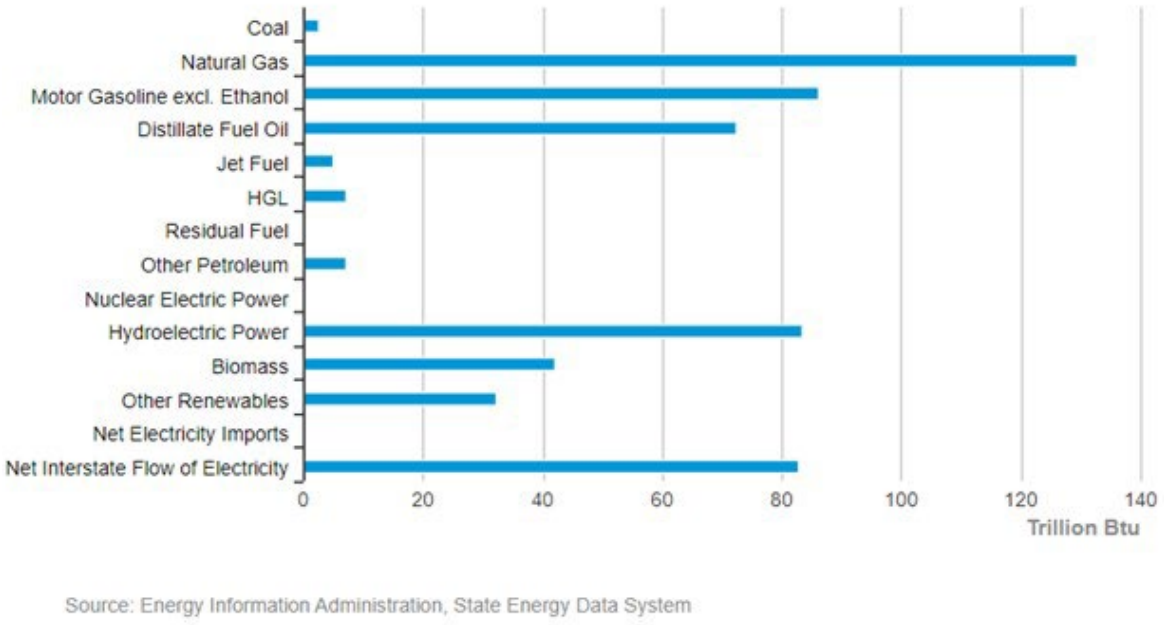


Fig. 3.3.1 Idaho state energy profile in 2020 (EIA 2022).

Idaho's lands and waters possess abundant energy and mineral resources. Efforts to reduce carbon emissions in response to climate change is motivating energy producers to expand electrical generation from renewable energy sources while phasing out carbon-based sources such as coal and natural gas. Demand for minerals is also increasing to meet the need to produce new electronic and energy storage technologies (WGA 2022a).

Energy Production & Mining contributes importantly to Idaho's economy and local communities:

- Energy production—Idaho's expanding human population is increasing local energy demands. Energy production in Idaho focuses on renewable electricity, but some oil and natural gas production occurs in the Weiser–Payette Basin hydrocarbon field (Breedlovestrout 2017). Idaho's electricity generation is primarily from renewable energy sources that include hydroelectricity, wind, solar, geothermal, and biomass

(OEMR 2021). In 2019, renewable sources generated 76% of in-state electricity with hydroelectricity composing 58% (OEMR 2022). Construction of new utility-scale wind and solar energy facilities is increasing in Idaho to reduce carbon-based electricity generation, which is a goal of the state's electric utilities. First constructed in 2006, Idaho's utility-scale wind energy facilities now provide 16% of in-state generation. More than an estimated 200,000 megawatts of wind energy remain available for development (OEMR 2022). Over 500 mi (805 km) of new and upgraded transmission lines are also planned to deliver Idaho's renewable energy to in-state and regional markets (OEMR 2022).

- Mining—Global mineral demands are prompting new exploration and industrial-scale mining in Idaho. Idaho has an extensive mining history dating back to the mid-1800s. Gold was the key mineral that originally attracted prospectors to Idaho. Now, silver and phosphate are the most commonly produced minerals with Idaho supplying about 45% and 22% of the nation's silver and phosphate, respectively. Idaho produces many other valuable minerals including antimony, tungsten, cobalt, vanadium, molybdenum, and gemstones. Quarrying of sand, gravel, and crushed rock provides crucial raw materials for the construction sector and transportation system, which are expanding in response to Idaho's growing human population.

County, state, and federal regulatory authorities hold much of Idaho's lands and waters supplying energy and mineral resources in public trust. These same lands and waters also support fish, wildlife, and plants, including SGCN. Utility-scale energy production and industrial-scale mining projects usually have long-term life cycles of construction, operations, reclamation, and restoration, which can affect SGCN conservation for decades. For example, legacy effects of mining in the 19th and 20th centuries continue to impair the health and productivity of some Idaho lands and waters, including SGCN habitats. Today, responsible siting and BMPs can help Energy Production & Mining projects reduce negative effects on SGCN.

Licensing or permitting by regulatory authorities is often required before an entity can use public energy and mineral resources. For example, hydroelectric projects on public waterways might need operating licenses from the Federal Energy Regulatory Commission (FERC); renewable energy projects on private lands might need county-issued conditional use permits; and industrial mines on public lands might need state-issued water rights (IDWR 2022e), federal permits, National Environmental Policy Act (NEPA) processes, and state-regulated mine site reclamation (IDL 2022).

Licensing and permitting processes balance public interests through a multiple-use management philosophy, which can require tradeoffs and mitigation for negative effects to natural resources held in public trust. Therefore, licensing and permitting often require consideration of fish, wildlife, and plants. For proposed Energy Production & Mining projects, regulators consider potential effects on existing conditions and apply the mitigation hierarchy to offset negative effects. The mitigation hierarchy consists of first attempting to avoid negative effects, next to minimize unavoidable negative effects, and lastly to compensate for remaining negative effects not avoided or adequately minimized (WGA 2022a).

Energy Production & Mining's products and services can be compatible with SGCN conservation when stakeholders collaborate. Many long-standing partners associated with Energy Production & Mining are already contributing in many ways to conserving the state's fish, wildlife, and plants. In addition to licensing and permitting, established relationships among Energy Production & Mining partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-oriented solutions to meet society's needs while conserving SGCN. Considering the increasing local and global energy and mineral needs, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, modern society, economies, and communities.

Overarching Effects & Actions

Potential effects of Energy Production & Mining on SGCN vary depending on many regional and site-specific circumstances including project purpose, location, landownership, production methods and duration, and infrastructure needs. The following are examples of potential site-specific negative SGCN effects associated with Energy Production & Mining projects:

- Habitat conversion, fragmentation, and reduced quality (e.g., industrialization, pollutant discharges, invasive species introduction and spread, and increased wildfire ignitions)
- Disturbance and displacement (e.g., increased human activities and noise)
- Hindered SGCN movements and migration (e.g., roads, fencing, and other infrastructure)
- Direct mortality (e.g., fish, bird, and bat turbine strikes, bird strikes with solar panels and fences, and destruction of rare plant populations)

Regulatory licensing and permitting can create opportunities for project proponents, resource management agencies, and stakeholders to collaborate when identifying project effects on SGCN and options to address negative effects. Land-use planning also has collaborative opportunities to identify potential risks to SGCN from future energy and mineral development and determine measures to address risks through responsible Energy Production & Mining.

Technical assistance from resource agencies, preferably during early planning, is an important approach to inform both project proponents and regulatory decision-makers about potential project effects and recommend opportunities to conserve SGCN (WGA 2021b). By applying the mitigation hierarchy, technical assistance could include recommendations to reduce negative project effects with alternative siting, design features, construction and operational BMPs, and habitat restoration after decommissioning (e.g., Christol et al. 2021). Recommendations can also include voluntary compensatory mitigation for negative project effects not adequately avoided or minimized (WGA 2022a).

Finding collaborative opportunities to conserve SGCN and meet society's energy and mineral needs should be goals of land-use planning and project licensing and permitting. The connection between lands and waters supporting Energy Production & Mining and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b).

Focusing on achieving mutually beneficial results, the following voluntary actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters affected by Energy Production & Mining and important to Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Assist industry, resource managers, regulatory authorities, and other stakeholders with planning and implementing approaches to achieve joint SGCN and Energy Production & Mining goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential risks to SGCN goals and objectives from future energy and mineral development, and recommend measures to address risks.
    - Develop, assemble, maintain, and disseminate databases to support land-use and project planning.
    - Identify and address SGCN knowledge gaps and proactively develop information to support project planning, effects analysis, and measures to offset negative effects.
    - Assess the status of stressors related to Energy Production & Mining and SGCN goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential energy and mining-related stressors that could affect SGCN goals and objectives.
- Assist Energy Production & Mining project proponents, resource managers, regulatory authorities, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in regulatory processes during early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of project effects.
    - Analyze potential project-specific effects and apply the mitigation hierarchy to recommend measures to offset negative effects throughout a project's life cycle.
    - Recommend monitoring and adaptive management approaches to guide implementation of the mitigation hierarchy and conserve SGCN throughout project life cycles.
- Collaborate with industry, project proponents, resource managers, landowners, and other stakeholders to plan and implement approaches to achieve joint SGCN and Energy Production & Mining goals and objectives. The following are examples of voluntary actions:
    - Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting;

construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023).
    - Incentivize project proponents to conserve SGCN and their habitats.
    - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
    - Construct or upgrade facilities and infrastructure to benefit fish and wildlife movements.
    - Avoid, minimize, and compensate for negative effects on SGCN from facilities, infrastructure, operations, and maintenance (e.g., bird detection/turbine curtailment technologies and bat deterrent technologies at wind energy facilities and capping pipes marking mining claims).
    - Manage vegetation associated with energy and mining projects to minimize negative effects on SGCN and maximize beneficial effects (e.g., pollinator-friendly vegetation management).
    - Implement Integrated Pest Management principles to reduce the introduction and spread of invasive species while benefiting pollinator habitat (ISDA 2016; WAFWA 2019; USDA 2021; IISC 2022; USDA 2022).
    - Construct new power lines according to the Avian Power Line Interaction Committee (APLIC) protocols to protect bird SGCN from electrocution and collisions.
    - Identify existing power lines and other infrastructure with high risks of bird SGCN dying from electrocution or collision and retrofit according to APLIC protocols or relevant other standards as appropriate.
    - Encourage the siting of facilities and infrastructure if feasible away from areas, habitats, and movement routes important for SGCN.
    - Construct infrastructure and install deterrents on existing infrastructure to discourage predatory bird perching and nesting as appropriate to protect SGCN ground-nesting birds (e.g., Greater Sage-Grouse).
    - When excluding wildlife from hazard areas, design, install, and maintain fencing that avoids or minimizes risk of wildlife collision or entanglement.
    - When facilitating wildlife movements, reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
    - Restore habitat affected by construction and maintenance activities.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform regulatory authorities, project proponents, stakeholders, and the public about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Survey, monitor, and assess SGCN population and habitat conditions to determine status and effectiveness of actions implemented to address effects of Energy Production & Mining-related stressors and achieve SGCN goals and objectives.
- Collaborate with industry, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs

(e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023) to offset effects of Energy Production & Mining projects.
- Recommend that project proponents perform monitoring and conduct adaptive management to assess the effectiveness of measures implemented to offset negative project effects.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Establish collaborative working groups as appropriate including communities, industries, regulatory authorities, and resource managers to facilitate the exchange of information and knowledge about opportunities and efforts to benefit SGCN, assist Energy Production & Mining industries, and support communities.
- Participate with project proponents, resource managers, regulatory authorities, and other stakeholders to develop collaborative measures to offset negative effects of Energy Production & Mining projects on SGCN.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into Energy Production & Mining projects.
- Encourage public and stakeholder participation in land-use planning and licensing and permitting processes to raise awareness and consideration of both SGCN conservation needs and society's energy and mineral needs.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitat and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Chapter 2 habitats form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with Energy Production & Mining. Ideally, SGCN conservation will be mutually beneficial for responsible Energy Production & Mining.

Forest & Woodland

Energy Production & Mining projects have the potential to affect Forest & Woodland habitats, where mineral resources are relatively abundant. Increasing global demands for minerals have increased mining project proposals across Idaho. Idaho's forests also support local forestry and ranching economies and provide abundant opportunities for outdoor recreation. Consequently, Energy Production & Mining projects can change existing land uses and potentially reduce SGCN habitat; project infrastructure and activities can influence SGCN

behavior (e.g., avoidance, displacement, or movement patterns). In addition to Energy Production & Mining, other stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, urban development, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect both SGCN habitat and important amenities that Forest & Woodland habitats provide to Idaho communities.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by Energy Production & Mining include Fisher, Grizzly Bear, Moose, Lewis's Woodpecker, White-headed Woodpecker, Olive-sided Flycatcher, Cassin's Finch, Western Bumble Bee, Gillette's Checkerspot, and Clearwater Phlox. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Energy Production & Mining projects, are listed in Table 3.3.1.

Table 3.3.1 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Aspen Forest & Woodland Pinyon–Juniper Woodland	Forest habitats are changed to nonhabitat.	Incentivize project proponents to conserve forests to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023).
	Forest habitats are harmed by destructive wildfire.	Reduce risks of destructive wildfire associated with energy and mineral projects (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
	Forest health and productivity are decreased by invasive plant infestation.	Improve forest health to benefit SGCN (e.g., invasive species control, erosion prevention and control, forest restoration, and desirable vegetation planting and management).
		Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (ISDA 2016; WAFWA 2019; USDA 2021, 2022).

Table 3.3.1 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	SGCN are disturbed or displaced by infrastructure, human activities, and noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's economy and communities.
		Implement BMPs that reduce SGCN disturbance in important locations and during important periods (e.g., big game winter range, bighorn sheep lambing, migratory bird nesting, and roosting bats) (e.g., Protection of Bat Roost Guidelines subcommittee et al. 1992; Sherwin et al. 2009; AKN 2023).
	SGCN movements or migrations are hindered by fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in fencing.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
		Implement the *Idaho Action Plan (V5.0) – Improving Big Game Winter Range and Migration Routes* (IDFG 2023a).
Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Riparian forests are changed to nonhabitat.	Incentivize project proponents to conserve riparian forests to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023).
	Water supplies or water quality are decreased by construction and maintenance activities. Water supplies are reduced by surface water and groundwater diversions.	Manage riparian forests to benefit SGCN and conserve water supplies and water quality for responsible Energy Production & Mining (e.g., construction and maintenance BMPs, stormwater management, pollution prevention and control, erosion prevention and control, vegetated buffers, water supply and instream flow conservation, groundwater recharge, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, and invasive species control) (e.g., EPA 2009; DEQ 2020; EPA 2023b).

Table 3.3.1 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	Water quality is reduced by stormwater runoff, soil erosion, or industrial discharges. Riparian forests are harmed by infrastructure and project construction, operations, or maintenance.	Conserve SGCN by including flood-resilient designs and BMPs in energy and mining facilities and infrastructure (e.g., seasonal high-water flows, erosion prevention and control, gravel and woody debris transport, culvert upgrades, fish passage, and wildlife movements) (e.g., EPA 2023b).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Shrub & Herb Wetland

Energy Production & Mining infrastructure and activities have the potential to affect Shrub & Herb Wetland habitats. Water is often necessary for energy and mineral projects. Therefore, the use of surface water and groundwater and the release of water pollutants through industrial facilities and stormwater discharges can also potentially affect Shrub & Herb Wetland habitats. Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and the introduction and spread of invasive species. These interacting stressors can further affect both SGCN habitat and important amenities that Shrub & Herb Wetland habitats provide to Idaho communities.

Depending on circumstances, IDWR and USACE might regulate energy and mineral projects in Shrub & Herb Wetland habitats per the ISCPA and CWA, respectively (IDWR 2022b). Therefore, facilities and infrastructure associated with energy and mineral projects in wetlands and riparian zones might need state and federal permits that could include protective measures for SGCN.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by Energy Production & Mining include Northern Leopard Frog, Hoary Bat, Silver-haired Bat, Moose, Trumpeter Swan, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN

conservation and responsible Transportation & Service Corridor projects, are listed in Table 3.3.2.

Table 3.3.2 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Alkali–Saline Marsh, Playa & Shrubland	Wetlands and riparian zones are changed to nonhabitat.	Incentivize project proponents to conserve wetlands and riparian zones to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023).
	Water supplies or water quality are decreased by construction and maintenance activities. Water supplies are reduced by surface water and groundwater diversions. Water quality is reduced by stormwater runoff, soil erosion, or industrial discharges. Wetlands and riparian zones are harmed by infrastructure and project construction, operations, or maintenance.	Manage wetlands and riparian zones to benefit SGCN and conserve water supplies and water quality for responsible Energy Production & Mining (e.g., construction and maintenance BMPs, stormwater management, pollution prevention and control, erosion prevention and control, vegetated buffers, water supply and instream flow conservation, groundwater recharge, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, and invasive species control) (e.g., EPA 2009; DEQ 2020; EPA 2023b).
		Conserve SGCN by including flood-resilient designs and BMPs in energy and mining facilities and infrastructure (e.g., seasonal high-water flows, erosion prevention and control, gravel and woody debris transport, culvert upgrades, fish passage, and wildlife movements) (EPA 2023b).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
	SGCN are disturbed or displaced by infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN.
		Implement BMPs that reduce SGCN disturbance in important locations and during important periods (e.g., bird nesting) (e.g., BLM 2020b).

Desert & Semidesert

Renewable energy and mineral resources are relatively abundant in Idaho's expansive Desert & Semidesert habitats. Therefore, proposals for renewable energy and mining projects are increasing, particularly across southern Idaho. These areas also support traditional local economies including ranching and outdoor recreation. Consequently, Energy Production & Mining projects in Desert & Semidesert habitats can change existing land uses and potentially reduce SGCN habitat. In addition to changing land uses, other stressors potentially affecting Desert & Semidesert habitats include prolonged drought, changing precipitation and snowpack trends, urban development, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by Energy Production & Mining include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Short-eared Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, Slickspot Peppergrass, and Spalding's Catchfly. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Energy Production & Mining, are listed in Table 3.3.3.

Table 3.3.3 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland Cliff, Scree & Badland Sparse Vegetation	Shrublands are changed to nonhabitat.	Incentivize project proponents to conserve shrublands to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; REWI 2023).
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).

Table 3.3.3 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	Shrublands are harmed by destructive wildfire.	Reduce risks of destructive wildfire associated with energy and mineral projects (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
	Rangeland health and productivity are decreased by invasive plant infestation.	Improve rangeland health to benefit SGCN (e.g., invasive species control, erosion prevention and control, rangeland restoration, and desirable vegetation planting and management).
		Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
	SGCN are disturbed or displaced by infrastructure, human activities, and noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's economy and communities.
		Implement BMPs that reduce SGCN disturbance in important locations and during important periods (e.g., Pronghorn on winter range and Greater Sage-Grouse during lekking) (e.g., Idaho Sage-grouse Advisory Committee 2006; Taylor et al. 2016).
	Increase in direct mortality of birds or reduced nest success if predatory bird nesting or perching locations are provided by infrastructure.	Construct infrastructure to discourage predatory bird perching and nesting as appropriate to protect SGCN ground-nesting birds (e.g., Greater Sage-Grouse and Sharp-tailed Grouse).
	SGCN movements or migrations are hindered by fences. SGCN survival decreases from colliding with or becoming entangled/entrapped in fencing.	Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
		Implement the *Idaho Action Plan (V5.0) – Improving Big Game Winter Range and Migration Routes* (IDFG 2023a).

Aquatic Vegetation & Freshwater Habitat

Energy Production & Mining has the potential to affect Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat) by using surface water and groundwater and releasing water pollutants through industrial facilities and stormwater discharges. In addition to Energy Production & Mining, other stressors potentially affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, other pollutant sources decreasing water quality, and the introduction and spread of invasive species.

Idaho's water allocation and distribution processes administered by IDWR regulate the diversion of public waters for Energy Production & Mining. State and federal permitting also regulate pollutant discharges to public waters from Energy Production & Mining facilities including IPDES administered by DEQ (DEQ 2022b) and NPDES administered by EPA (EPA 2022b) under the CWA (EPA 2022a). IDPES and NPDES permits include measures to meet water quality standards. In addition, water conservation programs and BMPs can further improve Energy Production & Mining operational efficiencies thereby reducing water diversions and pollutants (DEQ 2022a).

Examples of SGCN occurring in aquatic habitat and potentially influenced by Energy Production & Mining include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Harlequin Duck, Western Grebe, and Ring-billed Gull. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Energy Production & Mining, are listed in Table 3.3.4.

Table 3.3.4 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Aquatic Habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Freshwater Aquatic Vegetation Rivers (5th order & higher)	Water supplies, streamflow, and spring flow are reduced by surface water and groundwater diversions.	Manage aquatic habitat to benefit SGCN and conserve water supplies and water quality for responsible Energy Production & Mining (e.g., construction and maintenance BMPs, stormwater management, pollution prevention and control, erosion prevention and control, vegetated buffers, water supply and instream flow conservation, groundwater recharge, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, and invasive species control) (e.g., EPA 2009; DEQ 2020; FWS 2022; EPA 2023b).

Table 3.3.4 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Aquatic Habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Lakes, Ponds & Reservoirs Springs	Water quality is reduced by stormwater runoff, soil erosion, or industrial discharges. Shorelines, lakebeds, and stream channels are harmed by project construction, operations, and maintenance (Fig. 3.3.2).	Conserve SGCN by including design features and BMPs in water management infrastructure (e.g., stormwater management, pollution prevention and control, and erosion prevention and control) (e.g., EPA 2023b).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).



Fig. 3.3.2 Crooked River post-dredge mining restoration project, Idaho (Nez Perce–Clearwater National Forests 2022).

Caves & Subterranean Habitats

Energy Production & Mining projects can negatively affect Caves & Subterranean Habitats (including abandoned mines) by changing the high thermal stability of subterranean habitat and disturbing and displacing SGCN. However, actions that apply responsible Energy Production & Mining practices can benefit Caves & Subterranean Habitats and SGCN.

Examples of SGCN occurring in Caves & Subterranean Habitats and potentially influenced by Energy Production & Mining include Western Small-footed Myotis, Little Brown Myotis, Yuma Myotis, Silver-haired Bat, and Townsend's Big-eared Bat. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Energy Production & Mining, are listed in Table 3.3.5.

Table 3.3.5 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Caves & Subterranean Habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Caves & Subterranean Habitats	SGCN are disturbed or displaced. Direct mortality of SGCN if trapped inside abandoned mines during closure activities or reduced fecundity and associated reproductive success if exclusions conducted at end of hibernation period. SGCN survival decreases from the introduction of harmful diseases.	Incentivize project proponents and stakeholders to conserve caves and mines as appropriate to benefit Idaho's subterranean-dependent SGCN, natural resource-based economy, and communities.
		Inventory and assess caves and abandoned mines for SGCN suitability.
		Manage caves and abandoned mines to benefit subterranean-dependent SGCN and public safety (e.g., access management, install bat-compatible gates in abandoned mine openings where appropriate, airflow maintenance, invasive species control, and information and education) (e.g., Sherwin et al. 2009; White-nose Syndrome Disease Management Working Group 2019).
		Conserve subterranean habitat and SGCN by implementing programs, projects, and BMPs as appropriate to reduce risks of disease introduction and spread, particularly bats and *Pd*/white-nose syndrome (WNS) (e.g., access management, gating, signage, and information and education) (e.g., White-nose Syndrome Disease Management Working Group 2019, 2020).
		Provide technical assistance as appropriate to regulatory authorities, project proponents, industry, resource managers, and other stakeholders about opportunities to avoid negative effects to subterranean-dependent SGCN.

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.3.6 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit responsible Energy Production & Mining.

Table 3.3.6 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bat SGCN Bird SGCN including: Trumpeter Swan Greater Sage-Grouse Sharp-tailed Grouse Golden Eagle Ferruginous Hawk	Bird or bat survival decreases from colliding with or becoming entangled/entrapped in energy production equipment, facilities, fences, power lines, or other infrastructure (Fig. 3.3.3). Abundance is reduced by disturbance or displacement from energy or mining infrastructure, operations, or maintenance during important seasonal periods (e.g., nesting, lekking, and roosting).	Implement programs, projects, and BMPs to avoid, minimize, and mitigate for negative effects of energy and mining infrastructure, operations, and maintenance (e.g., bird detection/turbine curtailment technologies and bat deterrent technologies at wind energy facilities and capping pipes marking mining claims) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; BLM 2016; REWI 2023).
		Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of project infrastructure, operations, and maintenance (e.g., siting locations for solar panels, wind turbines, transmission lines, and fencing; infrastructure designs; construction BMPs; and operations and maintenance procedures) (e.g., IDAPA 20.03.02.140; EPA 2012; Jones 2012; CPW 2021; NRCS 2021; REWI 2023).
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout	Abundance is reduced by entrainment, impingement, or other harm from energy or mining infrastructure, operations, or maintenance.	Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Implement the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho* (IDFG 2007).
		Implement the *Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho* (IDFG 2022b).
		Implement the *Management Plan for the Conservation of Snake River White Sturgeon in Idaho* (IDFG 2008).

Table 3.3.6 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Steelhead Sockeye Salmon Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot	Abundance and distribution are reduced by disturbance or displacement, movement or migration barriers, or habitat loss and degradation from energy and mining infrastructure, operations, or maintenance.	Implement programs, projects, and BMPs to avoid, minimize, and mitigate for negative effects of water management infrastructure and operations (e.g., EPA 2023b).
		Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of water management and project infrastructure (e.g., instream flows, fish passage, fish screens, in-water work windows, and compensatory mitigation).
		Install and maintain fish screening on water intake and diversion infrastructure per NOAA Fisheries criteria as appropriate.
		Mitigate entrainment, impingement, and turbine fatalities at energy facilities.
		Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.
Wolverine Pronghorn Rocky Mountain Goat California Bighorn Sheep Rocky Mountain Bighorn Sheep Moose Greater Sage-Grouse Sharp-tailed Grouse	Abundance and distribution are reduced by disturbance or displacement, movement or migration barriers, and habitat loss or degradation from energy and mining infrastructure, operations, or maintenance.	Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
		Implement the *Idaho Action Plan (V5.0) – Improving Big Game Winter Range and Migration Routes* (IDFG 2023a).
		Implement the *Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho 2015–2025* (IDFG 2015b).
		Implement the *Idaho Bighorn Sheep Management Plan 2022–2027* (IDFG 2022a).
		Implement the *Idaho Moose Management Plan 2020–2025* (IDFG 2020b).
		Implement the *Idaho Mountain Goat Management Plan 2019–2024* (IDFG 2019b).
		Implement the *Management Plan for the Conservation of Fisher, Wolverine, and Canada Lynx in Idaho 2023–2028* (IDFG 2023b).

Table 3.3.6 Voluntary actions intended to benefit SGCN and responsible Energy Production & Mining by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Plant SGCN including: Slickspot Peppergrass Leslie Gulch Monardella	Distribution, abundance, reproduction, and survival are reduced by habitat loss or degradation from energy and mining infrastructure, operations, or maintenance.	Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of energy and mining infrastructure, operations, and maintenance on plant SGCN (e.g., project siting, infrastructure designs, BMPs, and operational and maintenance procedures) (e.g., Jones 2012).
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to energy and mining infrastructure, operations, or maintenance (e.g., siting, buffers/setbacks, access management, targeted protective fencing or other barriers, and information and education).
		Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to conserve plant SGCN populations associated with energy mining.
		Transplant or propagate plant SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.



Fig. 3.3.3 New technology in use at Wyoming wind farm to reduce turbine-related eagle mortality (Learn 2021).

3.4 Transportation & Service Corridors

Overview

Transportation & Service Corridors consists of Roads & Railroads and Utility & Service Lines (CMP 2016a). Idaho's Transportation & Service Corridors are part of the nation's interconnected critical national infrastructure networks that supply important products and services to sustain modern society. The need to update and improve Idaho's Transportation & Service Corridors is increasing as the state's human population expands.

Idaho's Transportation & Service Corridors support the region's economy and connect the state's communities (WGA 2021c). That transportation system includes roads, highways, interstates, and railroads. Associated transportation infrastructure includes bridges, culverts, and fencing. Continuous maintenance, upgrades, and expansion are needed to meet the transportation needs of Idaho's and the region's growing population, economy, and commerce. Idaho's miles of roadways increased 8% from 99,860 mi (160,709 km) in 2010 to 107,568 mi (173,114 km) in 2019 (FHWA 2010, 2020). This increase is likely to accelerate during the next decade as part of the Idaho Transportation Department's (ITD) Transportation Expansion & Congestion Mitigation (TECM) Program (ITD 2022). Improving motorist safety is also an important reason for upgrading Idaho's transportation system, which includes reducing risks of vehicle collisions with big game.

Idaho's service corridors mainly contain utility infrastructure including electrical transmission and distribution lines, telecommunications, water pipelines, and liquid fuel/natural gas pipelines. Like the transportation system, service corridors need continuous maintenance, upgrades, and expansion to meet growing utility demands associated with the expanding population. For example, over 500 mi (805 km) of new and upgraded transmission lines will be constructed to meet Idaho's growing electricity demand and service the developing renewable energy industry (OEMR 2022).

Infrastructure for Transportation & Service Corridors is for all practical purposes intended to last forever. The lands and waters that Transportation & Service Corridors occupy and cross support many important fish, wildlife, and plants, including SGCN. Therefore, stressors associated with Transportation & Service Corridors can inadvertently have long-term effects on SGCN. Responsible siting and BMPs can help avoid or minimize negative effects of Transportation & Service Corridors on SGCN.

Licensing and permitting by regulatory authorities are often required for Transportation & Service Corridors projects, especially if public lands, waters, or funding is involved (WGA 2021c). Licensing and permitting processes balance public interests through a multiple-use management philosophy, which can require tradeoffs and mitigation for negative effects to natural resources held in public trust. Therefore, licensing and permitting processes often require consideration of fish, wildlife, and plants. For proposed Transportation & Service Corridors projects, regulators consider potential effects on existing conditions and apply the mitigation hierarchy to offset negative effects. The mitigation hierarchy consists of first

attempting to avoid negative effects, next to minimize unavoidable negative effects, and lastly to compensate for remaining negative effects not avoided or adequately minimized (WGA 2022a).

Transportation & Service Corridors can be compatible with SGCN conservation when stakeholders collaborate. Many long-standing partners associated with Transportation & Service Corridors are already contributing in many ways to conserving the state's fish, wildlife, and plants. In addition to licensing and permitting, established relationships among Transportation & Service Corridors partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-oriented solutions to meet society's needs while conserving SGCN. Considering the increasing local and regional needs for transportation and utility services, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, modern society, economies, and communities.

Overarching Effects & Actions

Potential effects of Transportation & Service Corridors on SGCN vary depending on many regional and site-specific circumstances including project location, purpose, specific infrastructure designs, landownership, construction methods, and operations and maintenance BMPs. The following are examples of potential site-specific negative SGCN effects associated with Transportation & Service Corridors:

- Habitat conversion, fragmentation, and reduced quality (e.g., invasive species introduction and spread, increased wildfire ignitions)
- Disturbance and displacement (e.g., increased human activities and traffic noise)
- Hindered big game movements and migration (e.g., highways and fencing)
- Hindered fish movements (e.g., culverts)
- Direct mortality (e.g., wildlife–vehicle collisions, bird–power line collisions, and bird electrocutions)

Regulatory licensing and permitting processes can create opportunities for project proponents, resource management agencies, stakeholders, and the public to collaborate when identifying project effects on SGCN and options to address negative effects. Land-use planning also has collaborative opportunities to identify potential risks to SGCN from future Transportation & Service Corridors projects and determine measures to address risks.

Technical assistance from resource agencies, preferably during early planning, is an important approach to inform both project proponents and regulatory decision-makers about potential project effects and recommend opportunities to conserve SGCN (WGA 2021b). By applying the mitigation hierarchy, technical assistance could potentially include recommendations to reduce negative project effects with alternative siting, design features, construction and operational BMPs, and habitat restoration. Recommendations can also include voluntary compensatory mitigation for negative project effects not adequately avoided or minimized (WGA 2022a).

Finding collaborative opportunities to conserve SGCN and meet society's needs for Transportation & Service Corridors, including improved motorist safety and reliable utility services, should be goals of land-use planning and project licensing and permitting. The connection between lands and waters crossed by Transportation & Service Corridors and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following voluntary actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters affected by Transportation & Service Corridors and important to Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Assist industry, resource managers, regulatory authorities, and other stakeholders with planning and implementing approaches to achieve joint SGCN and Transportation & Service Corridors goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential risks to SGCN goals and objectives from future Transportation & Service Corridors projects, and recommend measures to address risks.
    - Develop, assemble, maintain, and disseminate databases to support land-use and project planning.
    - Identify and address SGCN knowledge gaps and proactively develop information to support project planning, effects analysis, and potential measures to offset negative effects.
    - Assess the status of stressors related to Transportation & Service Corridors and SGCN goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential Transportation & Service Corridors related stressors that could negatively affect SGCN goals and objectives.
- Assist Transportation & Service Corridors project proponents, resource managers, regulatory authorities, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in regulatory processes during early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and apply the mitigation hierarchy to recommend measures to offset negative effects throughout a project's life cycle.

    - Recommend monitoring and adaptive management approaches to guide implementation of the mitigation hierarchy and conserve SGCN throughout project life cycles.
- Collaborate with utility industries, ITD, resource managers, landowners, and other stakeholders to plan and implement approaches to achieve joint SGCN and Transportation & Service Corridors goals and objectives. The following are examples of voluntary actions:
    - Implement ITD's *Programmatic Biological Assessment: Statewide Federal Aid, State and Maintenance Actions* (ITD 2021) in coordination with the FWS and NOAA.
    - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
    - Improve motorist safety by informing, designing, implementing, and maintaining infrastructure projects to reduce wildlife–vehicle collision, especially with big game (e.g., signage, wildlife crossing structures, wildlife detection systems, and big game fencing).
    - Inform, design, install, and maintain measures to enhance motorist awareness and reduce wildlife–vehicle collision risks.
    - Construct or upgrade bridges and culverts to benefit fish and wildlife movements and provide bird and bat roosting opportunities where feasible.
    - Construct or upgrade bridges and culverts to improve instream, streambank, floodplain, riparian, and wetland habitat conditions, including flood-resilient designs.
    - Manage vegetation along roads and in utility corridors to minimize negative effects on SGCN and maximize beneficial effects (e.g., pollinator-friendly vegetation management).
    - Implement Integrated Pest Management principles to reduce the introduction and spread of invasive species while benefiting pollinator habitat along roadsides and in utility corridors (ISDA 2016; WAFWA 2019; USDA 2021; IISC 2022; USDA 2022).
    - Construct new power lines according to the Avian Power Line Interaction Committee (APLIC) protocols to protect bird SGCN from electrocution and collisions.
    - Identify existing power lines and other infrastructure with high risks of bird SGCN dying from electrocution or collision and retrofit according to APLIC protocols or relevant other standards as appropriate.
    - Encourage utilities to route power lines and other infrastructure if feasible away from areas, habitats, and movement routes important for SGCN.
    - Construct infrastructure and install deterrents on existing infrastructure to discourage predatory bird perching and nesting as appropriate to protect SGCN ground-nesting birds (e.g., Greater Sage-Grouse).
    - When excluding wildlife from hazard areas, design, install, and maintain fencing that avoids or minimizes risk of wildlife collision or entanglement.
    - When facilitating wildlife movements, reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing

specifications, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
    - Restore habitat affected by construction and maintenance activities.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform regulatory authorities, project proponents, and stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, ITD, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Survey, monitor, and assess SGCN population and habitat conditions to determine status and effectiveness of actions implemented to address negative effects of Transportation & Service Corridors related stressors to achieve SGCN goals and objectives.
- Collaborate with ITD, industry, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to offset effects of Transportation & Service Corridors projects.
- Recommend that proponents perform monitoring and conduct adaptive management to assess the effectiveness of measures implemented to offset negative project effects.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Establish collaborative working groups as appropriate including communities, industries, regulatory authorities, and resource managers to facilitate the exchange of information and knowledge about opportunities and efforts to benefit SGCN, assist Transportation & Service Corridors industries, and support communities.
- Participate with project proponents, resource managers, regulatory authorities, and other stakeholders to develop collaborative measures to offset negative effects of Transportation & Service Corridors projects on SGCN.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into Transportation & Service Corridors projects and BMPs (Fig. 3.4.1).
- Encourage public and stakeholder participation in land-use planning and licensing and permitting processes to raise awareness and consideration of both SGCN conservation needs and society's transportation and utility needs.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

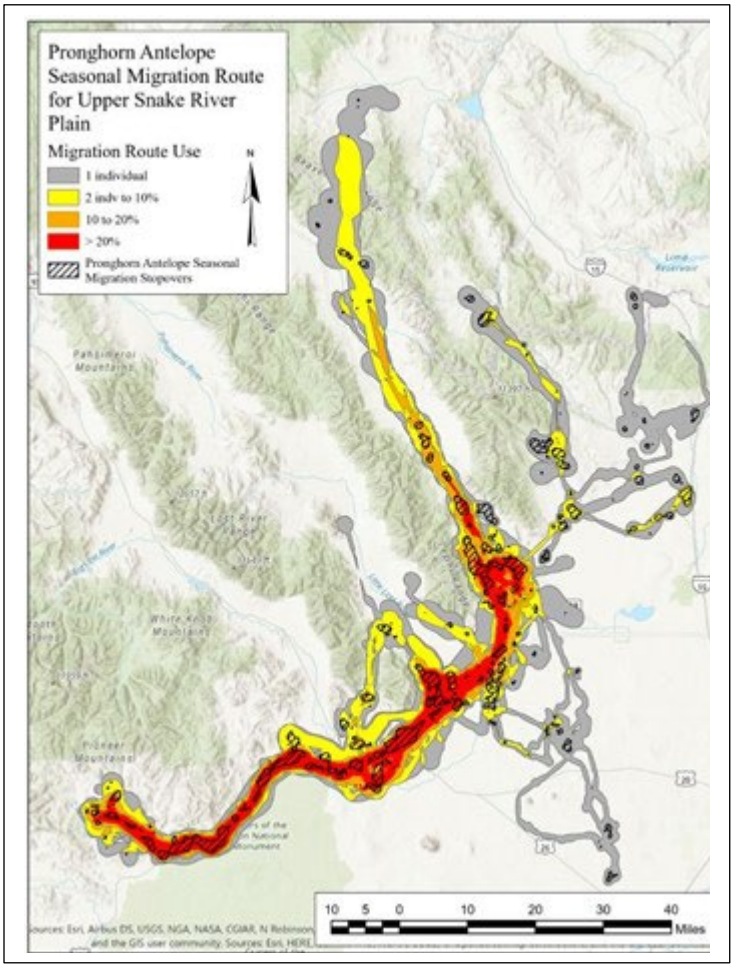


Fig. 3.4.1 Pronghorn seasonal migration route for the Upper Snake River Plain (IDFG 2020c).

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Chapter 2 habitats form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with Transportation & Service Corridors. Ideally, SGCN conservation will be mutually beneficial for responsible Transportation & Service Corridors projects.

Forest & Woodland

Transportation & Service Corridors have the potential to affect Forest & Woodland habitats. Road density and traffic can also influence SGCN behavior (e.g., avoidance, displacement, or movement patterns) and wildlife–vehicle collisions. In addition to Transportation & Service Corridors, other stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, urban development, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect both SGCN habitat and important amenities that Forest & Woodland habitats provide to Idaho communities. For example, invasive plant species infestations often spread along Transportation & Service Corridors. Elevated risks of wildfire ignition can also be associated with Transportation & Service Corridors (Shinneman et al. 2018).

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by Transportation & Service Corridors include Fisher, Grizzly Bear, Moose, Lewis's Woodpecker, White-headed Woodpecker, Olive-sided Flycatcher, Cassin's Finch, Western Bumble Bee, Gillette's Checkerspot, and Clearwater Phlox. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Transportation & Service Corridors projects, are listed in Table 3.4.1.

Table 3.4.1 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, Services, and BMPs
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Subalpine–High Montane Forest	Forest habitats are changed to nonhabitat.	Incentivize project proponents to conserve forests to benefit Idaho's SGCN, natural resource-based economy, culture and heritage, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity and noise reduction) (e.g., ITD 2023).
	SGCN are disturbed or displaced by infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN.
		Implement access management as appropriate to protect SGCN during important periods and to enhance movements and migration (e.g., seasonal wildland road closures and road and trail decommissioning).
	Forests are harmed by destructive wildfire.	Reduce wildfire risks associated with transportation and utility projects (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and

Table 3.4.1 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, Services, and BMPs
		suppression, desirable vegetation planting and management, and information and education).
	Forest health and productivity are decreased by invasive species infestation.	Improve forest health to benefit SGCN (e.g., invasive species control, erosion control, and desirable vegetation planting and management).

Shrub & Herb Wetland

The construction and maintenance of infrastructure associated with Transportation & Service Corridors have the potential to affect Shrub & Herb Wetland habitats. Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, water pollutants, and the introduction and spread of invasive species. These interacting stressors can further affect both SGCN habitat and important amenities that Shrub & Herb Wetland habitats provide to Idaho communities.

Depending on circumstances, IDWR and USACE might regulate infrastructure construction and maintenance in Shrub & Herb Wetland habitats per the ISCPA and CWA, respectively (IDWR 2022b). Therefore, infrastructure associated with Transportation & Service Corridors in wetlands and riparian zones might need state and federal permits that could include protective measures for SGCN.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by Transportation & Service Corridors include Northern Leopard Frog, Hoary Bat, Silver-haired Bat, Moose, Trumpeter Swan, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Transportation & Service Corridors projects, are listed in Table 3.4.2.

Table 3.4.2 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Ruderal Marsh, Wet Meadow & Shrubland Alkali–Saline Marsh, Playa & Shrubland	Wetlands and riparian zones are changed to nonhabitat.	Incentivize project proponents to conserve wetlands and riparian zones to benefit Idaho's SGCN, natural resource-based economy, and communities.
	Wetland and riparian productivity are decreased by vegetation management, invasive species infestation, and soil erosion.	Manage wetlands and riparian zones to benefit SGCN (e.g., buffers/setbacks, desirable vegetation planting and management, targeted riparian fencing, access management, soil health management, erosion prevention and control, streambank and floodplain restoration, and invasive species control).
	Water supplies or water quality are decreased by construction and maintenance activities. Water quality is reduced by stormwater runoff, soil erosion, or excess road salt runoff. Wetlands and riparian zones are harmed by infrastructure and project construction, operations, or maintenance. Water supplies, streamflow, and stream channels are affected by culverts or bridges.	Manage wetlands and riparian zones to benefit SGCN and conserve water supplies and water quality (e.g., construction and maintenance BMPs, stormwater management, pollution prevention and control, erosion prevention and control, vegetated buffers, and road salt reduction if feasible) (e.g., EPA 2009; DEQ 2020; EPA 2023b).
		Conserve SGCN and benefit transportation systems by including flood-resilient designs and BMPs in wetland, riparian, and stream crossing infrastructure (e.g., seasonal high-water flows, erosion prevention and control, gravel and woody debris transport, culvert upgrades, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, fish passage, and wildlife movements) (e.g., Allen and Leech 1997; Knutson and Fealko 2014; USACE 2015; EPA 2023b).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Table 3.4.2 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	SGCN are disturbed or displaced by infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN.
	SGCN movements or migrations are hindered by culverts or bridges.	Facilitate SGCN movements and benefit the transportation system with flood-resilient stream-crossing infrastructure (e.g., culvert enlargement, culvert to bridge conversion, expanded bridge spans, and stream reconnection).

Desert & Semidesert

Transportation & Service Corridors and related construction and maintenance activities have the potential to affect Desert & Semidesert habitats. Road densities and traffic can also result in wildlife–vehicle collisions and influence SGCN behavior (e.g., avoidance, displacement, and movement patterns). In addition to Transportation & Service Corridors, other stressors potentially affecting Desert & Semidesert habitats include prolonged drought, decreased snowpack, natural resource development, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect both SGCN habitat and important amenities that Desert & Semidesert habitat provides to Idaho communities. For example, invasive plants often spread along Transportation & Service Corridors. Elevated risks of wildfire ignition can also be associated with Transportation & Service Corridors (Shinneman et al. 2018).

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by Transportation & Service Corridors include Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, and Slickspot Peppergrass. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Transportation & Service Corridors projects, are listed in Table 3.4.3.

Table 3.4.3 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Sparsely Vegetated Dune Scrub & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation	Shrublands are changed to nonhabitat.	Incentivize project proponents to conserve shrublands to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Inform regulatory authorities, project proponents, and industry about opportunities to reduce negative effects on SGCN (e.g., facility siting; construction, operations, and maintenance BMPs; and human activity noise reduction) (e.g., Hilty et al. 2020; Cramer et al. 2022).
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
	Shrublands are harmed by destructive wildfire.	Reduce risks of destructive wildfire associated with transportation and utility corridors (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, desirable vegetation planting and management, and information and education).
	Rangeland health and productivity are decreased by invasive plant infestation.	Improve rangeland health to benefit SGCN (e.g., invasive species control, erosion prevention and control, rangeland restoration, and desirable vegetation planting and management).
	SGCN are disturbed or displaced by infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's economy and communities.
	Increase in direct mortality of birds or reduced nest success if predatory bird nesting or perching locations are provided by infrastructure.	Construct infrastructure and install deterrents on existing infrastructure to discourage predatory bird perching and nesting as appropriate to protect SGCN ground-nesting birds (e.g., Greater Sage-Grouse).

Aquatic Vegetation & Freshwater Habitat

The construction and maintenance of infrastructure for Transportation & Service Corridors have the potential to affect Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat). Other potential stressors affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, pollutants decreasing water quality, and the introduction and spread of invasive species. These interacting stressors can further affect SGCN habitat, important amenities that aquatic habitat provides to Idaho communities, and cause risks to Transportation & Service Corridors investments (Gillespie et al. 2014). For example, the design, construction, and maintenance of highway bridges and pipelines crossing rivers can be more difficult with unpredictable precipitation and seasonal runoff patterns.

Depending on circumstances, IDWR, IDL, or USACE might regulate infrastructure construction and maintenance in aquatic habitat per the ISCPA, Idaho Lake Protection Act, and CWA, respectively. Therefore, Transportation & Service Corridors infrastructure in aquatic habitat might need state and federal permits that could include protective measures for SGCN.

Examples of SGCN occurring in aquatic habitat and potentially influenced by Transportation & Service Corridors include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Harlequin Duck, and Ring-billed Gull. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and responsible Transportation & Service Corridors projects, are listed in Table 3.4.4.

Table 3.4.4 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Freshwater Aquatic Vegetation Rivers (5th order and higher)	Water supplies or water quality are decreased by construction and maintenance activities.	Manage aquatic habitat to benefit SGCN and conserve water supplies and water quality (e.g., construction and maintenance BMPs, stormwater management, pollution prevention and control, erosion prevention and control, vegetated buffers, and road-salt reduction) (e.g., EPA 2009; DEQ 2020; FWS 2022; EPA 2023b).

Table 3.4.4 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors if stressors are affecting the quantity, quality, or connectivity of aquatic habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Water quality is reduced by stormwater runoff, soil erosion, or excess road salt runoff. Shorelines, lake beds, and stream channels are harmed by infrastructure and project construction, operations, and maintenance. Water supplies, streamflow, and stream channels are affected by culverts or bridges.	Conserve SGCN and benefit transportation systems by including flood-resilient designs and BMPs in stream-crossing infrastructure (e.g., seasonal high-water flows, erosion prevention and control, gravel and woody debris transport, culvert upgrades, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, fish passage, and wildlife movements) (e.g., Allen and Leech 1997; Knutson and Fealko 2014; USACE 2015; EPA 2023b).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
	SGCN movements or migrations are hindered or blocked by infrastructure (e.g., culverts and bridges).	Construct and upgrade to flood-resilient stream crossing infrastructure that benefits fish and wildlife movements (e.g., culvert enlargement, culvert to bridge conversion, expanded bridge spans, and stream reconnections).
	SGCN are disturbed or displaced by infrastructure, human activities, or noise.	Site and plan facilities and infrastructure to reduce negative effects on SGCN.
		Implement BMPs that reduce SGCN disturbance in important locations and during important periods (e.g., nesting season) (e.g., FWS 2023b).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.4.5 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit responsible Transportation & Service Corridors projects.

Table 3.4.5 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors by addressing effects of stressors if occurring

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Steelhead Sockeye Salmon Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot	Abundance and distribution are reduced by movement or migration barriers from decreased streamflow; water management; and transportation and utility infrastructure, operations, or maintenance (e.g., culverts, bridges, or other infrastructure).	Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Implement the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho* (IDFG 2007).
		Implement the *Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho* (IDFG 2022b).
		Implement the *Management Plan for the Conservation of Snake River White Sturgeon in Idaho* (IDFG 2008).
		Construct and upgrade to flood-resilient stream crossing infrastructure that benefits fish movements (e.g., culvert enlargement, culvert to bridge conversion, expanded bridge spans, and stream reconnections).
		Include flood-resilient designs and BMPs in stream crossing infrastructure (e.g., seasonal high-water flows, erosion prevention and control, gravel and woody debris transport, culvert upgrades, shoreline and wetland restoration, floodplain connection, desirable vegetation planting and management, fish passage, and wildlife movements) (e.g., Allen and Leech 1997; Knutson and Fealko 2014; USACE 2015; EPA 2023b).
		Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of project infrastructure and operations (e.g., siting, infrastructure designs, BMPs, and operational procedures).
Waterbird SGCN including: Trumpeter Swan Northern Pintail Western Grebe	Bird survival decreases from colliding with power lines or other utility infrastructure.	Site and construct power lines and utility infrastructure away from important bird areas, habitats, and movement routes (e.g., wetlands, riparian, and waters).
		Identify existing power lines and utility infrastructure with risks of bird collisions and retrofit as appropriate including according to the APLIC protocols.
		Construct new power lines and utility infrastructure to avoid or minimize bird collision risks including according to the APLIC protocols.

Table 3.4.5 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors by addressing effects of stressors if occurring (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Clark's Grebe White-faced Ibis		
Raptor SGCN including: Golden Eagle Ferruginous Hawk Great Gray Owl	Bird survival decreases from electrocution by power lines or other utility infrastructure.	Identify existing power lines with high risks of bird fatality from electrocution and retrofit as appropriate including according to the APLIC protocols.
		Site and construct new power lines and utility infrastructure to avoid or minimize bird electrocutions including according to the APLIC protocols.
Wolverine Pronghorn California Bighorn Sheep Rocky Mountain Bighorn Sheep Moose Greater Sage-Grouse Sharp-tailed Grouse	Abundance and distribution are reduced by disturbance or displacement, movement or migration barriers, fence collisions or entanglement, wildlife–vehicle collisions, and habitat loss or degradation from transportation and utility infrastructure, operations, or maintenance (Fig. 3.4.2).	Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
		Implement the *Idaho Action Plan (V5.0) – Improving Big Game Winter Range and Migration Routes* (IDFG 2023a).
		Implement the *Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho 2015–2025* (IDFG 2015b).
		Implement the *Idaho Bighorn Sheep Management Plan 2022–2027* (IDFG 2022a).
		Implement the *Idaho Moose Management Plan 2020–2025* (IDFG 2020b).
		Implement the *Management Plan for the Conservation of Fisher, Wolverine, and Canada Lynx in Idaho 2023–2028* (IDFG 2023b).
		Reduce negative effects of fencing on SGCN by considering fence placement, using wildlife-friendly fencing specifications to allow big game passage, marking fences to reduce bird collisions, capping pipe fenceposts, and removing unnecessary fences.
		Reconnect seasonal ranges where transportation systems have interrupted migration routes (e.g., crossing structures, wildlife-friendly fencing, and conservation easements as appropriate).

Table 3.4.5 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors by addressing effects of stressors if occurring (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Pollinating insect SGCN including: Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee Monarch Butterfly	Abundance and distribution are reduced by habitat loss or degradation from transportation and utility infrastructure, operations, or maintenance (e.g., vegetation management and improper herbicide use reducing foraging areas for pollinating insects).	Implement the *Idaho Pollinator Protection Plan* (ISDA 2016).
		Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of transportation and utility corridor infrastructure, operations, and maintenance on pollinating insect SGCN (e.g., project siting, infrastructure designs, BMPs, and operational and maintenance procedures).
		Manage vegetation in transportation and utility corridors to minimize negative effects on pollinating insect SGCN and maximize beneficial effects (e.g., pollinator-friendly vegetation management including native milkweeds) (WAFWA 2019).
		Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on beneficial pollinators (ISDA 2016; USDA 2021, 2022).
		Support ITD enrollment in the Nationwide Candidate Conservation Agreement for Monarch Butterfly on Energy and Transportation Lands (Cardno 2020).
Plant SGCN including: Piper's Milk-vetch Macfarlane's Four-o'clock Christ's Paintbrush Indian Valley Sedge	Abundance and distribution are reduced by habitat loss or degradation from transportation and utility infrastructure, operations, or maintenance (e.g., vegetation management and improper herbicide use).	Provide technical assistance as appropriate to regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of transportation and utility corridor infrastructure, operations, and maintenance on plant SGCN (e.g., project siting, infrastructure designs, BMPs, and operational and maintenance procedures).
		Manage vegetation in transportation and utility corridors to minimize negative effects on plant SGCN and maximize beneficial effects (e.g., proper mowing and herbicide application practices).
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to transportation and utility infrastructure, operations, or maintenance (e.g., siting, buffers/setbacks, access management, targeted protective fencing or other barriers, proper mowing and herbicide application practices, and information and education).
		Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to conserve plant SGCN populations associated with roads and utility corridors (e.g., species identification, conservation practices, and proper mowing and herbicide application practices).

Table 3.4.5 Voluntary actions intended to benefit SGCN and responsible Transportation & Service Corridors by addressing effects of stressors if occurring (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Transplant or propagate plant SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.



Fig. 3.4.2 Moose using newly developed passage opportunity under Idaho State Highway 28 (cc) BY **IDFG.**

3.5 Biological Resource Use

Overview

Biological Resource Use consists of Hunting & Collecting Terrestrial Animals, Logging & Wood Harvesting, and Fishing & Harvesting Aquatic Resources (CMP 2016a). Logging & Wood Harvesting is referenced here as "forestry," to more holistically address the manufacturing of forest products and forest management. Similarly, Hunting & Collecting Terrestrial Animals and Fishing & Harvesting Aquatic Resources are referenced here collectively as "recreational

hunting, fishing & trapping," which is managed by IDFG under the supervision of the Idaho Fish and Game Commission.

Forestry

Forestry includes public and private forest management and infrastructure, timber harvest, and forest product manufacturing. Idaho's public and private forests and waters provide society with abundant renewable resources and services including forest products (e.g., wood, paper, and furniture), livestock forage, healthy soils, clean air and water, erosion and flood control, and outdoor recreational opportunities. Forests also provide important habitat for fish, wildlife, and plants, including SGCN. The forest industry also contributes importantly to Idaho's economy, local communities, and way of life. For example, managing Idaho's 16.5 million acres (6.7 million ha) of forests available for harvesting forest products employs approximately 3,250 people. In 2020, forestry contributed $2.4 billion to the state's economy and supported over 31,000 jobs (Idaho Forest Products Commission 2020). Demand for forest products is increasing as the human population increases globally, nationally, and locally.

Forestry's production of renewable products and services for society can be compatible with SGCN conservation when stakeholders collaborate in problem solving. The WGA Policy Resolution 2021-03, National Forest and Rangeland Management (WGA 2021a), emphasizes the importance of collaboration and strategic planning between stakeholders to achieve healthy forests. Many long-standing partners associated with forestry are already contributing greatly to conserving the state's fish, wildlife, and plants. Established relationships among forestry partners and stakeholders can create opportunities to collaborate in proactive, voluntary, and community-based solutions to meet society's needs while conserving SGCN. Considering the increasing needs for forest products, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, economically vital forests, and community culture and heritage.

Recreational Hunting, Fishing & Trapping

Idaho's abundant fish and wildlife populations are important to the rich culture and heritage of the state's citizens and communities. Created in 1938 by a public initiative, the Idaho Fish and Game Commission is responsible for managing fish and wildlife populations for the public trust by administering the state's wildlife policy as described in Idaho Code § 36-103 (2022). Recreational hunting, fishing & trapping also contribute importantly to Idaho's economy, particularly for rural communities. Being major economic drivers, recreational hunting, fishing & trapping generates over $1.4 billion in annual economic activity in Idaho, which supports thousands of jobs and hundreds of small businesses.

To meet the demand for recreational hunting, fishing & trapping, and other wildlife recreation, IDFG works with hunters, anglers, and trappers to promote the legacy of the "sportsmen and women conservationists" and builds participation in recreation as a means of managing and conserving Idaho's fish and wildlife. IDFG also strives to increase public involvement in decision-making processes. Public involvement will be increasingly important as the demand

for sustainable recreational hunting, fishing & trapping increases with Idaho's expanding human population.

Overarching Effects & Actions—Forestry

Natural resources provided by healthy forests and waters, both publicly and privately owned, sustain the state's forest industry and communities. These forests and waters also provide habitat for fish, wildlife, and plants, including SGCN. Therefore, conserving forests and waters can benefit both forestry and SGCN.

The connection between natural resources supporting forestry and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of forests and waters important to forestry, local communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with forestry producers, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and sustainable forestry goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and forestry goals and objectives for managing stressors (e.g., forest and rangeland health, soil health, water supplies, and water quality).
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and forestry-related planning.
    - Assess the status of stressors related to SGCN and forestry goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitats relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential forestry-related stressors that could affect SGCN goals and objectives (Fig. 3.5).
- Promote and incentivize collaborative programs, projects, and BMPs on public and private lands that benefit joint SGCN and forestry goals and objectives. The following are examples of voluntary actions:

  - Implement soil and water conservation projects and BMPs to benefit water supplies, water quality, and soil health, in particular wetlands, riparian zones, and aquatic habitats associated with forested habitats (Barkley et al. 2015).
  - Improve forest and rangeland health (e.g., Rocky Mountain Goat, Rocky Mountain Bighorn Sheep, and Moose).
  - Apply SGCN-friendly forest management and forestry BMPs (e.g., amphibians, Northern Idaho Ground Squirrel, Fisher, White-headed Woodpecker, and beneficial pollinators) (e.g., Pilliod et al. 2008; Raley et al. 2012; Suronen and Newingham 2013; ISDA 2016; WAFWA 2019; Latif et al. 2020; USDA 2021).
  - Implement BMPs to avoid and minimize the disturbance of nesting migratory birds by forest management and timber harvest activities (e.g., BLM 2020b).
  - Construct and upgrade livestock fencing to wildlife-friendly specifications that facilitate big game movements and protect rare plant populations (e.g., Paige 2012).
  - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
  - Conserve pollinator SGCN (e.g., Yellow Bumble Bee, Western Bumble Bee, and Monarch Butterfly) and benefit forestry with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
  - Conserve high-priority SGCN populations and habitat, and forests and waters, with cooperative agreements (e.g., land exchanges, conservation easements, and Forest Legacy Program).
- Collaborate with forestry producers, resource managers, and private landowners to use existing forestry programs and incentivize voluntary soil, water, and SGCN conservation projects; BMPs; technology upgrades; and conservation of working forests (e.g., forest incentive programs such as Forest Stewardship Program, Forest Legacy Program, Sustainable Forestry Initiative, Good Neighbor Authority, American Tree Farm System, and Forest Stewardship Council).
- Partner with willing resource managers and private landowners to carry out projects that benefit both SGCN and forestry goals and objectives across federal, state, and private landownerships.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform forestry producers, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration with IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and forestry.
- Collaborate with forestry producers, resource managers, industry, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs beneficial to both SGCN and forestry.

- Encourage and incentivize forestry producers, resource managers, industry, and universities to develop collaborative forestry programs and BMPs that benefit SGCN and support sustainable forestry, monitoring, and adaptive management.

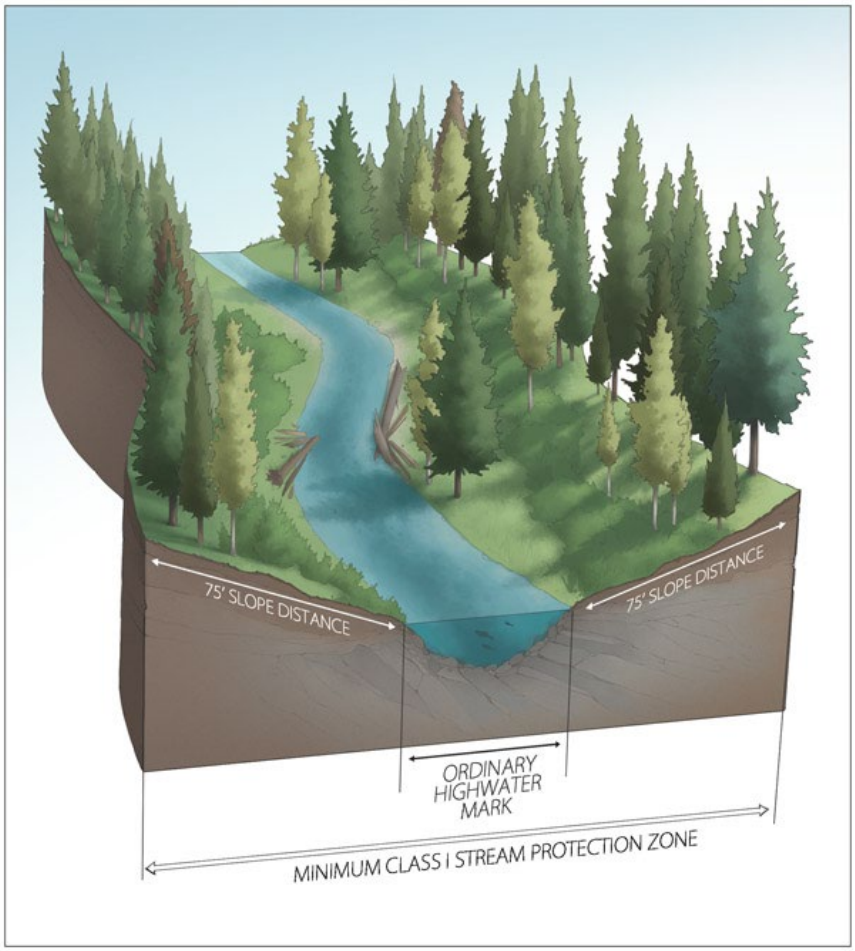


Fig. 3.5 Graphic depicting Idaho Class I Stream Protection Zone from *Idaho Forestry Best Management Practices Field Guide* (Barkley et al. 2015).

- Assist forestry project proponents, resource managers, and other stakeholders with information to address project effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and recommend measures to offset negative effects.
    - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in sustainable forestry programs, projects, and BMPs that will also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, forestry producers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, improve forestry (e.g., forest and rangeland health, and soil and water conservation), and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into forestry.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of forestry and SGCN conservation needs.
- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Overarching Effects & Actions—Recreational Hunting, Fishing & Trapping

Recreational hunting, fishing & trapping are part of Idaho's rich outdoor heritage and contribute to Idaho's economy. The Idaho Fish and Game Commission sets regulations for harvesting fish and wildlife, and IDFG implements those regulations. Overarching actions in the following subsections align with IDFG's 2015 *Strategic Plan* (IDFG 2015a) and are broadly applicable for conserving all SGCN and their habitats (see Chapter 2):

Voluntary Actions Related to Native Species and Their Habitats

- Strategic Goal 1 guides IDFG management to sustain Idaho's fish and wildlife and their habitats with the following objectives and actions:
    - Maintain or improve game populations to meet the demand for recreational hunting, fishing & trapping.
    - Ensure the long-term survival of native fish, wildlife, and plants.
    - Increase the capacity of habitat to support fish and wildlife.
    - Eliminate the impacts of fish and wildlife diseases on fish and wildlife populations, livestock, and humans.
- Strategic Goal 2 guides IDFG management to meet the demand for recreational hunting, fishing & trapping (and other wildlife-associated recreation) with the following objectives and actions:
    - Maintain a diversity of recreational hunting, fishing & trapping opportunities.
    - Sustain fish and wildlife recreation on public lands.

  - Increase the variety and distribution of access to private land for recreational hunting, fishing & trapping (e.g., improve landowner/sportsperson cooperation through communication and enforcement of hunting, fishing, and trapping rules).
  - Increase opportunities for wildlife viewing and appreciation.
  - Maintain broad public support for recreational hunting, fishing & trapping and wildlife viewing (e.g., emphasize ethics, safety, and fair chase in education and enforcement programs).

Voluntary Actions Related to Information and Knowledge Gaps

- Strategic Goal 4 guides enhancement of IDFG's capabilities to manage fish and wildlife and serve the public with the following objectives and actions:
  - Attract and retain a diverse and professional workforce.
  - Provide programs, equipment, and facilities for excellent customer service and management effectiveness (e.g., promote and strengthen volunteer programs to assist with fish and wildlife management and education).
  - Improve information management and business systems (e.g., develop a data management system to make data more readily usable and available to the public and other agencies).

Voluntary Actions Related to Outreach

- Strategic Goal 3 guides IDFG efforts to improve public understanding and involvement in fish and wildlife management with the following objectives and actions:
  - Improve citizen involvement in the decision-making process (e.g., ensure that interested and affected stakeholders are notified of opportunities to participate in decisions and that all voices are heard).
  - Increase public knowledge and understanding of Idaho's fish and wildlife (e.g., expand use of new information technologies to improve public outreach, provide biological information, and convey the status of populations and basis for management decisions).

Habitat-specific Effects & Actions—Forestry

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitat and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with forestry (e.g., the sustainable harvest of wood and paper products). Ideally, SGCN conservation will be mutually beneficial for forestry.

Forest & Woodland

Idaho's expansive public and private Forest & Woodland habitats support the state's forest products industry. Sustainable forestry today applies modern silviculture to achieve forest health objectives (D'Amato et al. 2018; FS 2020). Improper historic forest management negatively affected the health of some Forest & Woodland habitats (Hessburg et al. 2022). This legacy of past improper forest management and other isolated circumstances can be ongoing stressors affecting SGCN habitat and forest health.

Additional stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, disease and insect outbreaks, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect SGCN habitat, forest health, and important forestry products and services for society (Dale et al. 2001; Hessburg et al. 2022). For example, fire is an important stressor that can benefit some forests when carefully managed. However, stressors that elevate the risk of unnatural wildfire can create severe consequences for the sustainability of forestry and communities, especially along expanding WUIs.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by forestry include Wolverine, Fisher, Rocky Mountain Goat, Moose, Great Gray Owl, Lewis's Woodpecker, White-headed Woodpecker, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Western Bumble Bee, Whitebark Pine, and Clearwater Phlox. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and forestry, are listed in Table 3.5.1.

Table 3.5.1 Voluntary actions intended to benefit SGCN and sustainable forestry if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Subalpine–High Montane Forest	Forest habitats are changed to nonhabitat.	Incentivize landowners and resource managers to conserve priority forests to benefit Idaho's SGCN, forestry economy, culture and heritage, and rural communities (e.g., Forest Legacy Program).
	Forests are prone to destructive wildfire by decreased health and productivity from invasive plants, and insect and disease outbreaks.	Implement the *Idaho Forest Action Plan* (IDL 2020).
		Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Reduce destructive wildfire risks (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).

Table 3.5.1 Voluntary actions intended to benefit SGCN and sustainable forestry if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Aspen Forest & Woodland Whitebark Pine Forest & Woodland Pinyon–Juniper Woodland Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Forests are harmed by destructive wildfire (e.g., unnatural wildfire frequency, extent, and severity).	Protect high-priority SGCN populations and habitat during firefighting (e.g., large-diameter [>21 in (>53 cm) dbh] Ponderosa Pine, elite/plus [blister rust resistant seed source] Whitebark Pine trees, big game winter range, and cottonwood stands) unless beneficial effects are expected.
		Restore forests negatively affected by destructive wildfire and invasive insect and disease outbreaks (e.g., erosion control, strategic salvage logging, desirable vegetation planting and management, and invasive species control.
	Forest health and productivity is decreased by invasive plants, insect outbreaks, and forest diseases. Varieties of tree ages, sizes, and types have been reduced by legacy forest management. Fire-resistant mature forest characteristics have been decreased by legacy forest management.	Improve forest health to benefit SGCN and forestry (e.g., invasive species control, forest restoration; desirable vegetation planting and management, access management, and erosion prevention and control).
		Conserve SGCN and benefit forestry by increasing forest diversity (e.g., patch sizes and openings, stand structure, tree species and undergrowth composition, tree densities, tree ages, tree sizes, snags, and woody debris).
		Manage forests to benefit SGCN and forestry to keep fire-resistant and mature forest characteristics (e.g., large trees, large snags and woody debris, invasive species control, fuel reduction treatments, and forest restoration).
		Restore Whitebark Pine stands by planting seedlings resistant to White Pine Blister Rust, using prescribed burning and mechanical thinning (e.g., to remove Subalpine Fir), and focusing restoration in colder locations (Keane 2018).
	Soils are eroded and compacted by improper forest management. Water quality is reduced by soil erosion and shade removal from forest management infrastructure and activities (e.g., roads and harvest activities).	Control soil erosion (e.g., unneeded road and trail decommissioning, forest restoration, desirable vegetation planting and management, woody debris maintenance, and access management).
		Implement Idaho Forest Practices Act BMPs during infrastructure construction and forestry and harvest activities to protect, maintain, and enhance forests and water quality, particularly associated wetlands, riparian zones, and aquatic habitats (e.g., stream protection zones, protective buffers, road and stream crossing siting and specifications, harvesting system, erosion prevention and control, slash management, invasive species control, and reforestation) (see Barkley et al. 2015).

Species-Specific Effects & Actions—Forestry and Recreational Hunting, Fishing & Trapping

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.5.2 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit both forestry and recreational hunting, fishing & trapping.

Table 3.5.2 Voluntary actions intended to benefit SGCN and sustainable forestry and recreational hunting, fishing & trapping (see IDAPA 13.01.06, "Rules Governing Classification and Protection of Wildlife")

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Protected wildlife including big game animals, upland game animals, game birds, game fish, furbearing animals, and protected nongame species (IDAPA 13.01.06)	Abundance is reduced by illegal capture or take.	Enforce laws and rules protecting SWAP species and their habitats (e.g., surveys, patrols, check stations, patrols, investigations, and prosecutions).
		Support and promote public involvement in reporting and addressing illegal SWAP species capture or take (e.g., Citizens Against Poaching—Idaho, citizen working groups, education and outreach campaigns, violation awareness and reporting, and enforcement support).
	Supplies of legally hunted, fished, and trapped SWAP species are not meeting management objectives.	Implement IDFG management plans as appropriate, including developing the means and methods to supply populations of hunted, fished, or trapped SWAP species per management objectives for sustainable harvest (e.g., season setting, methods of take, bag limits, and population and harvest monitoring).
Plant SGCN including: Robinson's Starwort Clearwater Phlox	Abundance and distribution are reduced by habitat loss or degradation from forest management practices (e.g., vegetation management and soil disturbance during timber harvest).	Provide technical assistance to forestry producers, resource managers, and private landowners about opportunities to avoid or minimize negative effects on plant SGCN populations.
		Manage forests to protect plant SGCN and benefit forest management (e.g., invasive species control, proper herbicide application practices, and vegetation management).
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to forest management (e.g., targeted protective fencing or other barriers and information and education).
		Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to conserve plant SGCN populations associated with forest management.

3.6 Human Intrusions & Disturbance

Overview

Human Intrusions & Disturbance consists of Recreational Activities (hereafter outdoor recreation) and Military Exercises. Idaho's lands and waters provide abundant opportunities for a diversity of outdoor recreation activities. Idaho's extensive public lands also provide ground-based and aerial training areas for Military Exercises important for maintaining national security. Both outdoor recreation and the military are important to the state's economy and communities.

Outdoor Recreation

Outdoor recreation is fundamental to Idaho's rich outdoor heritage and many of Idaho's lands and waters support outdoor recreation (IDPR 2018). These lands and waters also support the state's rich diversity of fish, wildlife, and plants. In recent decades, Idaho has had one of the fastest growing populations in the US, primarily from people relocating to the state. Among other factors, people moving to Idaho are attracted to the expansive public lands and associated outdoor recreation (including abundant wildlife-related recreation), which is important to Idaho's economy, rural communities, and culture and heritage.

Most (79%) Idahoans participate in one or more forms of outdoor recreation (IDPR 2018). Popular forms of recreation include hiking, biking, motorboating, rafting, snow skiing, water-skiing, snowmobiling, and off-highway vehicle (OHV) riding. Hunting, fishing, and wildlife viewing are also popular. The demand for outdoor recreation has increased dramatically in recent years, resulting in unprecedented levels of visitation to areas managed by IDPR and others (e.g., a record 7.7 million visitors to Idaho State Parks in 2020) (IDPR 2022). Travel and tourism expenditures, retail sales, and equipment manufacturing in Idaho contribute recreation-related economic activity, which generated over $2 billion for Idaho's economy in 2020 (BEA 2021a, 2021b).

The values and goals of sustainable outdoor recreation are typically compatible with SGCN conservation, especially when stakeholders collaborate. Many long-standing partners associated with outdoor recreation are already contributing to conserving the state's fish, wildlife, and plants. Established relationships among outdoor recreation partners and stakeholders can create opportunities to collaborate in proactive, voluntary, and community-oriented solutions to meet society's needs while conserving SGCN. Considering the increasing demand for outdoor recreation, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, outdoor recreation-based economy, and community culture and heritage.

Military Exercises

Idaho supports the US military. Military Exercises are crucial for maintaining combat readiness and proficiency in support of the National Defense Strategy. Idaho provides aerial- and

ground-based military training ranges including the US Air Force's special use airspace, associated with Mountain Home Air Force Base, and Idaho Army National Guard's Orchard Combat Training Center, both in southwest Idaho.

The military is important to Idaho's economy, communities, and culture. However, Military Exercises and installations have the potential to affect SGCN. The Department of Defense (DOD) manages natural resources associated with military installations, including SGCN, through Integrated Natural Resources Management Plans (INRMPs). The DOD also addresses effects of Military Exercises on natural resources through NEPA processes. The State of Idaho routinely participates in the DOD's INRMP and NEPA processes to identify and address effects on priority wildlife and plants. The state will continue to collaborate with the DOD as an important partner for conserving Idaho's SGCN while supporting the nation's military.

Overarching Effects & Actions—Outdoor Recreation

Idaho's lands and waters, both privately and publicly owned, are essential to sustaining the many forms of outdoor recreation that contribute to the state's economy and communities. Similarly, these lands and waters provide habitat for fish, wildlife, and plants, including SGCN. Therefore, conserving Idaho's lands and waters can benefit outdoor recreation and SGCN.

The connection between natural resources supporting outdoor recreation and SGCN conservation provides an opportunity for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing effects of stressors that have the potential to negatively affect the health of lands and waters important to outdoor recreation, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with outdoor recreation users and groups, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and outdoor recreation goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and outdoor recreation goals and objectives for managing stressors (e.g., forest and rangeland health, soil health, water supplies, and water quality).
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and outdoor recreation-related planning.
    - Assess the status of stressors related to SGCN and outdoor recreation goals and objectives.

    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential outdoor recreation-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and sustainable outdoor recreation goals and objectives. The following are examples of potential voluntary actions:
    - Upgrade and maintain recreation infrastructure considering SGCN conservation.
    - Protect sensitive and vulnerable animal and plant SGCN populations and their habitat (e.g., travel and access management, targeted protective fencing or other barriers, and recreational trail routing and maintenance).
    - Implement soil and water conservation to promote water supplies, water quality, soil stability, and forest, rangeland, and wetland/riparian zone health (e.g., habitat restoration, invasive species control, and erosion prevention and control).
    - Conserve SGCN pollinators with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (e.g., Yellow Bumble Bee, Western Bumble Bee, Monarch Butterfly, and Gillette's Checkerspot) (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
    - Conserve high-priority SGCN populations and habitat with cooperative agreements (e.g., land exchanges, conservation easements, and Land and Water Conservation Fund).

Voluntary Actions Related to Information and Knowledge Gaps

- Inform outdoor recreation users and groups, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and sustainable outdoor recreation.
- Collaborate with outdoor recreation users and groups, industry, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to benefit both SGCN and sustainable outdoor recreation.
- Encourage and incentivize outdoor recreation groups, industry, resource managers, and universities to develop collaborative recreational programs and BMPs that benefit SGCN and support outdoor recreation, adaptive management, and monitoring (e.g., Miller et al. 2020).
- Assist outdoor recreation project proponents, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.

  - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
  - Analyze potential project-specific effects and recommend measures to offset negative effects.
  - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in sustainable outdoor recreation programs, projects, and BMPs that also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, outdoor recreation users and groups, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, improve outdoor recreation, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation in outdoor recreation.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of outdoor recreation and SGCN conservation needs.
- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Overarching Effects & Actions—Military Exercises

Effects of Military Exercises on SGCN vary depending on many seasonal and site-specific circumstances including training duration, timing, frequency, proximity, and intensity. The following are examples of potential negative SGCN effects associated with Military Exercises:

- Disturbance and displacement from preferred habitat
- Physiological stress during crucial reproductive seasons
- Habitat fragmentation and reduced habitat effectiveness
- Ground and soil disturbance

The DOD's INRMP and NEPA processes create opportunities for resource management agencies, stakeholders, and the public to collaborate when identifying effects of Military Exercises on SGCN and options to address negative effects. Technical assistance from resource agencies is an important approach to inform the INRMP and NEPA processes about effects and recommend opportunities to conserve SGCN. By applying the mitigation hierarchy,

technical assistance could potentially include voluntary recommendations to reduce negative effects such as with alternative siting, BMPs, and habitat restoration.

Finding collaborative opportunities to conserve SGCN and support Military Exercises should be a goal of participating in the DOD's INRMP and NEPA processes. The connection between the lands and airspace used for Military Exercises and SGCN conservation provides an opportunity to collaborate in mutually beneficial conservation efforts. The following actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters affected by Military Exercises and important to Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Assist DOD, resource managers, and other stakeholders with planning and implementing approaches to achieve both SGCN and Military Exercise goals and objectives. The following are examples of voluntary actions:
    - Participate in INRMP and NEPA processes, communicate the state's SGCN goals and objectives, identify potential risks to SGCN goals and objectives from future Military Exercises, and recommend measures to address risks.
    - Develop, assemble, maintain, and disseminate databases to support INRMP and NEPA processes.
    - Identify and address SGCN knowledge gaps and proactively develop information to support project planning, effects analysis, and potential measures to offset negative effects.
    - Assess the status of stressors related to Military Exercises and SGCN goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitats relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential Military Exercise-related stressors that could affect SGCN goals and objectives.
- Assist DOD, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in INRMP and NEPA processes during early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and apply the mitigation hierarchy to recommend measures to offset negative effects throughout a project's life cycle.
    - Recommend monitoring and adaptive management approaches to guide implementation of the mitigation hierarchy and conserve SGCN throughout project life cycles.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform DOD and stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Survey, monitor, and assess SGCN population and habitat conditions to determine status and effectiveness of actions implemented to address effects of Military Exercise-related stressors and achieve SGCN goals and objectives.
- Collaborate with DOD, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to offset effects of Military Exercises (see Caudal and Gallet 2023).
- Encourage and incentivize DOD to perform monitoring and conduct adaptive management to assess the effectiveness of measures implemented to offset negative effects.

Voluntary Actions Related to Outreach

- Establish collaborative working groups as appropriate including communities, industries, regulatory authorities, and resource managers to facilitate the exchange of information and knowledge about opportunities and efforts to benefit SGCN, assist DOD, and support communities.
- Participate with DOD, resource managers, and other stakeholders to develop collaborative measures to offset negative effects of Military Exercises on SGCN.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into Military Exercises.
- Encourage public and stakeholder participation in INRMP and NEPA processes to raise awareness and consideration of both SGCN conservation needs and Military Exercise needs.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Habitat-specific Effects & Actions—Outdoor Recreation

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with outdoor recreation. Ideally, SGCN conservation will be mutually beneficial for outdoor recreation.

Forest & Woodland

Camping, hiking, biking, OHV touring, horseback riding, sightseeing, wildlife viewing, and hunting are popular forms of outdoor recreation in Forest & Woodland habitats. However, outdoor recreation activities, facilities, and infrastructure also have the potential to locally affect Forest & Woodland habitats. For example, outdoor recreation activities and infrastructure can disturb or displace wildlife, remove vegetation, spread invasive species, cause erosion, and compact soils. Additional stressors potentially affecting Forest & Woodland habitats more broadly include prolonged drought, changing precipitation and snowpack trends, insect and disease outbreaks, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. Outdoor recreation can worsen these stressors by spreading invasive plants and elevating ignition risks for unnatural wildfire, which can negatively affect SGCN, forest health, and recreational opportunities for Idaho communities.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by outdoor recreation include Wolverine, Fisher, Rocky Mountain Goat, Moose, Yellow-billed Cuckoo, Lewis's Woodpecker, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Western Bumble Bee, Whitebark Pine, and Indian Valley Sedge. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.1.

Table 3.6.1 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Subalpine–High Montane Forest Aspen Forest & Woodland Whitebark Pine Forest & Woodland	SGCN are disturbed, displaced, or otherwise harmed by recreational facilities, infrastructure, or human activities.	Site and plan recreation facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's outdoor recreation economy and communities.
		Manage human access and activities in forests to benefit SGCN and outdoor recreation (e.g., travel and access management, targeted protective fencing or other barriers, recreational trail routing and maintenance, erosion prevention and control, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods (e.g., bird nesting) (e.g., Miller et al. 2020).

Table 3.6.1 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Pinyon–Juniper Woodland Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Vegetation productivity is decreased by invasive species introduction and spread.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Improve forest health to benefit SGCN and outdoor recreation (e.g., forest restoration, desirable vegetation planting and management, erosion prevention and control, and information and education).
	Forest health is harmed by destructive wildfire caused by recreational activities.	Reduce risks of destructive wildfire (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
	Soils are eroded or compacted by recreational activities.	Prevent and control soil erosion (e.g., access management, unneeded road and trail decommissioning, forest restoration, and desirable vegetation planting and management).

Shrub & Herb Wetland

Shrub & Herb Wetland habitats can be locally sensitive to outdoor recreation if recreational infrastructure and activities change water flows, input water quality pollutants, remove wetland vegetation, cause erosion, or compact soils. Additional stressors potentially affecting Shrub & Herb Wetland habitats more broadly include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, water diversions, pollutants decreasing water quality, and the introduction and spread of invasive species. These interacting stressors can further affect both SGCN habitat and important amenities for outdoor recreation and Idaho's communities.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by outdoor recreation include Northern Leopard Frog, Little Brown Myotis, Hoary Bat, Moose, Trumpeter Swan, Northern Pintail, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.2.

Table 3.6.2 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland	SGCN are disturbed, displaced, or otherwise harmed by recreational facilities, infrastructure, or human activities.	Site and plan recreation facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's outdoor recreation economy and communities.
		Manage human access and activities in wetlands and riparian zones to benefit SGCN and outdoor recreation (e.g., travel and access management, targeted protective fencing or other barriers, recreational trail routing and maintenance, pedestrian bridges and boardwalks, viewing areas, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods (e.g., Miller et al. 2020).
	Vegetation productivity is decreased by invasive species introduction and spread. Soils are eroded and compacted by recreational activities. Water quality is reduced by soil erosion, increased sediment inputs, and pollutants.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Manage wetlands and riparian zones to benefit SGCN and outdoor recreation (e.g., erosion prevention and control, access management, recreational trail routing and maintenance, pedestrian bridges and boardwalks, wetland and streambank restoration, desirable vegetation planting and management, and information and education).
		Conserve water supplies and water quality (e.g., water supply and streamflow improvement, buffers/setbacks, vegetated buffers, improved stormwater management, upgraded water treatment facilities, waste disposal and management facilities, recreation infrastructure and facility maintenance, and information and education).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Desert & Semidesert

Much of Idaho's Desert & Semidesert habitats occurs on public lands administered by the BLM and FS. These public lands provide abundant open spaces and opportunities for outdoor recreation. Camping, hiking, biking, OHV touring, horseback riding, sightseeing, rock hounding, wildlife viewing, and hunting are popular forms of outdoor recreation in Desert & Semidesert habitats. However, outdoor recreation activities, facilities, and infrastructure also have the potential to locally affect Desert & Semidesert habitats. For example, outdoor recreation activities and infrastructure can locally disturb or displace wildlife, remove vegetation, cause erosion, and compact soils.

Additional stressors potentially affecting Desert & Semidesert habitats more broadly include prolonged drought, decreased snowpack, natural resource development, the introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect SGCN habitat, rangeland health, and outdoor recreation provided to Idaho communities. For example, the increasing prevalence of invasive plants and unnatural destructive wildfire are harmful stressors affecting Desert & Semidesert habitats (Chambers et al. 2014; Chambers et al. 2019). Outdoor recreation can potentially worsen these stressors by spreading invasive plants and elevating wildfire ignition risks.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by outdoor recreation include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, Slickspot Peppergrass, and Winward's Goldenbrush. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.3.

Table 3.6.3 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Sparsely Vegetated Dune Scrub & Grassland	SGCN are disturbed, displaced, or otherwise harmed by recreational facilities, infrastructure, or human activities.	Site and plan recreation facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's outdoor recreation economy and communities.

Table 3.6.3 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation		Manage human access and activities in rangelands to benefit SGCN and outdoor recreation (e.g., travel and access management, targeted protective fencing or other barriers, recreational trail routing and maintenance, camping facilities, erosion prevention and control, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods (e.g., wintering, lambing, lekking, and nesting) (e.g., Miller et al. 2020).
	Vegetation productivity is decreased by invasive species introduction and spread.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Improve rangeland health to benefit SGCN and outdoor recreation (e.g., rangeland restoration, desirable vegetation planting and management, and erosion prevention and control).
	Rangeland health is harmed by destructive wildfire caused by recreational activities.	Reduce risks of destructive wildfire (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
	Soils are eroded and compacted by recreational activities.	Prevent and control soil erosion (e.g., access management, unneeded road trail decommissioning, rangeland restoration, and desirable vegetation planting and management).

Polar & High Montane Scrub, Grassland & Barrens

Most Polar & High Montane Scrub, Grassland & Barrens habitat (hereafter Alpine Tundra) is remote and minimally affected by human activities, including outdoor recreation. Although typically of small scale, outdoor recreation activities, facilities, and infrastructure can locally affect Alpine Tundra. For example, the fragile vegetation and soils of Alpine Tundra can be sensitive to trampling by both motorized and nonmotorized forms of recreation. Additional stressors potentially affecting Alpine Tundra more broadly include prolonged drought, decreased snowpack, increased temperatures, extended growing season, and invasion by conifer trees.

Examples of SGCN occurring in Alpine Tundra and potentially influenced by outdoor recreation include Hoary Bat, Silver-haired Bat, Wolverine, Grizzly Bear, Rocky Mountain Goat, Golden Eagle, Gray-crowned Rosy-Finch, and Black Rosy-Finch. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.4.

Table 3.6.4 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Alpine Tundra

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Alpine Tundra	SGCN are disturbed, displaced, or otherwise harmed by recreational facilities, infrastructure, or human activities.	Site and plan recreation facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's outdoor recreation economy and communities.
		Manage Alpine Tundra to benefit SGCN and outdoor recreation (e.g., access management, targeted protective fencing or other barriers, recreational trail routing and maintenance, camping facilities, ski resorts, erosion prevention and control, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods (e.g., Miller et al. 2020).
	Vegetation productivity is decreased by invasive species introduction and spread.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
	Soils are eroded and compacted by recreational activities.	Prevent and control soil erosion (e.g., access management, unneeded road and trail decommissioning, habitat restoration, and desirable vegetation planting and management).

Aquatic Vegetation & Freshwater Habitat

Consisting of streams, rivers, lakes, and reservoirs, Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat) is important for water-related outdoor recreation. Boating, water-skiing, swimming, whitewater rafting and kayaking, and fishing are popular forms of water-related outdoor recreation. These same water sources also provide many other societal needs including municipal water, industrial water, agricultural irrigation, commercial transportation, hydroelectricity, and habitat for fish, wildlife, and plants.

Water-based outdoor recreation activities, facilities, and infrastructure also have the potential to locally affect aquatic habitat. For example, outdoor recreation-related stressors can include streambank and shoreline erosion, the introduction and spread of invasive species, SGCN

disturbance and displacement, and water pollutants. Additional stressors potentially affecting aquatic habitat more broadly include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, other pollutant sources decreasing water quality, and the introduction and spread of invasive species. These interacting stressors can further affect the lands and waters that provide SGCN habitat and recreational opportunities available to Idaho communities.

Examples of SGCN occurring in aquatic habitat and potentially influenced by outdoor recreation include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Harlequin Duck, Western Grebe, and Ring-billed Gull. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.5.

Table 3.6.5 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	SGCN are disturbed, displaced, or otherwise harmed by recreational facilities, infrastructure, or human activities.	Site and plan recreation facilities and infrastructure to reduce negative effects on SGCN while benefiting Idaho's outdoor recreation economy and communities.
		Manage aquatic habitat to benefit SGCN and outdoor recreation (e.g., access management, recreation sites, boat launches, docking facilities, camping facilities, decontamination facilities, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods (e.g., Miller et al. 2020).
	Aquatic habitat productivity is decreased by invasive species introduction and spread. Shorelines, lake beds, and stream channels are harmed by recreational facilities, infrastructure, or human activities.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Manage aquatic habitat to benefit SGCN and sustainable outdoor recreation by controlling shoreline erosion (e.g., access management, monitoring and enforcement, buffers/setbacks, lake bed and shoreline restoration, desirable vegetation planting and management, flood-resilient recreation infrastructure, and information and education).
		Manage SGCN fish habitat and fisheries to benefit outdoor recreation (e.g., water management, in-water and shoreline restoration, instream and shoreline habitat complexity, large woody debris, desirable vegetation planting and management, diversion screening, and erosion prevention and control).

Table 3.6.5 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of aquatic habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	Shorelines and streambanks are eroded by boat wakes (Fig. 3.6). Water quality is reduced by soil erosion, increased sediment inputs, and pollutants.	Conserve water supplies and water quality (e.g., buffers/setbacks, vegetated buffers, improved stormwater management, upgraded water treatment facilities, waste disposal and management facilities, recreational infrastructure and facility maintenance, and information and education).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).



Fig. 3.6 Example of boat wake management outreach from the Idaho Department of Parks and Recreation (IDPR 2021).

Caves & Subterranean Habitats

Caving and cave tourism are increasingly popular forms of outdoor recreation. Much of Idaho's Caves & Subterranean Habitats, including abandoned mines, occurs on state- or federally-managed lands. The BLM, FS, NPS, and INL typically manage Caves & Subterranean Habitats, with human entry regulated by recreation and abandoned mine programs. Caves & Subterranean Habitats can be sensitive to human activities such as caving and cave tourism. Negative effects can include disturbing or displacing SGCN and disrupting the highly stable temperatures of Caves & Subterranean Habitats. Of particular concern, cave and mine visitors can introduce diseases to Caves & Subterranean Habitats such as the fungus *Pseudogymnoascus destructans* (*Pd*) responsible for white-nose syndrome in bats (WNS). Other stressors potentially affecting Caves & Subterranean Habitats include prolonged drought, decreased snowpack, increased temperatures, natural resource development and uses, and accumulation of invasive plants at cave or mine entrances. In particular, climate stressors have the potential to change the highly stable temperatures of Caves & Subterranean Habitats and reduce habitat effectiveness for cave-obligate SGCN.

Examples of SGCN occurring in Caves & Subterranean Habitats (including abandoned mines) and potentially affected by outdoor recreation include Western Small-footed Myotis, Little Brown Myotis, Yuma Myotis, Silver-haired Bat, and Townsend's Big-eared Bat (also see Sections 3.11 and 3.12). Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and outdoor recreation, are listed in Table 3.6.6.

Table 3.6.6 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Caves & Subterranean Habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Caves & Subterranean Habitats	SGCN are disturbed or displaced by human activities. Subterranean habitat is damaged. SGCN survival decreases from the introduction of harmful diseases.	Assist the outdoor recreation industry, cave tourism businesses, recreationists, and resource managers with conserving subterranean habitat as appropriate to benefit SGCN, the outdoor recreation economy, and communities.
		Manage subterranean habitat to benefit SGCN and outdoor recreation (e.g., access management, bat-compatible gates in abandoned mine openings, airflow maintenance, invasive species control, and information and education).

Table 3.6.6 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Caves & Subterranean Habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Conserve subterranean habitat and SGCN by implementing programs, projects, and BMPs as appropriate to reduce risks of disease introduction and spread (e.g., access management, gating, signage, and information and education) (e.g., White-nose Syndrome Disease Management Working Group 2019; Miller et al. 2020; White-nose Syndrome Disease Management Working Group 2020).
		Provide technical assistance as appropriate to regulatory authorities, project proponents, industry, resource managers, and other stakeholders about opportunities to avoid negative effects to subterranean-dependent SGCN.

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.6.7 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit outdoor recreation.

Table 3.6.7 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Pronghorn Rocky Mountain Goat California Bighorn Sheep	Local abundance is reduced by disturbance or displacement from important seasonal habitat by recreational activities, infrastructure, or facility maintenance.	Coordinate with resource managers to identify important seasonal habitat and protect SGCN potentially vulnerable to disturbance caused by recreational activities during important periods (e.g., wintering, migration, lambing, denning, lekking, and nesting).
		Provide information and education informing recreationists about SGCN that are potentially vulnerable to recreational activities and the need for protective measures.
		Implement the *Idaho Bighorn Sheep Management Plan 2022–2027* (IDFG 2022a).

Table 3.6.7 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Rocky Mountain Bighorn Sheep Moose Greater Sage-Grouse Sharp-tailed Grouse		Implement the *Idaho Mountain Goat Management Plan 2019–2024* (IDFG 2019b).
		Implement the *Idaho Moose Management Plan 2020–2025* (IDFG 2020b).
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
		Implement the *Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho 2015–2025* (IDFG 2015b).
Pollinating insect SGCN including: Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee Monarch Butterfly Gillette's Checkerspot	Local abundance is reduced by habitat loss or degradation from recreational activities and vegetation management during facility maintenance.	Coordinate with resource managers as appropriate to protect pollinating insect SGCN potentially vulnerable to recreational activities, infrastructure, and facility maintenance.
		Implement the *Idaho Pollinator Protection Plan* (ISDA 2016).
		Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
		Provide information and education informing recreationists about plant and pollinating SGCN that are vulnerable to recreational activities and the need for protective measures.
Waterbird SGCN including: Western Grebe Clark's Grebe Caspian Tern Common Loon	Nest success decreases from recreational activities disturbing floating nests and shallow-water habitat.	Coordinate with resource managers as appropriate to protect SGCN potentially vulnerable to disturbance caused by recreational activities (e.g., access and boating management).
		Provide information and education informing recreationists and resource managers about plant and pollinating SGCN that are potentially vulnerable to recreational activities and the need for protective measures.

Table 3.6.7 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Grizzly Bear	Abundance is reduced by control actions needed in response to human–bear conflict.	Participate in Grizzly Bear conservation and management actions in coordination with the Interagency Grizzly Bear Committee (e.g., human–bear conflict and human-caused bear mortality reductions, providing secure habitat, information and education, and technical assistance).
		Provide human–bear conflict management staffing capacity and assign staff to strategic locations in the state to perform proactive and responsive conflict-bear management (e.g., access management and technical assistance).
		Coordinate with resource managers to avoid or minimize human–bear conflict associated with recreational activities.
		Provide information and education to outdoor recreation users about bear safety precautions and BMPs (e.g., Lackey et al. 2018; Can 2020).
Dune-related insect SGCN including: Idaho Dunes Tiger Beetle Columbia River Tiger Beetle Bruneau Dune Tiger Beetle	Local abundance is reduced by habitat loss or degradation from recreational activities, infrastructure, or facility maintenance (e.g., trampling, crushing, and soil erosion).	Coordinate with resource managers as appropriate to identify important dune habitat and protect dune-related insect SGCN populations potentially vulnerable to recreational activities, infrastructure, and facility maintenance.
		Manage recreational activities and maintain infrastructure and facilities to minimize negative effects on dune-related insect SGCN and maximize beneficial effects (e.g., BMPs, access management, targeted protective fencing or other barriers, and erosion prevention and control) (e.g., Miller et al. 2020).
		Provide information and education informing recreationists and resource managers about dune-related insect SGCN that are potentially vulnerable to recreational activities and the need for protective measures.
Plant SGCN including: Packard's Milk-vetch Slickspot Peppergrass Macfarlane's Four-o'clock	Local abundance is reduced by habitat loss or degradation from recreational activities, infrastructure, or facility maintenance (e.g., trampling, crushing, and soil erosion).	Coordinate with resource managers as appropriate to identify important plant SGCN populations potentially vulnerable to recreational activities, infrastructure, and facility maintenance.
		Promote and incentivize the protection of plant SGCN populations potentially vulnerable to recreational activities, infrastructure, and facility maintenance (e.g., BMPs, access management, targeted protective fencing or other barriers, and erosion prevention and control) (e.g., American Trails Staff 2018; Miller et al. 2020).

Table 3.6.7 Voluntary actions intended to benefit SGCN and sustainable outdoor recreation by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Christ's Paintbrush Ute Ladies-tresses Indian Valley Sedge		Provide information and education informing recreationists and resource managers about plant SGCN that are potentially vulnerable to recreational activities and the need for protective measures (e.g., species identification, infrastructure siting, conservation practices, facility maintenance, vegetation management, and proper mowing and herbicide application practices).

3.7 Natural System Modifications

Overview

Natural System Modifications consist of Fire & Fire Suppression and Dams & Water Management/Use (CMP 2016a). Idaho's lands and waters have been developed and managed to provide the products and services needed by society. Over the past approximately 175 years, Idaho's natural resources were increasingly developed and managed, which modified natural wildfire patterns and water flows (Fig. 3.7.1). Historically, wildland Fire & Fire Suppression (hereafter fire management) focused on protecting loss of products and services provided by forests and rangelands. Dams & Water Management/Use (hereafter water management) focused on developing infrastructure and processes to capture, store, allocate, and deliver water for beneficial uses, which include domestic, municipal, irrigation, stock watering, manufacturing, mining, hydropower, aquaculture, recreation, and fish and wildlife (IDWR 2022e). Modern fire management and water management are central to the resource-based industries that produce the products and services necessary for Idaho's economy and overall way of life.

Fire Management

Wildfire significantly affects Idaho's natural resources, economy, and communities (WGA 2021a). Wildland fire is also the most influential broad-scale stressor affecting forest and rangeland health. Depending on circumstances, fire can contribute either positively or negatively to forest and rangeland health (IRRC [no date]). To obtain the positive benefits of fire, fire management applies prescribed burning as an important tool among many for managing forests and rangelands.

Beginning in the early 1900s, wildfire suppression was a priority to protect communities, forest products, and rangeland forage. Prior to European settlement, natural wildfire and cultural burning practices by American Indians were important for maintaining the health and

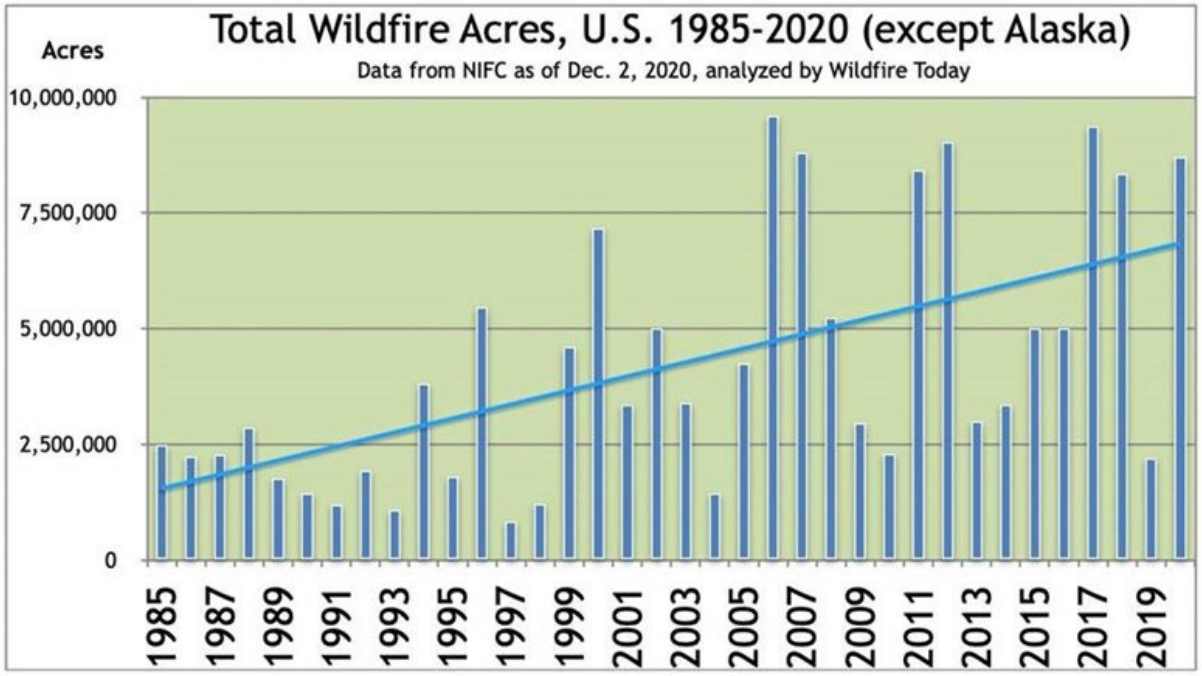


Fig. 3.7.1 Millions of acres burned annually by fire from 1985 to 2020 within the US (except Alaska) from: The National Interagency Fire Center (NIFC 2022).

productivity of many forests and rangelands (Hessburg and Agee 2003; Twidwell et al. 2021). For example, relatively frequent presettlement wildfires in some forests and rangelands removed fuel buildup and created a mixture of vegetation types and age classes. Prior to understanding the role of wildfire in maintaining forests and rangelands, broad-scale wildfire suppression allowed forests and rangelands to accumulate unnaturally large amounts of fuels (Fig. 3.7.2). The introduction and spread of invasive species, especially highly flammable annual grasses like Cheatgrass, further changed the natural fuel and wildfire patterns.

- Changes in fuel amounts and types, coupled with changing temperatures and precipitation, have resulted in a new pattern of unnaturally frequent, large, intense, and destructive wildfires:
- Since the 1970s, large wildfire frequency in Northwest forests has increased 1,000%, and the average number of acres burned has increased by 7 times (Westerling et al. 2006; Westerling 2016).
- Rangeland fires have increased in frequency, size, and severity (Balch et al. 2013).
- Average area burned has increased 2,966% during the past two decades (Westerling 2016).
- Economic cost of increased wildfire severity is between $71 billion and $348 billion annually in the US (Thomas et al. 2017).

Damaging wildfire is an annual risk to many Idaho communities (e.g., WUI), watersheds, forests, and rangelands. Consequently, wildfire suppression efforts continue in many important

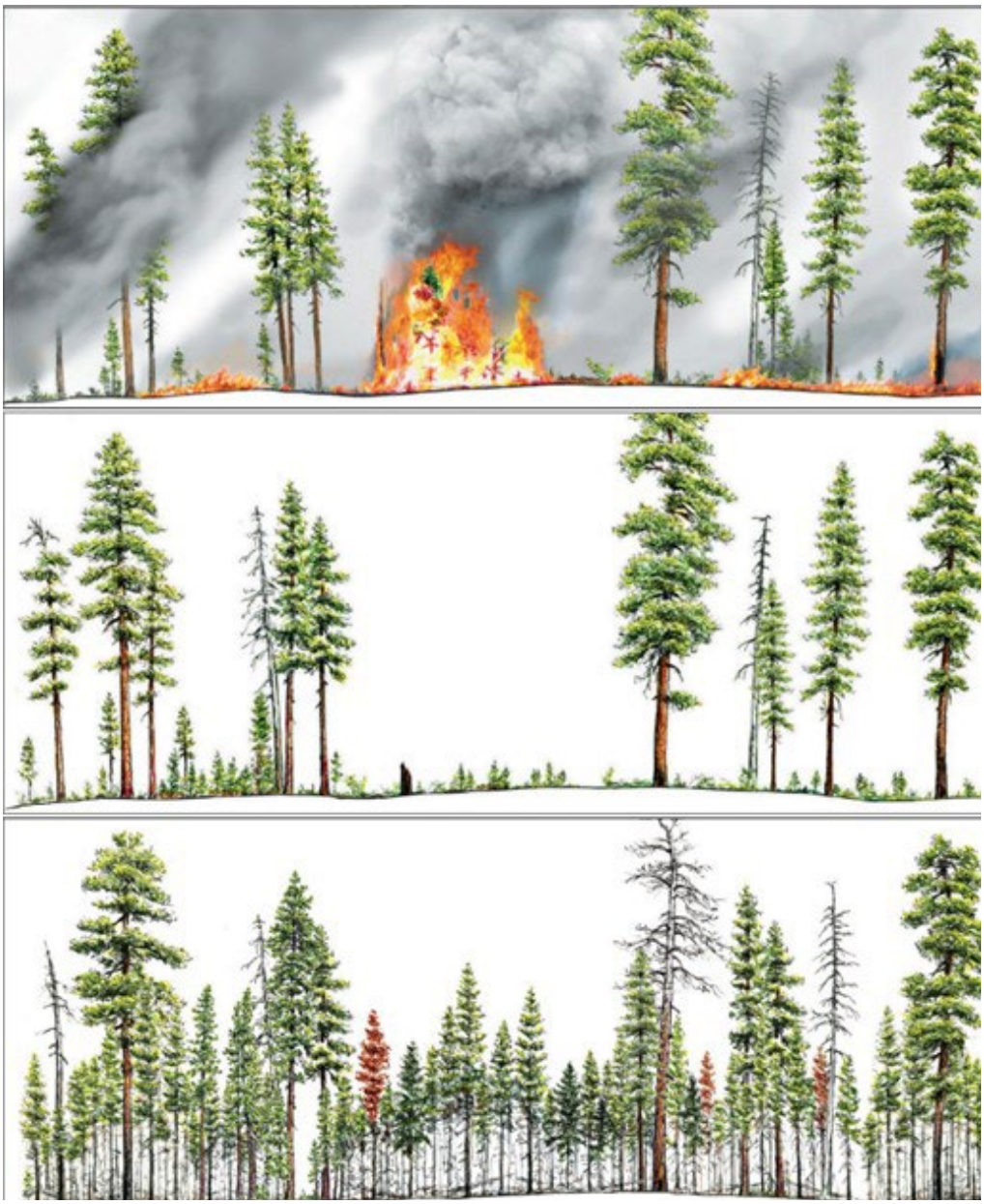


Fig. 3.7.2 Conceptual diagram of low and moderate severity fire effects on post-fire residual structure. Top: frequent fire reduces surface and ladder fuels. Middle: gradual accumulation of live and dead fuels between fires. Bottom: conditions after prolonged fire exclusion. Forest is denser and more layered, and high-severity fire is likely. Drawing credit: Robert Van Pelt.

circumstances, such as to protect property, infrastructure, commodities, and fish and wildlife habitat. When used appropriately, prescribed burning is a powerful tool that can reduce destructive wildfire risks and help restore forest and rangeland health by removing heavy fuel

accumulations over large areas. Therefore, prescribed burning is a key tool for collaborative forest and rangeland health initiatives.

The values and goals of wildland fire management are typically compatible with SGCN conservation, especially when stakeholders collaborate in community-minded solutions (Bothwell 2019). WGA Policy Resolution 2021-03, *National Forest and Rangeland Management* (WGA 2021a), emphasizes the importance of collaborative fire management planning and project implementation for healthy forests and rangelands across federal, state, and private ownerships. Many long-standing partners associated with fire management are already contributing in many ways to conserving the state's fish, wildlife, and plants. Established relationships between fire management partners and stakeholders can create opportunities to collaborate in proactive, voluntary, and community-based solutions to meet society's needs while conserving SGCN. Considering the increasing risks of destructive wildfire, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, natural resource-based economy, and communities.

Water Management

Water in the West is a precious and increasingly scarce resource due to many factors including human population growth, competing demands, warming climate, and aging infrastructure (WGA 2021a, 2021b). Water is also Idaho's most important natural resource and strength of the state's economy and way of life:

- Idaho has 880 mi^2 (2,279 km^2) of surface water, comprising more than 2,000 lakes and 93,000 mi (149,669 km) of streams and rivers.
- Reservoir and lake storage systems have a total capacity of over 12 million acre-ft (14.8 billion m^3) and support water supplies, flood management, hydropower generation, and outdoor recreation.
- Annual stream inflow into Idaho is about 37 million acre-ft (45.6 billion m^3), but annual outflow is about 75 million acre-ft (92.5 billion m^3) making Idaho a net exporter of water to the Columbia River system (IDWR 2022c).
- Surface water diversion, groundwater pumping, managed aquifer recharge, and reservoir storage compose the basis of Idaho's water delivery system.
- Surface water accounts for most of the water use.
- Groundwater composes about 22% of Idaho's total water use but provides nearly 92% of drinking water.
- Agriculture dominates water uses, accounting for more than 85% of the state's water diversions (Dieter et al. 2018).
- To support the extensive agricultural production in southern Idaho's dry climate (<10 in [25.4 cm] of precipitation per year), the 779-mi-long (1,254 km) Snake River and its tributaries supply water to 3 million acres (1.2 million ha) of irrigated farmlands.
- Hydropower is significant in Idaho, with over 140 existing hydroelectric plants having a combined generating capacity that provides about half of the state's electricity.

The importance of water to Idaho's communities is recognized in the state's constitution (ID CONST. art. XV, § 3), which provides for the appropriation and allocation of water from any natural stream for beneficial use. The Idaho Water Resource Board (IWRB) is the water management authority in Idaho. IWRB sets water policy through the *Idaho State Water Plan* (IWRB 2012), which specifies water management objectives for the use, development, and conservation of water across the state.

IDWR administers the *Idaho State Water Plan* and oversees the public water allocation and distribution process (i.e., water rights) (IDWR 2022e). DEQ ensures the Idaho's water quality standards are met (DEQ 2022d). Idaho allocates water and issues water rights using a "prior appropriation doctrine" based on the principle of "first in time, first in right." Although well regulated, water management can be difficult because the demand for water continues to increase due to Idaho's growing human population; but the supply of unappropriated water continues to decrease. In addition, many river basins are not providing dependable water supplies for existing appropriations (IWRB 2012). Prolonged drought, changing precipitation and snowpack trends, and shifting seasonal water runoff patterns are also likely to affect water availability and water management into the future.

Water management's goals and contributions to society can be compatible with SGCN conservation. The *Idaho State Water Plan* includes collaboration between IWRB and stakeholders to develop local and regional conservation strategies that include consideration of fish and wildlife (IWRB 2012). Many long-standing partners associated with water management are already contributing in many ways to conserving the state's fish and wildlife. Established relationships between water management partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-oriented solutions to meet society's water needs while conserving SGCN (WGA 2021a). Considering the increasing water needs, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, natural resource-based economy, and communities.

Overarching Effects & Actions—Fire Management

Unnatural destructive wildfire can harm lands and waters, both privately and publicly owned, that sustain Idaho's natural resource-based economy and communities. Similarly, unnatural wildfire can affect habitat for fish, wildlife, and plants, including SGCN. Fire management, including prescribed burning as a management tool, is needed for protecting, restoring, and enhancing forest and rangeland health, conserving Idaho's lands and waters to benefit SGCN, and protecting Idaho's natural resources.

The connection between natural resources benefited by fire management and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters important for Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with fire managers, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and fire management goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and fire management goals and objectives for managing stressors.
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and fire management-related planning.
    - Assess the status of stressors related to SGCN and fire management goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential fire management-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and fire management goals and objectives. The following are examples of voluntary actions:
    - Develop and implement wildfire mitigation and response plans.
    - Increase wildland and WUI firefighting capacity.
    - Acquire and strategically position firefighting resources.
    - Implement soil and water conservation projects and BMPs to improve forest and rangeland health and reduce risks of destructive wildfire (e.g., WFLC 2014; Barkley et al. 2015; IDL 2018).
    - Conduct wildland fuel and wildfire risk reduction treatments including in the WUI.
    - Apply mechanical treatments, prescribed burning, and prescribed wildfire as appropriate to reduce risks of destructive wildfires, restore forest health, and manage SGCN habitat (e.g., fuel treatments, invasive species control, and postwildfire habitat restoration on the Craig Mountain Wildlife Management Area to benefit Rocky Mountain Bighorn Sheep and other SGCN).
    - Prioritize protection of high-priority SGCN populations and habitats as appropriate during firefighting (e.g., Greater Sage-Grouse habitat, big game winter range, large-diameter [>21 in (>53 cm) dbh] Ponderosa Pine, elite/plus [blister rust resistant seed source] Whitebark Pine trees, and cottonwood stands).
    - Apply wildlife-friendly BMPs during postfire habitat restoration (e.g., USGS 2024).

    - Apply pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs during postfire habitat restoration (e.g., Yellow Bumble Bee, Western Bumble Bee, and Monarch Butterfly) (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
- Collaborate with fire managers, private landowners, and resource managers to use existing fire management programs and incentivize voluntary water, soil, and SGCN conservation projects, fire management projects, and BMPs (e.g., Rural Fire Capacity Grants, Rangeland Fire Protection Associations, Idaho Forest Stewardship Program, State Fire Assistance Program, Volunteer Fire Assistance Program, and Good Neighbor Authority).
- Collaborate with willing private landowners and resource managers in projects to benefit both SGCN and fire management goals and objectives across private, state, and federal landownerships.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform fire managers, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and fire management.
- Collaborate with fire managers, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to benefit both SGCN and fire management.
- Encourage and incentivize fire managers, industry, resource managers, and universities to develop collaborative fire management programs and BMPs that benefit SGCN and address forest and rangeland health, unnatural destructive wildfire risk reduction, prescribed burning, postwildfire restoration, adaptive management, and monitoring.
- Assist fire management project proponents, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and recommend measures to offset negative effects.
    - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.

- Incentivize participation in fire management programs, projects, and BMPs that also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, fire managers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, reduce risks of unnatural destructive wildfire, avoid human-caused wildfire ignitions, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into fire management.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of fire management and SGCN conservation needs.
- Participate in collaborative programs that involve stakeholders in resource stewardship and fire management in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Overarching Effects & Actions—Water Management

Crucial to sustaining Idaho's resource-based economy and communities, water management is well established, regulated, and administered. Water management includes planning and policy oversight by IWRB; administrating water allocation, beneficial use, and delivery processes by IDWR and district water masters; and monitoring and forecasting by IDWR and the NRCS. Water management relies on extensive infrastructure that captures and stores water (e.g., dams, reservoirs, managed aquifer recharge), delivers water to users, and monitors water availability and usage.

Considering the modified existing conditions of Idaho's land and water resources, water management processes, uses, and infrastructure have the potential either to benefit or negatively affect SGCN depending on specific circumstances. The connection between water management and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters important for Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with water managers, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and water management goals and objectives. The following are examples of voluntary actions:

  - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
  - Establish joint SGCN and water management goals and objectives for managing stressors.
  - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
  - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and water management-related planning.
  - Assess the status of stressors related to SGCN and water management goals and objectives.
  - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
  - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential water management-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and water management goals and objectives. The following are examples of voluntary actions:
  - Conserve water per the *Idaho State Water Plan* (IWRB 2012).
  - Implement soil and water conservation projects and BMPs to improve water supplies and water quality (e.g., USDA ARS 2021; NRCS 2023).
  - Provide fish passage and aquatic habitat connectivity (e.g., stream restoration of Panther Creek to improve habitat connectivity for steelhead, Chinook Salmon, Bull Trout, and other SGCN).
  - Implement sustainable agricultural BMPs to conserve water supplies and water quality including SGCN-friendly irrigation practices, conservation tillage, and erosion prevention and control (e.g., Rehman et al. 2022).
  - Restore and maintain aquatic, instream, wetland, and riparian habitat including floodplain connections (e.g., Blackfoot River watershed restoration to benefit Yellowstone Cutthroat Trout, Moose, Sharp-tailed Grouse, and other SGCN).
  - Manage wetlands and waters as appropriate to benefit migrating and nesting bird SGCN (e.g., moist-soil and shallow-water management).
  - Reduce water temperatures by improving and maintaining instream water flows, seasonal runoff patterns, and stream channel processes (e.g., Spring Valley Reservoir flow augmentation for the Potlatch River to reduce summer water temperatures for steelhead and other SGCN).
  - Install and maintain priority streamflow and water quality monitoring equipment to support water management and decision-making.
  - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
  - Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.

    - Conserve high-priority SGCN populations and habitats, and water supplies or water quality, with cooperative agreements (e.g., land exchanges, conservation easements, and water banking and trading).
- Collaborate with water managers, water users, private landowners, and resource managers to use existing water management programs and incentivize voluntary soil, water, and SGCN conservation projects, BMPs, technology upgrades, and water storage and delivery infrastructure upgrades (e.g., RCPP, Environmental Quality Incentives Program, Clean Lakes Program, and Nonpoint Source Management Program).
- Collaborate with willing private landowners and resource managers in projects to benefit both SGCN and water management goals and objectives across private, state, and federal landownerships.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform water managers, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and water management.
- Collaborate with water managers, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, BMPs to benefit both SGCN and water management.
- Encourage and incentivize water managers, industry, resource managers, and universities to develop collaborative water management programs and BMPs that benefit SGCN and support water conservation, adaptive management, and monitoring.
- Assist water management project proponents, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and recommend measures to offset negative effects.
    - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in water management programs, projects, and BMPs that will also benefit SGCN conservation.

- Establish collaborative working groups as appropriate including communities, water managers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, conserve water resources, improve water quality, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation in water management.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of water management and SGCN conservation needs.
- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Habitat-specific Effects & Actions—Fire Management

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with fire management. Ideally, SGCN conservation will be mutually beneficial for fire management.

Forest & Woodland

Forest management historically included wildfire suppression, which negatively affected the health of some Forest & Woodland habitats by allowing unnatural fuel buildup that changed wildfire frequencies and magnitudes (Hessburg et al. 2022). The legacy of past wildfire suppression can negatively affect SGCN and their habitat. Modern forest management is important for restoring and maintaining healthy forests, which generally improves Forest & Woodland habitats.

Additional stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, disease and insect outbreaks, and the introduction and spread of invasive species. These interacting stressors can further affect SGCN habitat, forest health, and important forest products provided to Idaho communities (Dale et al. 2001; Hessburg et al. 2022). For example, fire is an important stressor that can benefit some forests when carefully managed. However, stressors that elevate the risk of destructive wildfire can create severe consequences for forest health and communities, especially along expanding forested WUIs.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by fire management include Wolverine, Fisher, Rocky Mountain Goat, Moose, Great Gray Owl, Lewis's Woodpecker, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Western Bumble Bee, and Whitebark Pine. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and forest health, are listed in Table 3.7.1.

Table 3.7.1 Voluntary actions intended to benefit SGCN and sustainable fire management if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Dry Lower Montane–Foothill Forest Mesic Lower Montane Forest Subalpine–High Montane Forest Aspen Forest & Woodland Whitebark Pine Forest & Woodland Pinyon–Juniper Woodland	Forests and forest health are harmed by destructive wildfire. Forests are prone to unnatural wildfire by decreased health and unnatural fuel buildup from invasive species infestation and insect and disease outbreaks. Fuels have increased to unnatural levels from past wildfire suppression. Fire-resistant mature forest characteristics have been decreased by past forest management.	Implement the *Idaho Forest Action Plan* (IDL 2020).
		Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Reduce risks of destructive wildfire (e.g., fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Protect high-priority SGCN populations and habitat during firefighting unless beneficial effects are expected.
		Improve forest health to benefit SGCN and fire management (e.g., forest restoration, vegetation management, invasive species control, desirable vegetation planting and management, and erosion prevention and control).
		Manage forests as appropriate to benefit SGCN and fire management by keeping diverse fire-resistant and mature forest characteristics (e.g., diverse patch sizes and opening patterns, diverse tree types and densities, large-diameter ages, large snags, downed logs, and large woody debris).
		Restore forests negatively affected by destructive wildfire (e.g., desirable vegetation planting and management, erosion control, strategic salvage logging, and invasive species control).
Aspen Forest & Woodland	Quaking Aspen stands are decreasing from lack of burning to stimulate sprouting and remove competition from invading conifer trees.	Regenerate aspen stands with prescribed burning as appropriate to remove invading conifer trees and stimulate aspen sprouting.

Temperate & Boreal Grassland & Shrubland

Temperate & Boreal Grassland & Shrubland habitats have been significantly affected by invasive plants such as Cheatgrass, North Africa Grass, Yellow Star-thistle, Rush Skeletonweed, and Medusahead. These invasive plants reduce rangeland health and productivity by outcompeting desirable native plants. The unnatural fuel loads from these invasive plants are also increasing the frequency, size, and intensity of destructive wildfires. Conversely, wildfire suppression in some grasslands has contributed to invasions by conifer trees. Other stressors potentially affecting Temperate & Boreal Grassland & Shrubland habitats include prolonged drought, changing precipitation and snowpack trends, and shifting seasonal water runoff patterns. These interacting stressors can further affect SGCN habitat, rangeland health, and important goods and services that Temperate & Boreal Grassland & Shrubland habitats provide to Idaho communities.

Examples of SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by fire management include American Pika, Northern Idaho Ground Squirrel, Southern Idaho Ground Squirrel, Rocky Mountain Goat, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Grasshopper Sparrow, Yellow Bumble Bee, Western Bumble Bee, Monarch Butterfly, and Spalding's Catchfly. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and rangeland health, are listed in Table 3.7.2.

Table 3.7.2 Voluntary actions intended to benefit SGCN and sustainable fire management if stressors are affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Montane–Foothill Grassland & Shrubland Subalpine–High Montane Mesic Meadow Snowbrush Ceanothus Chaparral	Rangelands and rangeland health are harmed by destructive wildfire. Rangeland health is decreased by invasive species infestation and fuel buildup, which increases risks of unnatural destructive wildfire.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Reduce risks of destructive wildfire (e.g., fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Protect high-priority SGCN populations and habitats during firefighting unless beneficial effects are expected.
		Improve rangeland health to benefit SGCN and fire management (e.g., rangeland restoration, vegetation management, invasive species control, desirable vegetation planting and management, and erosion prevention and control).

Table 3.7.2 Voluntary actions intended to benefit SGCN and sustainable fire management if stressors are affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
	Fuels have increased to unnatural levels from invasive species infestation.	Restore rangelands negatively affected by destructive wildfire and invasive species infestation (e.g., desirable vegetation planting and management, erosion control, and invasive species control).
	Meadow and grassland health is harmed by invading conifer trees and other woody vegetation from lack of burning.	Manage meadows and grasslands to benefit SGCN (e.g., invasive species control, desirable vegetation planting and management, mechanical removal of conifer trees, and prescribed burning as appropriate).

Desert & Semidesert

Nonnative and invasive plant introductions since the 1800s have changed the composition of native grasses, forbs, and shrubs in some Desert & Semidesert habitats (Burkhardt 1996; [Wrangle] World Rangeland Learning Experience 2023), particularly lower elevation sagebrush-steppe shrubland (Chambers et al. 2014; Chambers et al. 2019). Fuels provided by these invasive annual grasses have changed natural fire patterns to be more frequent, intensive, and expansive. Invasive annual grasses and unnatural wildfire reduce the health and productivity of Desert & Semidesert habitats. Conversely, wildfire suppression in higher-elevation Desert & Semidesert habitats has contributed to the lengthening of natural wildfire frequencies and allowed junipers to expand downslope into sagebrush-steppe shrublands (Maestas et al. 2021). Additional stressors potentially affecting Desert & Semidesert habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and habitat conversion. These interacting stressors can impair rangeland health, which can negatively affect SGCN and benefits that Desert & Semidesert habitats provide to Idaho communities.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by fire management include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Pinyon Jay, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, Packard's Milk-vetch, and Slickspot Peppergrass. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and rangeland health, are listed in Table 3.7.3.

Table 3.7.3 Voluntary actions intended to benefit SGCN and sustainable fire management if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland	Shrublands and rangeland health are harmed by destructive wildfire. Rangeland health is decreased by invasive species infestation and fuel buildup, which increases risks of unnatural destructive wildfire. Fuels have increased to unnatural levels from invasive species.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022).
		Reduce risks of destructive wildfire (e.g., fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Improve rangeland health to benefit SGCN and fire management (e.g., rangeland restoration, vegetation management, desirable vegetation planting and management, and information and education).
		Restore Desert & Semidesert habitats (e.g., sagebrush-steppe) negatively affected by destructive wildfire (e.g., desirable vegetation planting and management, erosion control, and invasive species control).
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
	Rangeland health is harmed by invading juniper and pinyon from past wildfire suppression.	Conserve sagebrush-steppe SGCN and benefit fire management by controlling tree species invading shrublands (e.g., juniper removal in sagebrush-steppe).
		When removing pinyon trees to accomplish other management priorities, consider the importance of these interfaces for the conservation of Pinyon Jays. Consider separating the management of juniper and pinyon habitat to minimize unintended negative impacts to Pinyon Jays.
		Implement the *Idaho Forest Action Plan* (IDL 2020).

Habitat-specific Effects & Actions—Water Management

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitat and propose collaborative actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with water management. Ideally, SGCN conservation will be mutually beneficial for water management.

Forest & Woodland

Sustainable water supplies, streamflow, and water-level fluctuations are needed to regenerate and maintain riparian Forest & Woodland habitats, especially cottonwoods, on regulated streams and rivers. Therefore, water management can either benefit or negatively affect the health of many riparian forests. Additional stressors potentially affecting riparian Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and the introduction and spread of invasive species. These interacting stressors can affect riparian forest health, which can also negatively affect SGCN habitat and amenities that riparian forests provide to Idaho communities.

Examples of SGCN occurring in riparian Forest & Woodland habitats and potentially influenced by water management include Hoary Bat, Silver-haired Bat, Moose, Harlequin Duck, Yellow-billed Cuckoo, Lewis's Woodpecker, Wilson's Warbler, Western Bumble Bee, Water Howellia, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and riparian forest health, are listed in Table 3.7.4.

Table 3.7.4 Voluntary actions intended to benefit SGCN and sustainable water management if stressors are affecting the quantity, quality, and connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Riparian forests are reduced by surface water and groundwater diversions, levees, dams, and water management that reduce water supplies and streamflow.	Conserve SGCN and benefit water management by improving water conservation with design features and BMPs included in water management infrastructure (e.g., water conservation measures, improved stormwater management, upgraded water management infrastructure, and pollution prevention and control).
		Manage riparian forests to benefit SGCN and water management (e.g., water conservation, water supply and streamflow improvement, shoreline and streambank restoration, floodplain reconnection, erosion prevention and control, invasive species control, and desirable vegetation planting and management).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Shrub & Herb Wetland

Sustainable water supplies, streamflow, and water-level fluctuations are needed to maintain Shrub & Herb Wetland habitats on regulated water systems. Water management can therefore either benefit or negatively affect the health of wetlands and riparian zones. Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, pollutants decreasing water quality, and the introduction and spread of invasive species.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by water management include Northern Leopard Frog, Little Brown Myotis, Hoary Bat, Moose, Trumpeter Swan, Northern Pintail, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and wetland and riparian health, are listed in Table 3.7.5.

Table 3.7.5 Voluntary actions intended to benefit SGCN and sustainable water management if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland	Wetlands and riparian zones are reduced by surface water and groundwater diversions, levees, dams, and water management that reduce water supplies and streamflow.	Conserve SGCN and benefit water management by improving water conservation with design features and BMPs included in water management infrastructure (e.g., water conservation measures, improved stormwater management, upgraded water management infrastructure, and pollution prevention and control).
		Manage wetlands and riparian zones to benefit SGCN and water management (e.g., water conservation, water supply and streamflow improvement, shoreline and streambank restoration, erosion prevention and control, invasive species control, and desirable vegetation planting and management).
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Aquatic Vegetation & Freshwater Habitat

Sustainable water supplies, streamflow, and water-level fluctuations are needed to maintain Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat) on regulated streams, rivers, lakes, and reservoirs. Therefore, water management can either benefit or negatively affect the health of aquatic habitat. Additional stressors potentially affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, pollutants decreasing water quality, and the introduction and spread of invasive species.

Examples of SGCN occurring in aquatic habitat and potentially influenced by water management include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Harlequin Duck, Western Grebe, Ring-billed Gull, and White-faced Ibis. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and water supplies and water quality, are listed in Table 3.7.6.

Table 3.7.6 Voluntary actions intended to benefit SGCN and sustainable water management if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	**Effects if stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Aquatic habitat is reduced by water supplies affected by water management infrastructure or operations. Fish movements and survival are reduced by passage barriers from water management infrastructure or operations.	Incentivize water management projects and BMPs to benefit SGCN conservation and water users (e.g., increased storage, aquifer recharge, water supply banks, modernized water management infrastructure, expanded streamflow and water use monitoring, and streamflow gauging upgrades).
		Improve water supplies and water quality (e.g., soil and water conservation, raised water tables, stormwater management, erosion prevention and control, vegetated buffers, and pollution prevention and control).
		Include water conservation design features and BMPs in water management infrastructure (e.g., water conservation measures, stormwater management, and water management infrastructure).
		Manage aquatic habitat to benefit SGCN and water management (e.g., water supply conservation, erosion prevention and control, streamflow improvement, habitat restoration, and invasive species control).
		Facilitate fish SGCN passage and benefit water management (e.g., irrigation diversion upgrades, fish passage structures, fish diversion screening, supplemental streamflow, stream reconnections, and appropriate dissolved gas levels downstream of dams).

Table 3.7.6 Voluntary actions intended to benefit SGCN and sustainable water management if stressors are affecting the quantity, quality, or connectivity of aquatic habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.7.7 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit fire management and water management.

Table 3.7.7 Voluntary actions intended to benefit SGCN and sustainable fire management and water management by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Steelhead Sockeye Salmon	Distribution and abundance are reduced by water management practices, infrastructure, or operations hindering movements. Abundance is reduced by entrainment, impingement, turbine strikes, or other harm from water management practices, infrastructure, or operations.	Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Implement the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho* (IDFG 2007).
		Implement the *Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho* (IDFG 2022b).
		Implement the *Management Plan for the Conservation of Snake River White Sturgeon in Idaho* (IDFG 2008).
		Implement projects, programs, and BMPs to avoid, minimize, and mitigate for negative effects of water management infrastructure or operations (e.g., NRCS 2023).
		Install and maintain fish screening on water intake and diversion infrastructure per NOAA fisheries criteria as appropriate.
		Mitigate entrainment, impingement, and turbine fatalities at water management and hydroelectric facilities.
		Install, operate, and maintain fish passage structures or other measures as appropriate (e.g., trap and transport).

Table 3.7.7 Voluntary actions intended to benefit SGCN and sustainable fire management and water management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot		Release cold water from reservoirs as appropriate to support anadromous fish migration.
		Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.
		Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, in-water work windows, fish passage, flood-resilient infrastructure siting, buffers/setbacks, habitat restoration, mitigation, and invasive species).
Cassia Crossbill	Survival is reduced by pine seeds being unavailable for forage because cones open early from wildfire.	Suppress wildfires when and where appropriate to prevent pinecones from opening prematurely and reducing sustained seed availability.
		Protect mature Lodgepole Pine for seed production, particularly on north slopes where tree recruitment and cone production are likely greatest.
		To help ensure long-term foraging opportunities for Cassia Crossbill, work collaboratively with the FS on proper fuels management to reduce intensity of fires in the area and to manage for healthy, diverse Lodgepole Pine.
Pinyon Jay	Distribution and abundance are reduced by fuel management reducing forage and habitat suitability.	Consider Pinyon Jay habitat and forage requirements as appropriate when designing and implementing fuel reduction treatments and rangeland restoration projects (Somershoe et al. 2020).
Clark's Nutcracker Whitebark Pine	Distribution, abundance, and survival are reduced by postwildfire conditions not conducive to seed caching.	Manage wildfire and prescribed burning patterns to benefit seed caching by Clark's Nutcracker, protect mature Whitebark Pine trees, and subsequent Whitebark Pine regeneration and growth (Keane 2018; Keane and Cushman 2018).
		Manage Whitebark Pine forests as appropriate to benefit SGCN and fire management by keeping diverse fire-resistant and mature forest characteristics (e.g., diverse patch sizes and opening patterns, diverse tree types and densities, large-diameter ages, large snags, downed logs, and large woody debris).
		Protect elite/plus (blister rust resistant seed source) and reproductively mature Whitebark Pine trees to the extent possible.

Table 3.7.7 Voluntary actions intended to benefit SGCN and sustainable fire management and water management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Slickspot Peppergrass	Abundance and distribution are reduced by lost or degraded slickspots from wildfire converting sagebrush-steppe to annual grass and forb communities.	Reduce risks of destructive wildfire (e.g., fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Improve rangeland health to benefit Slickspot Peppergrass and fire management (e.g., rangeland restoration, vegetation management, desirable vegetation planting and management, and information and education).
		Restore Desert & Semidesert habitats (e.g., sagebrush-steppe) negatively affected by destructive wildfire (e.g., desirable vegetation planting and management, erosion control, and invasive species control).
Ute Ladies-tresses	Abundance and distribution are reduced by habitat loss or degradation from water management practices, infrastructure, or operations altering water supplies and seasonal runoff patterns.	Provide technical assistance during water-related regulatory processes (e.g., diversion rates, water levels and streamflow, aquifer recharge, habitat restoration, and invasive species).
		Manage wetlands and riparian zones to benefit Ute Ladies-tresses (e.g., water conservation, water supply and streamflow improvement, floodplain reconnection, livestock and riparian pasture management, invasive species control, and wetland and riparian restoration).

3.8 Invasive & Problematic Species, Pathogens & Genes

Overview

The category Invasive & Problematic Species, Pathogens & Genes includes the subcategories Invasive Nonnative/Alien Plants & Animals, Problematic Native Plants & Animals, Introduced Genetic Material, and Pathogens & Microbes (CMP 2016a). Section 3.8 collectively refers to these stressors as "invasive species," and addressing these stressors is termed "invasive species management." Invasive species are a significant factor influencing the lands and waters that sustain Idaho's SGCN, natural resource-based economy, communities, and way of life.

Invasive species cause substantial negative effects to ecosystems, economies, and communities across the West. The subject of invasive species is broad and becoming more prevalent and more harmful to the state's SGCN and natural resource-based economy

including farming, ranching, forest products, recreation, and energy production (WGA 2022b). Therefore, other Chapter 3 sections also address invasive species management.

Although difficult and costly, coordinated west-wide invasive species management is necessary to sustain healthy and productive natural resources needed by society and to conserve SGCN. To that end, WGA created the Western Invasive Species Council in 2019 to improve cross-boundary and cross-jurisdictional coordination and collaboration in invasive species management (WGA 2022b). In 2022, WGA Policy Resolution 2022-11, *Biosecurity and Invasive Species Management* (WGA 2022b), reaffirmed that reducing the harmful effects of invasive species requires ever greater collaboration, responsiveness, investment, and coordinated efforts.

In Idaho, many long-standing partners are associated with invasive species management, which contributes greatly to conserving the state's fish, wildlife, and plants. For example, the Idaho Invasive Species Council (IISC) (IISC 2023) was formed in 2005 and continued in 2017 by executive order as a multiagency organization chaired by ISDA and composed of key local, tribal, state, and federal governments, and nonprofit and for-profit private organizations (Office of the Governor 2017). The IISC's purpose is to foster coordinated approaches that support local initiatives for invasive species management. The IISC coordinates with ISDA and partners to develop plans (IISC 2007; IISC and ISDA 2007; IISC 2022) and produces technical resources to inform and guide invasive species management around the state (Johnson et al. 2003; IISC 2007; IISC and ISDA 2007).

In coordination with the IISC, ISDA leads invasive species management in Idaho with multiple prevention, education, early detection, and treatment programs (IISC 2023). These and other established relationships among invasive species management partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-oriented solutions. Considering increasing needs for invasive species management, collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, natural resource-based economy, and communities.

Overarching Effects & Actions

Invasive species have the potential to affect the lands, waters, crops, livestock, and aquaculture that sustain Idaho's natural resource-based economy and communities. Similarly, invasive species can affect fish, wildlife, and plants, including SGCN. Invasive species management is therefore necessary to protect, restore, and enhance Idaho's lands and waters; conserve SGCN populations and habitat; and protect Idaho's natural resources.

The connection between natural resources potentially affected by invasive species and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Because invasive species-related stressors are common to many SGCN challenges, similar actions also appear in other sections of Chapter 3. Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing stressors that have the

potential to negatively affect the health and productivity of lands and waters important for Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with industry, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and invasive species management goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and invasive species management goals and objectives for managing stressors.
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and invasive species management-related planning.
    - Assess the status of stressors related to SGCN and invasive species management goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential invasive species-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and invasive species management goals and objectives (Fig. 3.8.1). The following are examples of potential voluntary actions:
    - Support Cooperative Weed Management Areas.
    - Perform surveillance monitoring to detect the prevalence, spread, and establishment of existing and newly introduced invasive species.
    - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
    - Eradicate new invasive species infestations with rapid response if feasible and control established infestations to manage spread and prevalence.
    - Assess the effectiveness of existing invasive species detection and control methods and develop new methods as appropriate for changing needs and conditions (e.g., climate).
    - Implement biosecurity protocols to prevent the introduction or movement of invasive species, diseases, or genes into wild fish, wildlife, or plant populations.
    - Address risks of diseases shared between domestic or captive animals and wildlife populations.
    - Assess and monitor the impact of established diseases on SGCN.
    - Assess and monitor risk and effects of common diseases and emerging diseases on SGCN.

- Coordinate wildlife disease surveillance and diagnosis with diagnostic laboratories and public health officials as applicable.
- Coordinate with the National Wildlife Health Center to diagnose SGCN mortality events and contribute to the Wildlife Health Information Sharing Partnership.
- Improve sampling and sample transport procedures and standardize and prioritize diagnostic testing and results reporting.
- Manage diverse and healthy habitat to promote resistance and resiliency to invasive species and benefit SGCN.
- Consider the genetic health of SGCN to prevent genetic pollution (e.g., restrict the introduction of undesirable genes to SGCN).
- Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.



Fig. 3.8.1 The Cheatgrass Challenge project, a proactive strategy for halting conversion of sagebrush rangelands to annual grasslands (NRCS 2019).

Voluntary Actions Related to Information and Knowledge Gaps

- Inform industry, private landowners, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration with IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and invasive species management.

- Collaborate with industry, private landowners, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to benefit both SGCN and invasive species management.
- Encourage and incentivize industry, private landowners, resource managers, and universities to develop collaborative invasive species management programs and BMPs that benefit SGCN and support sustainable agriculture, aquaculture, and forestry; adaptive management; and monitoring (e.g., invasive species identification, surveillance, ecology, transmission/dispersal pathways, and eradication/management treatments).
- Participate in coordinated surveillance efforts among stakeholders, agencies, and adjacent states to track the emergence and range expansion of invasive species.
- Support research to evaluate risks to SGCN from emerging fish and wildlife diseases, including disease transmission, spillover events from domestic or captive populations, and spread within or among SGCN.
- Assist industry, private landowners, resource managers, and other stakeholders with planning and implementing overarching approaches to achieve both SGCN and invasive species management goals and objectives.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in invasive species management programs, projects, and BMPs that also benefit SGCN conservation: Clean Drain Dry, Know What You Grow, and Buy It Where You Burn It (e.g., IISC 2023).
- Establish collaborative working groups as appropriate including communities, industry, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, manage invasive species, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation in invasive species management.
- Encourage public and stakeholder participation in invasive species management planning processes to raise awareness and ensure consideration is given to the needs of SGCN conservation.
- Participate in collaborative programs that involve stakeholders in invasive species management in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.
- Support public health programs that increase awareness of risks and personal protective methods to prevent the transmission of diseases between animals and humans.

Habitat-specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from stressors associated with invasive species. Ideally, SGCN conservation will be mutually beneficial for invasive species management.

Forest & Woodland

Invasive species that harm Forest & Woodland habitats include undesirable plants (e.g., Scot's Broom and knapweeds), damaging insects, and diseases. When within normal levels, native insects and diseases can be important for maintaining forest health by thinning small groups of trees weakened by drought or injury. Normal levels of weakened and dead trees can also provide SGCN food and cover (e.g., insects, snags, or downed woody debris). Severe outbreaks of forest insects and disease can stress forests, reduce tree growth, increase trees dying, and increase fuel loads. Excessive fuel buildup can harm forest health and lead to unnatural destructive wildfires that also harm SGCN. Additional stressors potentially affecting Forest & Woodland habitats include prolonged drought, changing precipitation and snowpack trends, and shifting seasonal water runoff patterns. These interacting stressors can further affect SGCN habitat, forest health, and important forestry products and services provided to Idaho communities.

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by invasive species include Wolverine, Fisher, Rocky Mountain Goat, Moose, Yellow-billed Cuckoo, Great Gray Owl, Lewis's Woodpecker, White-headed Woodpecker, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Western Bumble Bee, Whitebark Pine, and Elusive Polemonium. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and riparian forest health, are listed in Table 3.8.1.

Table 3.8.1 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane–Foothill Forest	Forests and forest health are harmed by insect and disease outbreaks.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022) to benefit SGCN and forest health by controlling infestations and spread of invasive plants, damaging insects, and forest diseases (e.g., early detection surveillance, rapid response, prescribed burning, mechanical treatments, stand thinning,

Table 3.8.1 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Mesic Lower Montane Forest Subalpine–High Montane Forest Aspen Forest & Woodland Whitebark Pine Forest & Woodland	Invasive plants decrease vegetation diversity and productivity and limit the potential to restore forest health.	decontamination BMPs, forest restoration, and information and education).
		Implement the *Idaho Forest Action Plan* (IDL 2020).
		Develop and propagate disease-resistant trees for restoration (e.g., Whitebark Pine resistant to White Pine Blister Rust).
		Restore forests negatively affected by invasive species, damaging insects, and forest diseases.

Temperate & Boreal Grassland & Shrubland

Undesirable invasive plants (e.g., Cheatgrass, North Africa Grass, Yellow Star-thistle, Rush Skeletonweed, and Medusahead) harm the health of Temperate & Boreal Grassland & Shrubland habitats. These invasive plants reduce rangeland health and productivity by outcompeting desirable native plants. The unnatural fuel loads from invasive plants are also increasing the frequency, size, and intensity of wildfires. These invasive plants also negatively affect SGCN habitat. Additional stressors potentially affecting Temperate & Boreal Grassland & Shrubland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and unnatural wildfire frequency, extent, and severity. These interacting stressors can further affect SGCN habitat, rangeland health, and important products and services that Temperate & Boreal Grassland & Shrubland habitats provide to Idaho communities.

Examples of SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by invasive species include American Pika, Northern Idaho Ground Squirrel, Rocky Mountain Goat, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Western Bumble Bee, Monarch Butterfly, and Spalding's Catchfly. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and rangeland health, are listed in Table 3.8.2.

Table 3.8.2 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Montane–Foothill Grassland & Shrubland	Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore rangeland health.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022) to benefit SGCN and rangeland health by controlling infestations and spread of invasive plants (e.g., early detection surveillance, rapid response, mechanical treatments, decontamination BMPs, rangeland restoration, and information and education).
		Restore rangelands negatively affected by Invasive Species (e.g., desirable vegetation planting and management, invasive species control, and erosion control).

Shrub & Herb Wetland

Undesirable invasive plants (e.g., Purple Loosestrife and Common Reed) harm the health of Shrub & Herb Wetland habitats. Invasive plants can reduce wetland and riparian health and productivity by outcompeting desirable native plants, reducing the diversity of plant species, forming exceptionally dense stands, and interrupting water flow patterns. In addition, invasive nonnative wildlife can outcompete or prey upon native species. For example, competition and predation by the American Bullfrog can also compound negative effects of an invasive fungal disease (i.e., *Batrachochytrium dendrobatidis* [*Bd*]) on native amphibians. Consequently, invasive species can impair the health of wetland and riparian habitats. Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and pollutants decreasing water quality. These interacting stressors can further affect SGCN habitat and important amenities provided to Idaho communities.

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by invasive species include Northern Leopard Frog, Little Brown Myotis, Hoary Bat, Silver-haired Bat, Moose, Trumpeter Swan, Northern Pintail, Sandhill Crane, White-faced Ibis, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Ladies-tresses. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and wetland and riparian health, are listed in Table 3.8.3.

Table 3.8.3 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Alkali–Saline Marsh, Playa & Shrubland	Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore healthy wetlands or riparian zones. SGCN survival decreases from predation by invasive aquatic animals. SGCN are displaced or otherwise harmed by invasive aquatic animals.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022) to benefit SGCN and wetland and riparian health by controlling infestations and spread of invasive plants (e.g., early detection surveillance, rapid response, mechanical treatments, decontamination BMPs, habitat restoration, and information and education).
		Manage effects of invasive species on unique habitats and related SGCN (e.g., Bog & Fen and Northern Bog Lemming).
		Restore wetlands and riparian zones negatively affected by invasive species (e.g., desirable vegetation planting and management, invasive species control, and erosion control).
		Control invasive aquatic animals preying upon native SGCN as appropriate and feasible.

Desert & Semidesert

Undesirable invasive plants, particularly invasive annual grasses (e.g., Cheatgrass, Medusahead), harm the health of Desert & Semidesert habitats. Invasive annual grasses change the composition and structure of native grasses, forbs, and shrubs in some Desert & Semidesert habitats (Burkhardt 1996; [Wrangle] World Rangeland Learning Experience 2023), particularly lower elevation sagebrush-steppe shrubland (Chambers et al. 2014; Chambers et al. 2019). Fuels provided by these invasive annual grasses have also changed natural wildfire patterns to be more frequent, intensive, and expansive.

Invasive plants and unnatural wildfire reduce the productivity of Desert & Semidesert habitats. In contrast, wildfire suppression in higher-elevation Desert & Semidesert habitats has lengthened natural wildfire frequencies and allowed junipers to expand unnaturally downslope into sagebrush-steppe shrublands. In addition to invasive plants and changing wildfire

patterns, other stressors potentially affecting Desert & Semidesert habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and habitat conversion (Pyke et al. 2015; [Wrangle] World Rangeland Learning Experience 2023). These interacting stressors can impair rangeland health, which can also negatively affect SGCN and amenities provided to Idaho communities.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by invasive species include Woodhouse's Toad, Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Long-billed Curlew, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Yellow Bumble Bee, Morrison Bumble Bee, Slickspot Peppergrass, and Macfarlane's Four-o'clock. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and rangeland health, are listed in Table 3.8.4.

Table 3.8.4 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

<table>
<tr><th>Habitat</th><th>Effects <u>if</u> stressors occur</th><th>Voluntary actions, programs, projects, and BMPs</th></tr>
<tr><td rowspan="2">Dry Shrubland & Grassland

Sparsely Vegetated Dune Scrub & Grassland

Dwarf Sagebrush Steppe & Shrubland

Tall Sagebrush Steppe & Shrubland

Saltbush Scrub

Cliff, Scree & Badland Sparse Vegetation</td><td rowspan="2">Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore rangeland health.

Invasive plants increase the frequency and intensity of wildfires and decrease shrubland restoration potential.</td><td>Implement The Idaho Invasive Species Strategic Plan 2022–2026 (IISC 2022) to benefit SGCN and rangeland health by controlling infestations and spread of invasive plants (e.g., early detection surveillance, rapid response, mechanical treatments, decontamination BMPs, rangeland restoration, and information and education).</td></tr>
<tr><td>Restore rangelands negatively affected by invasive species (e.g., desirable vegetation planting and management, invasive species control, and erosion control).</td></tr>
</table>

Aquatic Vegetation & Freshwater Habitat

Invasive species, both plant and animal, can harm the health of Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat) for SGCN and damage water management and recreation infrastructure. Aquatic invasive plants (e.g., Eurasian Water-milfoil, Curled Pondweed), can outcompete desirable native plants, reduce native plant diversity, and form exceptionally dense vegetation beds. Invasive wildlife species can outcompete or prey upon native species. Additional stressors potentially affecting aquatic habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, and pollutants decreasing water quality. These interacting stressors can further affect SGCN habitat and important amenities provided by aquatic habitat to Idaho communities.

Examples of SGCN occurring in aquatic habitat and potentially influenced by invasive species include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Mountain Whitefish, Bull Trout, Moose, Harlequin Duck, Western Grebe, Ring-billed Gull, and White-faced Ibis. Proposed voluntary actions intended to address the negative effects of stressors if occurring, and thus benefit SGCN conservation and water supplies and water quality, are listed in Table 3.8.5.

Table 3.8.5 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd	Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore healthy aquatic habitat. SGCN survival decreases from predation by invasive aquatic animals. SGCN are displaced or otherwise harmed by invasive aquatic animals.	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022) to benefit SGCN rangeland health by controlling infestations and spread of invasive plants and animals (e.g., early detection surveillance, rapid response, decontamination BMPs, and information and education).
		Restore aquatic habitat negatively affected by invasive species (e.g., invasive species control).
		Implement measures to prevent the release or spread of aquatic invasive species, diseases, and undesirable aquaculture products from aquaculture facilities (e.g., surveillance monitoring, response and control procedures, and containment measures) (Meyer 1991; Kennedy et al. 2016) (Fig. 3.8.2).

Table 3.8.5 Voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of aquatic habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
order) – Perennial Lakes, Ponds & Reservoirs Springs	Aquaculture release of aquatic invasive species, diseases, or undesirable aquaculture products.	



Fig. 3.8.2 Idaho watercraft inspection station checking for invasive Zebra and Quagga mussels (Invasive Species 2022).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.8.6 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit invasive species management.

Table 3.8.6 Voluntary actions intended to benefit SGCN and invasive species management by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Steelhead Sockeye Salmon Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot	Survival decreases from whirling disease, infectious hematopoietic necrosis virus, bacterial kidney disease, proliferative kidney disease, or other diseases. Abundance and distribution decrease from harmful competition or interbreeding with nonnative fish.	Develop and implement strategies to control effects of fish diseases.
		Monitor for mortality events or population declines that might indicate a disease outbreak
		Provide information and education to the public about the effects and spread of fish diseases.
		Encourage anglers, boaters, and other water users to reduce disease transmission by cleaning and drying boats and gear when moving between waterbodies.
		Develop and implement strategies to control distribution, abundance, and genetic pollution of undesirable fish species (e.g., nonnative Rainbow Trout and Brook Trout).
		Enforce regulations against unauthorized fish stocking.
		Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Implement the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho* (IDFG 2007).
		Implement the *Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho* (IDFG 2022b).
		Implement the *Management Plan for the Conservation of Snake River White Sturgeon in Idaho* (IDFG 2008).
Bird SGCN	Survival decreases from avian influenza, avian cholera, botulism, West Nile virus, salmonellosis, aspergillosis paramyxovirus, or other diseases.	Develop and implement strategies to control effects of bird diseases.
		Monitor for mortality events or population declines that might indicate a disease outbreak (e.g., Sharp-tailed Grouse; IDFG 2015b).
		Advise the public and researchers handling birds on proper personal protective equipment, decontamination, carcass disposal, and BMPs to prevent disease spread (e.g., Friend and Franson 1999).

Table 3.8.6 Voluntary actions intended to benefit SGCN and invasive species management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Implement carcass collection efforts as appropriate to minimize disease spread and provide samples for laboratory analysis (e.g., IDFG Wildlife Health Forensic Laboratory).
		Coordinate with wildlife rehabilitators and game bird captive-rearing operators to implement biosecurity protocols.
		Implement the *2021 Idaho Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles* (State of Idaho 2022).
		Assist BLM with the implementation of the 2015 *Idaho and Southwestern Montana Greater Sage-Grouse Approved Resource Management Plan Amendment* on BLM lands (BLM 2015).
Rocky Mountain Goat California Bighorn Sheep Rocky Mountain Bighorn Sheep	Survival decreases from respiratory or other diseases.	Develop and implement strategies to reduce effects of respiratory (e.g., bacterial pneumonia from *Pasteurella* spp. and *Mycoplasma ovipneumoniae*) or other diseases (IDFG 2019b, 2022a).
		Implement the *Idaho Mountain Goat Management Plan 2019–2024* (IDFG 2019b).
		Implement the *Idaho Bighorn Sheep Management Plan 2022–2027* (IDFG 2022a).
		Reduce risk of disease transmission by implementing BMPs and maintaining spatial or temporal separation with livestock (e.g., IDFG and ISDA 2008; WAFWA 2012).
Moose	Survival decreases from chronic wasting disease or parasite infestations from carotid artery worm, winter ticks, or other diseases.	Develop and implement strategies to manage populations that are negatively affected by chronic wasting disease, parasite infestations, or other diseases (IDFG 2020b).
		Monitor and document mortality events or population declines that might indicate a disease outbreak.
		Implement actions in the *2021 Strategy for Chronic Wasting Disease Prevention, Detection, and Management for Idaho's Wild Cervids (Deer, Elk, and Moose)* (IDFG 2021).
		Implement the *Idaho Moose Management Plan 2020–2025* (IDFG 2020b).
Wolverine Fisher	Survival decreases from SARS-CoV2 or other diseases.	Develop and implement strategies to reduce effects of SARS-CoV2 or other diseases.
		Monitor for mortality events and population declines that might indicate a disease outbreak.
		Conduct opportunistic sampling for SARS-CoV2.
		Implementing biosafety protocols as appropriate to prevent transmission when handling animals.

Table 3.8.6 Voluntary actions intended to benefit SGCN and invasive species management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bat SGCN	Survival or reproduction rates decrease from WNS or other diseases.	Develop and implement strategies to control effects of WNS or other diseases.
		Participate in the National Strategic *Pd* Surveillance Project to identify distribution of *Pd* and bats affected by WNS.
		Monitor for mortality events or unidentified population declines that might indicate a disease outbreak.
		Manage caves and mines and implement BMPs to minimize risks of spreading *Pd* and WNS (e.g., access management, work permissions, decontamination BMPs, bat-compatible gates at abandoned mines, internal cave climate considerations, and subterranean temperature/humidity monitoring) (e.g., White-nose Syndrome Disease Management Working Group 2019, 2020).
		Manage other mortality sources that further affect populations affected by WNS as appropriate.
		Implement the *National White-Nose Syndrome Decontamination Protocol* (White-nose Syndrome Disease Management Working Group 2020).
		Implement as appropriate the *Idaho White-Nose Syndrome Response Planning: Minnetonka Cave Management: A Case Study from the Structured Decision Making Workshop* (Dixon et al. 2020).
Pygmy Rabbit American Pika	Survival decreases from rabbit hemorrhagic disease virus 2 (RHDV2) or other diseases.	Develop and implement strategies to control effects of rabbit hemorrhagic disease virus 2 (RHDV2) or other diseases.
		Monitor for mortality events or population declines that might indicate a disease outbreak.
		Vaccinate at-risk populations as appropriate.
Pygmy Rabbit American Pika Northern Idaho Ground Squirrel Southern Idaho Ground Squirrel	Survival decreases from sylvatic plague or other diseases.	Develop and implement strategies to control effects of sylvatic plague or other diseases.
		Monitor for mortality events or unidentified population declines that might indicate a disease outbreak.
		Implement actions in the *Recovery Plan for the Northern Idaho Ground Squirrel* (FWS 2003).
		Implement disease management strategies as appropriate (e.g., vector control with insecticides or vaccines).

Table 3.8.6 Voluntary actions intended to benefit SGCN and invasive species management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Amphibian SGCN	Survival decreases from *Bd*, other diseases, or invasive species.	Develop and implement strategies to control effects of *Bd* (amphibian chytridiomycosis), other diseases, or invasive species.
		Monitor for mortality events or population declines that might indicate a disease outbreak.
		Investigate *Bd* disease prevalence in existing populations and in areas where no longer occurring (e.g., Northern Leopard Frog).
		Advise the public and researchers working with amphibians about cleaning and sanitizing equipment and clothing between waterbodies to minimize transfer of *Bd* to new areas.
		Control invasive species to benefit distribution and abundance of amphibian SGCN (e.g., American Bullfrog control and monitoring).
Bumble bee SGCN	Pathogen spillover from managed bee colonies (both commercially used bumble bees, as well as honey bees) when wild bumble bees come into contact with managed bees at foraging sites. Competition with honey bees reduces bumble bee foraging efficiency, worker size, and reproductive success (Thomson 2004; Goulson and Sparrow 2009).	Any use of commercially reared bumble bees for crop pollination should focus on minimizing the exposure of wild native species to managed species (Hatfield et al. 2012): • Do not purchase commercial bumble bees for use outside of the native range of the species. If you live in western North America, do not purchase commercial bumble bees until native, disease-free colonies become available. • Only use commercial bumble bees in greenhouses; do not use them for open-field crops. • Place screens over windows, vents, and other openings in greenhouses to prevent commercial bees from escaping and interacting with wild bumble bees. • Commercially acquired colonies should be killed (e.g., by being placed in a freezer overnight) after their period of use and NOT released into the wild.
		Honey bees (Hatfield et al. 2012): • We recommend that land managers discourage the placement of honey bee hives in natural areas, especially those with rare or unique habitats. • If this is not possible, we recommend that honey bee hives be placed as far as practicable from areas receiving special management treatment for bumble bees. • It is particularly important to distance honey bee hives from potential bumble bee nesting sites,

Table 3.8.6 Voluntary actions intended to benefit SGCN and invasive species management by addressing effects of stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		such as unmoved and untilled areas, old rock walls, fencerows or hedgerows, treed field margins, and hollow trees. Placing hives more that 0.6 mi (1 km) from such areas will substantially reduce the competitive effects of managed hives on bumble bees.
Plant SGCN including: Piper's Milk-vetch Slickspot Peppergrass Spalding's Catchfly Macfarlane's Four-o'clock Elusive Polemonium Christ's Paintbrush	Abundance and distribution are reduced by loss or degradation of habitat from invasive species infestations (e.g., nonnative and invasive plants).	Implement *The Idaho Invasive Species Strategic Plan 2022–2026* (IISC 2022) to benefit plant SGCN and rangeland health by controlling infestations and spread of invasive plants (e.g., early detection surveillance, rapid response, mechanical treatments, decontamination BMPs, rangeland restoration, and information and education).
		Restore rangelands negatively affected by invasive species (e.g., desirable vegetation planting and management, invasive species control, and erosion control).
Whitebark Pine	Abundance and distribution are reduced from Mountain Pine Beetle and White Pine Blister Rust decreasing survival.	Develop and propagate disease-resistant Whitebark Pine trees for restoration.
		Restore Whitebark Pine stands by planting seedlings resistant to White Pine Blister Rust, using prescribed burning and mechanical thinning (e.g., to remove Subalpine Fir), and focusing restoration in colder portions of Whitebark Pine's range (Keane 2018).
		Treat Whitebark Pine stands infested with Mountain Pine Beetle as appropriate with chemical (e.g., verbenone repellent) and mechanical measures (e.g., pruning and understory host removal).

3.9 Pollution

Overview

Pollution consists of Household Sewage & Urban Wastewater, Industrial & Military Effluents, Agricultural & Forestry Effluents, Garbage & Solid Waste, Airborne Pollutants, and Excess

Energy (hereafter, collectively called pollution management) (CMP 2016a). Clean water and healthy soils form the foundation of public health and welfare, community sustainability, and the state's natural resource-based economy (WGA 2021b). Most Chapter 3 sections also address pollution. Accordingly, no habitat-specific actions are presented.

Unmanaged pollutants have the potential to impair water quality and soil health, which ultimately harms public health and welfare, natural resources, economies, and communities (Fig. 3.9.1). Pollutant sources and quantities will likely increase as Idaho's human population continues to grow and industries expand. Although difficult and costly, managing pollution is necessary and increasingly important to sustain healthy and productive natural resources needed by society and to conserve SGCN. Therefore, reducing negative effects of pollution require ever greater attention, collaboration, investment, and community-driven solutions.



Fig. 3.9.1 Toxic blue-green algae bloom, Fernan Lake, Idaho (Emerson 2019).

Many long-standing partners are associated with pollution management in Idaho, which contributes greatly to conserving the state's fish, wildlife, and plants. Established relationships among pollution management partners and stakeholders create opportunities to collaborate in proactive, voluntary, and community-oriented solutions. Collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, natural resource-based economy, and communities.

Overarching Effects & Actions

Pollution management is necessary to sustain Idaho's resource-based economy and communities. State and federal laws, rules, and policies regulate the generation and management of pollution (DEQ 2022c; EPA 2022d). In coordination with communities, industries, health districts, and citizens, DEQ is responsible for ensuring Idaho's surface, ground, and drinking water meet state standards (DEQ 2022d). For example, pollutant discharges to public waters from stormwater, commercial/industrial facilities, and wastewater treatment facilities are regulated through state and federal permitting requirements including the IPDES administered by DEQ (DEQ 2022b) and NPDES administered by EPA (EPA 2022b) under the CWA (EPA 2022a). IDPES and NPDES permits include measures to meet water quality standards. DEQ is also responsible for coordinating closely with local governments, businesses, industries, and property owners to monitor and control waste generation, treatment, storage, and disposal (DEQ 2021).

The connection between pollution management keeping Idaho's lands and waters clean, healthy, and productive and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial conservation efforts, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following overarching actions are broadly applicable for addressing stressors that have the potential to negatively affect the health and productivity of lands and waters important for Idaho's resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with industries, resource managers, and other stakeholders to plan and implement approaches to achieve joint SGCN and pollution management goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish joint SGCN and pollution management goals and objectives for managing stressors.
    - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
    - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and pollution management-related planning.
    - Assess the status of stressors related to SGCN and pollution management goals and objectives.
    - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.

    - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential pollution-related stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and pollution management goals and objectives (Fig. 3.9.2). The following are examples of voluntary actions:
    - Protect sensitive or vulnerable animal and plant SGCN populations and their habitats.
    - Manage pollution per *Idaho Agricultural Pollution Abatement Plan* (Resource Planning Unlimited 2003).
    - Implement as appropriate stormwater pollution and prevention plans, erosion control plans, spill prevention, control, and countermeasure plans, and water use plans.
    - Participate in collaborative stakeholder groups and water quality improvement programs (e.g., basin advisory groups and watershed advisory groups).
    - Implement soil and water conservation projects and BMPs (e.g., NRCS 2022, 2023) to benefit water supplies, water quality, and soil health.
    - Implement sustainable agricultural BMPs to conserve water supplies and water quality and improve soil health including SGCN-friendly irrigation practices, crop rotation, and conservation tillage (e.g., Rehman et al. 2022).
    - Improve water quality by restoring aquatic, instream, wetland, and riparian habitat, including floodplain connections.
    - Reduce water temperatures by improving and maintaining instream water flows, seasonal runoff patterns, and stream channel processes.
    - Release cold water from reservoirs as appropriate to support anadromous fish migration.
    - Investigate, develop, and implement strategies as appropriate to reduce nontarget pesticide poisoning of SGCN (e.g., amphibian SGCN and Fisher).
    - Conserve high-priority SGCN populations and habitat, and water supplies and water quality, with cooperative agreements (e.g., land exchanges and conservation easements).
- Incentivize partnerships with water users and private landowners to implement soil and water conservation projects and BMPs (e.g., NRCS 2023) to benefit pollution management and SGCN conservation goals and objectives.
- Collaborate with pollution managers, water users, industries, private landowners, and resource managers to use existing pollution management programs and incentivize voluntary water, soil, and SGCN conservation projects, BMPs, waste management, water treatment improvements, and pollutant remediation and cleanup (e.g., EPA 2009; DEQ 2020; EPA 2023b; NRCS 2023).
- Partner with willing private landowners and resource managers in conservation projects to benefit both SGCN and pollution management goals and objectives across private, state, and federal landownerships.



Fig. 3.9.2 Monofilament fishing line recycling bin streamside in Idaho (cc) BY **IDFG.**

Voluntary Actions Related to Information and Knowledge Gaps

- Inform pollution managers, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and pollution management.
- Collaborate with pollution managers, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs to benefit both SGCN and pollution management.

- Encourage and incentivize pollution managers, industry, resource managers, and universities to develop collaborative pollution management programs and BMPs that benefit SGCN and support soil and water conservation, adaptive management, and monitoring.
- Assist pollution management project proponents, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support preproject SGCN surveys and inventories to aid project planning and analysis of potential project effects.
    - Analyze potential project-specific effects and recommend measures to offset negative effects.
    - Recommend monitoring and adaptive management approaches to address negative effects of stressors.

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in pollution management programs, projects, and BMPs that also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, pollution managers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, address negative effects of pollution, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into pollution management practices, operations, and infrastructure.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of pollution management and SGCN conservation.
- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.9.1 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years. Ideally, SGCN conservation will also mutually benefit pollution management.

Table 3.9.1 Voluntary actions intended to benefit SGCN and pollution management by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Waterbird SGCN including: Trumpeter Swan Eared Grebe Western Grebe Clark's Grebe Caspian Tern Common Loon	Survival decreases from discarded fishing tackle causing injuries or death (e.g., entanglement with monofilament line and ingested hooks and lead sinkers).	Prepare and disseminate information, education, and outreach materials informing anglers about opportunities to protect SGCN from discarded fishing tackle.
		Install monofilament recycling stations and signage at key fishing locations as necessary and appropriate.
		Continue to promote "Keep Idaho Waters Clean!" by including messaging on ways anglers can help (e.g., Idaho Fishing Seasons & Rules booklet https://idfg.idaho.gov/rules/fish).

3.10 Geological Events

Overview

Geological Events consist of Volcanoes, Earthquakes, and Avalanches/Landslides (CMP 2016a). Geological Events can affect SGCN populations and habitat (Fig. 3.10). However, Geological Events mostly occur randomly. With some potential exceptions, fish and wildlife management planning in Idaho does not routinely consider Geological Events. Nonetheless, the SWAP considers Geological Events as a precaution in the unanticipated event that emergency actions are needed to address negative effects on a SGCN or its habitat.



Fig. 3.10 Debris flow blocking the Middle Fork of the Salmon River 4 mi downstream of the Boundary Creek Boat Launch (Salmon–Challis National Forest 2022).

Overarching Effects & Actions

Overarching voluntary actions are broadly applicable for addressing effects of Geological Events that might negatively affect SGCN or their habitats (see Chapter 2):

- Assess the negative effects of significant random Geological Events affecting SGCN habitat.
- Collaborate as appropriate with stakeholders and partners to address negative effects of significant random Geological Events on SGCN populations or habitat (e.g., landslide blocks a cave or mine entrance that serves as important bat roosting habitat).
- Monitor the recovery status of SGCN populations negatively affected by significant random Geological Events.

3.11 Climate Change

Overview

Climate Change consists of Ecosystem Encroachment, Changes in Geochemical Regimes, Changes in Temperature Regimes, Changes in Precipitation & Hydrological Regimes, and Severe/Extreme Weather Events (CMP 2016a). Climate-related stressors are driving factors influencing the lands and waters that sustain Idaho's SGCN, natural resource-based economy, communities, and overall way of life. Accordingly, most other Chapter 3 sections also address climate-related stressors.

Idaho is experiencing a changing climate, which is felt as stressors in the form of warming temperatures, prolonged and severe drought, changing precipitation and snowpack trends, and shifting seasonal water runoff patterns. Consequently, Idaho's climate is expected to become overall warmer, drier in summer, wetter in winter, and more variable during the next 50 to 70 years (Meehl et al. 2009; Rupp et al. 2017). The following are examples of current and forecasted changes:

- Temperature
    - Annual mean temperature has increased 1.8 °F (1 °C) since 1895, with heat waves becoming more frequent (Fig. 3.11.1).
    - Summer and winter temperatures are increasing more than spring or autumn.
    - Growing seasons are shifting and lengthening (Abatzoglou et al. 2014; Abatzoglou et al. 2021).
- Precipitation
    - Precipitation patterns are becoming more variable, with frequent severe storms, flooding from rain on snow, and prolonged droughts (Fig. 3.11.1).
    - Summer and autumn rain precipitation is decreasing, and spring and winter precipitation is increasing but with less as snow (Fig. 3.11.2) (Abatzoglou et al. 2014; Mote et al. 2018; Musselman et al. 2018; Abatzoglou et al. 2021).
    - Snowpack is peaking earlier, shifting upwards, and more inconsistent (Catalano et al. 2019; Marshall et al. 2019).
    - Soil and fuel moistures are decreasing contributing to increased wildfire (Abatzoglou and Williams 2016).
- Water Supply
    - Decreasing summer streamflow and warming air temperatures have warmed streams approximately 1.5 °F (0.8 °C).
    - Annual streamflow has decreased, and peak springtime streamflow is 1 to 2 weeks earlier.
    - Summer streamflow will continue to decrease, and springtime peak streamflow will be 4 to 9 weeks earlier (Hamlet et al. 2013; Chegwidden et al. 2020).

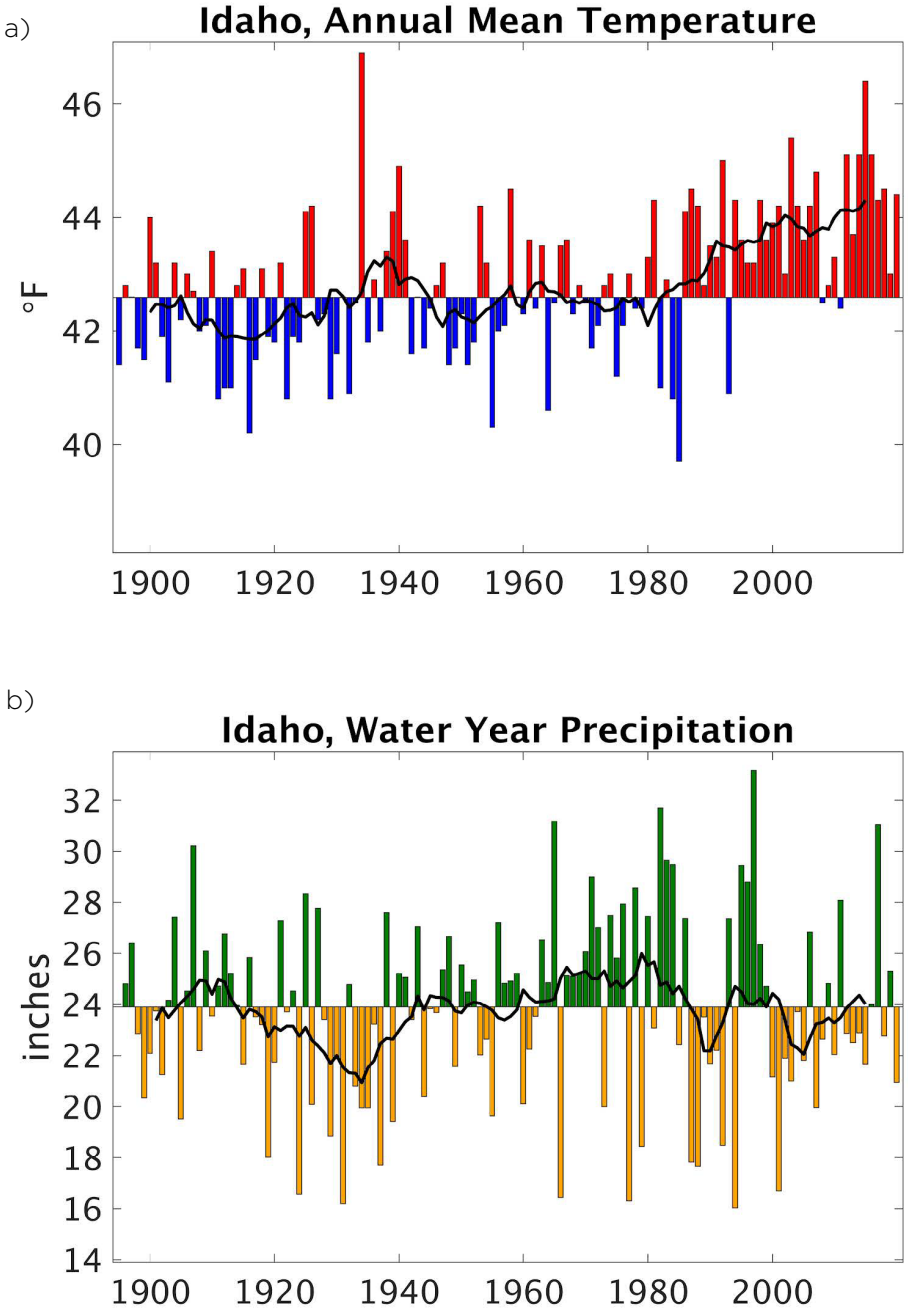
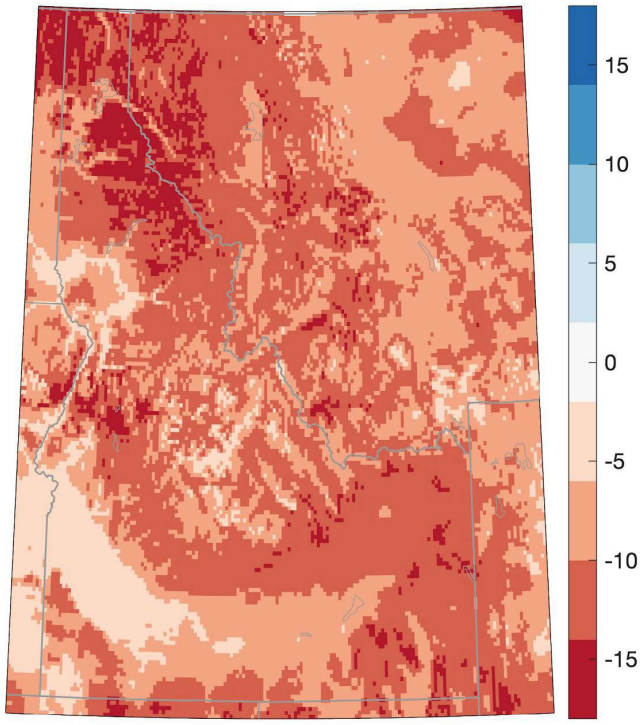


Fig. 3.11.1 Annual average air temperature (a) and total annual precipitation (b) in Idaho, 1901 to 2020 (data are plotted relative to the 1901 to 2000 average and black line indicates the 11-year moving average (from Abatzoglou et al. 2021).

a)



b)

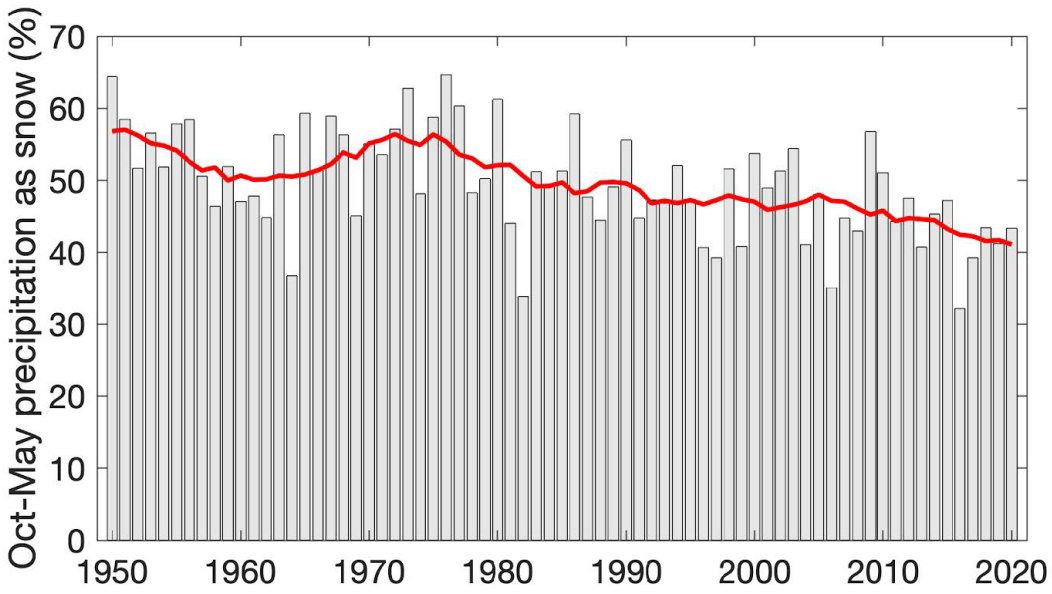


Fig. 3.11.2 a) Trends in the modeled percent of October–May precipitation falling as snow across Idaho, 1950 to 2020 (from Lynn et al. 2020). b) Time series of annual percent of October–May precipitation falling as snow for Idaho (Abatzoglou et al. 2021). Data source: Lynn et al. (2020).

Climate influences the distribution and abundance of SGCN and their habitats. The ability of SGCN to adapt to a changing climate is not entirely understood due to high local temperature and precipitation variability (Ford et al. 2013; Silverman and Maneta 2016). SGCN could therefore be benefited or harmed depending on circumstances. Therefore, SGCN conservation must be flexible and adaptable through time. Climate-related stressors can also influence the natural resources, especially water, necessary to supply society with renewable products and services. A changing climate can compound other stressors affecting natural resources such as increasing disease and insect outbreaks, the introduction and spread of invasive species (e.g., Cheatgrass, North Africa Grass, Yellow Star-thistle, Rush Skeletonweed, and Medusahead), and destructive wildfires (e.g., Adler et al. 2021; Paukert et al. 2021). These stressors can ultimately harm the health and productivity of Idaho's forests, rangelands, and waters.

Proactive and adaptive efforts can help reduce effects of climate-related stressors. Addressing these effects will require extensive stakeholder collaboration, planning, and problem solving. Established relationships among conservation partners and stakeholders, including industry and resource managers, create opportunities for proactive, voluntary, and community-oriented solutions. Collaboratively enhancing and incentivizing these partnerships into the future will be necessary for sustaining Idaho's SGCN, vital natural resource-based economies, and communities.

Overarching Effects & Actions

Climate-related SGCN conservation focuses on habitats that are resilient to climate-related stressors. Most importantly, climate-related actions must conserve Idaho's lands and waters, restore and enhance habitat health, and protect natural resources. The connection between natural resources and SGCN conservation provides opportunities for stakeholders to collaborate in mutually beneficial efforts to address climate-related stressors, particularly through voluntary socioeconomic incentives (WGA 2021b). Focusing on achieving mutually beneficial results, the following actions are broadly applicable for addressing climate-related stressors that have the potential to negatively affect the health and productivity of lands and waters important to Idaho's natural resource-based economies, communities, and SGCN:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with natural resource-based industries, resource managers, landowners, and other stakeholders to plan and implement approaches to achieve joint SGCN and climate-related stressor goals and objectives. The following are examples of voluntary actions:
    - Participate in land-use and resource planning processes, communicate the state's SGCN goals and objectives, identify potential stressors, and recommend measures to address stressors.
    - Establish SGCN goals and objectives for managing climate-related stressors.

  - Identify and address SGCN knowledge gaps and proactively develop information to support conservation planning, stressor analyses, and management recommendations.
  - Develop, assemble, maintain, and disseminate databases to support SGCN conservation and climate-related stressor planning.
  - Assess the status of stressors related to SGCN goals and objectives.
  - Conduct surveys, inventories, analyses, and modeling to assess existing and forecasted distribution and abundance of SGCN populations and habitat relative to stressors and potential actions to offset stressors.
  - Develop, prioritize, and implement strategies, actions, and adaptive management to alleviate potential stressors that could affect SGCN goals and objectives.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and resource-based industry climate-related goals and objectives. The following are examples of voluntary actions:
  - Improve forest and rangeland health including resilience to risks of climate-induced disease and insect outbreaks, invasive species infestations, and destructive wildfire.
  - Implement soil and water conservation projects and BMPs (e.g., NRCS 2022, 2023) to benefit water supplies, water quality, soil health, and resilience to climate-related stressors.
  - Restore and maintain diverse and healthy habitats to address warming and drying conditions that change growing seasons and the timing of SGCN life cycle events (e.g., budding, flowering, and dormancy), including planting native drought-tolerant vegetation adapted to warmer locations and broader soil moisture conditions.
  - Treat unnaturally high forest and rangeland fuel loads, develop and implement wildfire mitigation and response plans, increase wildland and WUI firefighting capacity, and acquire and strategically position firefighting resources.
  - Upgrade transportation infrastructure to benefit fish and wildlife movement, improve instream, streambank, wetland, floodplain, and riparian habitat conditions, and increase resilience to changing seasonal runoff patterns and increasingly large floods.
  - Reduce water temperatures by improving and maintaining instream water flows, seasonal runoff patterns, and stream channel processes.
  - Release cold water from reservoirs to support anadromous fish migration as appropriate.
  - Facilitate SGCN movements to habitat with favorable climates (e.g., northward, higher elevation).
  - Conserve pollinator SGCN with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (ISDA 2016; WAFWA 2019; USDA 2021, 2022).
  - Conserve high-priority SGCN populations and habitat that are sensitive or vulnerable to climate-related stressors with collaborative agreements (e.g., land exchanges, conservation easements, water banking and trading, Forest Legacy Program, and Land and Water Conservation Fund).

    - Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.
- Collaborate with resource-based industries, private landowners, and resource managers to address climate-related stressors with existing conservation programs and incentivize voluntary soil, water, and SGCN conservation projects; BMPs; infrastructure and technology upgrades; and conservation of working lands (e.g., Cheatgrass Challenge, Environmental Quality Incentives Program, Idaho Forest Stewardship Program, Good Neighbor Authority, State Fire Assistance Program, and Nonpoint Source Management Program).
- Partner with willing private landowners and resource managers in climate-resilient habitat management to benefit both SGCN and resource-based industry goals and objectives across private, state, and federal landownerships.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform resource-based industries, resource managers, and other stakeholders about Idaho's SGCN conservation goals and objectives in collaboration between IDFG, OSC, IDL, ISDA, IDPR, IDWR, DEQ, and OEMR.
- Implement an incentive-based stakeholder engagement plan as appropriate to foster an awareness of conservation and funding opportunities to implement programs, projects, and BMPs beneficial to both SGCN and addressing climate-related stressors.
- Collaborate with resource-based industries, resource managers, and other stakeholders to identify and fill knowledge gaps and capacity needs for implementing programs, projects, and BMPs beneficial to both SGCN and addressing climate-related stressors.
- Encourage and incentivize resource-based industries, resource managers, and universities to develop collaborative programs and BMPs that benefit SGCN and support resilience to climate-related stressors, adaptive management, and monitoring.
- Assist resource-based industries, resource managers, regulatory authorities, universities, and other stakeholders with obtaining information needed to plan, prioritize, and implement SGCN conservation into the future. The following are examples of voluntary actions:
    - Conduct surveys, inventories, and analyses to evaluate existing distributions, abundances, and conservation status of SGCN and their habitats relative to potential stressors.
    - Model and predict future distribution and abundance of SGCN populations and habitats to inform potential actions to offset stressors.
    - Assess SGCN genetics to inform conservation actions to increase connections and diversity among populations.
    - Identify areas resilient to climate-related stressors (e.g., cooler and moister) where SGCN have greater opportunities to persist long term (Fig. 3.11.3).
    - Assess the effectiveness of existing invasive species detection and control methods and develop new methods as appropriate for changing needs and climate conditions.
    - Map migration routes for big game SGCN.
    - Develop efficient and effective survey technologies and protocols suitable to detect elusive SGCN and SGIN (e.g., DNA of fecal pellets and eDNA).

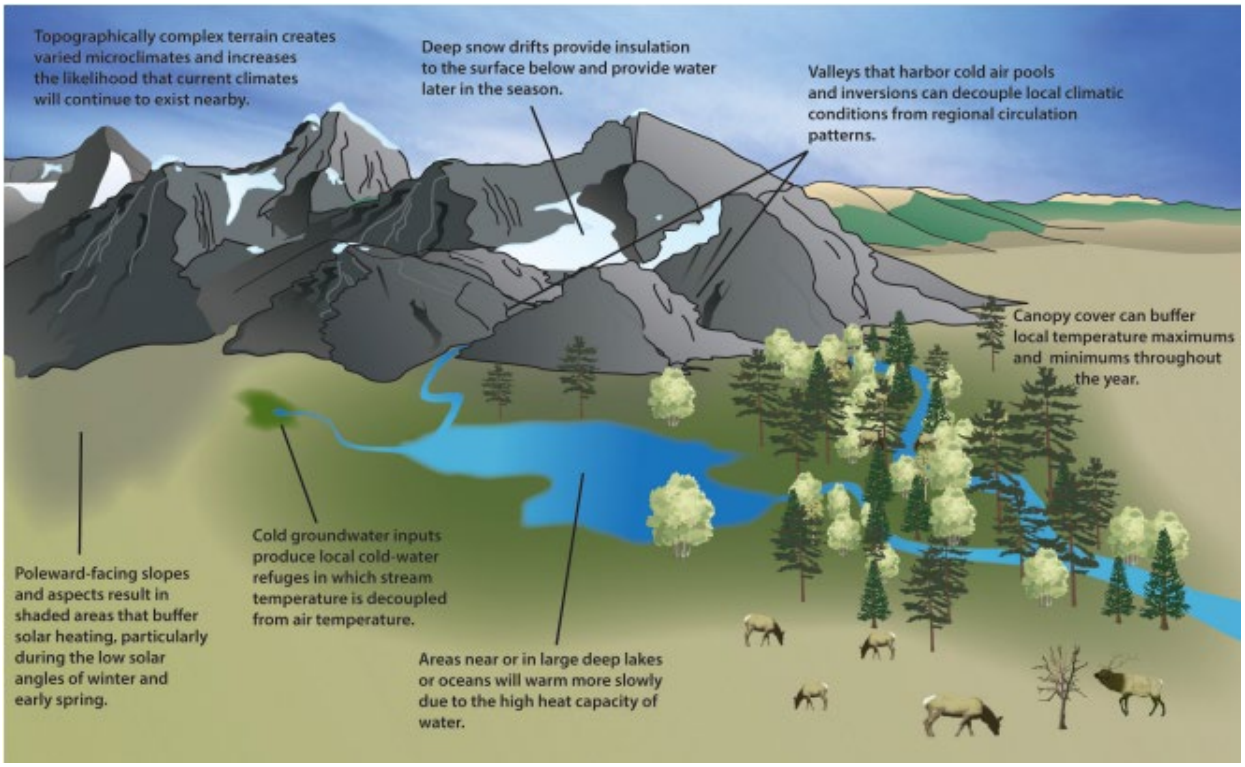


Fig. 3.11.3 Conceptual model of potential areas likely to be resilient to climate-related stressors and change (from Morelli et al. 2016).

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education and fish-and-wildlife-related recreation.
- Incentivize participation in sustainable conservation programs, projects, and BMPs that also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, resource-based industries, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, reduce effects of climate-related stressors, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation and climate-related stressors in natural resource management (e.g., public engagement about climate-related stressors and related SGCN conservation activities such as invasive species control, fuel treatment, and habitat restoration).
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of climate-related

stressors and SGCN conservation needs (e.g., landscape-scale planning over multiple timescales and with locally implementable projects).
- Participate in collaborative programs that involve stakeholders in resource stewardship in support of SGCN conservation.
- Encourage data sharing to support proactive and adaptive management for SGCN conservation.

Habitat-specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on key SGCN habitats and propose collaborative actions to offset negative effects if they occur. Key habitats were identified and prioritized for actions based on the estimated feasibility and effectiveness to address challenge-specific stressors likely to affect SGCN during the next 10 years. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to key habitats with the potential for negative SGCN effects from climate-related stressors. Ideally, SGCN conservation will be mutually beneficial for natural resource uses described in other Chapter 3 sections.

Forest & Woodland

Climate-related stressors affecting Forest & Woodland habitats include warming temperatures, reduced soil moisture from prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, unnatural wildfire frequency, extent, and severity, disease and insect outbreaks, and the introduction and spread of invasive species. These stressors are interacting to increase the prevalence of less productive and drier forest types, which are eventually prone to becoming shrublands and grasslands (Parks et al. 2019).

Examples of SGCN occurring in Forest & Woodland habitats and potentially influenced by climate-related stressors include Wolverine, Fisher, Rocky Mountain Goat, Moose, Great Gray Owl, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Western Bumble Bee, and Whitebark Pine. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.1.

Table 3.11.1 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Forest & Woodland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Lower Montane–Foothill Forest	Forest health is decreased by climate-related stressors.	Incentivize landowners and resource managers to conserve priority forests to benefit Idaho's SGCN, natural resource-based economy, and communities.

Table 3.11.1 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Mesic Lower Montane Forest Subalpine–High Montane Forest Whitebark Pine Forest & Woodland Pinyon–Juniper Woodland	Moist productive forests are changing to drier forests.	Improve forest health to benefit SGCN and resilience to climate-related stressors (e.g., forest restoration; prescribed burning, drought tolerant vegetation planting, soil moisture and health management, erosion prevention and control, and snow catchment and retention).
		Manage existing forests to improve productivity and avoid conversion to shrublands or grasslands.
		Conserve SGCN and benefit resilience to climate-related stressors by increasing forest diversity (e.g., patch sizes and openings, stand structure, tree species and undergrowth composition, tree types and densities, tree ages and sizes, snags, and woody debris).
		Manage forests as appropriate to benefit SGCN and resilience to climate-related stressors by keeping fire-resistant and mature forest characteristics (e.g., large-diameter cone-bearing trees, diverse native understories, large-diameter snags, large, downed logs, and woody debris.
		Restore Whitebark Pine stands by planting seedlings resistant to White Pine Blister Rust, using prescribed burning and mechanical thinning (e.g., to remove Subalpine Fir), and focusing restoration in colder portions of Whitebark Pine's range (Keane 2018).
	Forest health is decreased by invasive plants, and insect and disease outbreaks, which increase risks of unnatural destructive wildfire. Forests are harmed by destructive wildfire.	Reduce risks of destructive wildfire (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Protect high-priority SGCN populations and habitats during firefighting unless beneficial effects are expected.
		Restore forests negatively affected by destructive wildfire and invasive insect and disease outbreaks (e.g., erosion control, strategic salvage logging, desirable vegetation planting and management, and invasive species control).
Aspen Forest & Woodland	Quaking Aspen and Bigtooth Maple regeneration are decreased by climate-related stressors.	Identify and regenerate priority Aspen and Bigtooth Maple stands by stimulating suckering and improving soil moisture (e.g., prescribed burning as appropriate, mechanical removal of invading conifer trees, and targeted fencing/barriers).
		Improve soil moisture for snow-dependent aspen stands by increasing and retaining snowpack (e.g., snowpack retaining fences).

Table 3.11.1 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Forest & Woodland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Pinyon–Juniper Woodland	Pinyon–juniper reproduction and survival are decreased by climate-related stressors.	Manage pinyon–juniper stands to benefit SGCN and resilience to climate-related stressors by keeping a diversity of fire-resistant and mature stand characteristics (e.g., large-diameter ages, diversity of patches, invasive species control, fuel reduction treatments, and diverse native understories).
Montane Riparian & Swamp Forest Lowland–Foothill Riparian Forest	Riparian forest health is decreased by climate-related stressors.	Incentivize landowners and resource managers to conserve priority riparian forests to benefit both SGCN and Idaho's natural resource-based economy and communities.
		Restore and maintain priority riparian forests (e.g., water supply and streamflow improvement, streambank and floodplain restoration, beaver dam analogues (BDAs)/North American Beaver reintroduction, invasive species control, desirable vegetation planting and management, and erosion prevention and control).
		Manage riparian forests to benefit SGCN and resilience to climate-related stressors (e.g., riparian shade buffers, water supply and streamflow improvement, mature forest characteristics, large woody debris, and snags).

Temperate & Boreal Grassland & Shrubland

Warmer temperatures, wetter springs, drier summers, and earlier snowmelt are causing more frequent, severe, and longer lasting droughts. These droughts harm the health and productivity of Montane–Foothill Grassland & Shrubland habitats by decreasing soil moisture, increasing invasive species infestations, and increasing destructive wildfire. Consequently, some grasslands and shrublands are shrinking, mainly in low-elevation dry sites, and expanding in areas now with longer growing seasons. Some SGCN associated with grasslands and shrublands might shift their ranges with changing habitat distributions. However, other SGCN on small and isolated remnants, like Palouse Prairie grasslands, are unlikely to adapt.

Examples of SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by climate-related stressors include American Pika, Northern Idaho Ground Squirrel, Southern Idaho Ground Squirrel, Rocky Mountain Goat, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Moose, Mountain Quail, Sharp-tailed Grouse, Monarch Butterfly, and Spalding's Catchfly. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.2.

Table 3.11.2 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Temperate & Boreal Grassland & Shrubland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Montane–Foothill Grassland & Shrubland Subalpine–High Montane Mesic Meadow Snowbrush Ceanothus Chaparral	Rangeland health is decreased by climate-related stressors.	Incentivize landowners and resource managers to conserve priority rangelands to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Manage rangelands to benefit SGCN, increase wildfire-adapted vegetation as appropriate while controlling invasive species, and improving resilience to climate-related stressors (e.g., fuel reduction treatments, prescribed burning as appropriate, mechanical removal of invading conifer trees, rangeland restoration, soil health management, and desirable vegetation planting and management).
	Rangeland health is decreased by invasive species infestation, which increases risks of unnatural destructive wildfire. Rangelands are harmed by destructive wildfire.	Reduce risks of destructive wildfire (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Protect high-priority SGCN populations and habitats during firefighting unless beneficial effects are expected.
		Restore rangelands negatively affected by destructive wildfire (e.g., erosion control, desirable vegetation planting and management, and invasive species control).
Subalpine–High Montane Mesic Meadow	Meadow health is decreased by climate-related stressors.	Manage meadows to benefit SGCN (e.g., restoration and protection of water sources, soil health management, erosion prevention and control, invasive species control, removal of invading conifer trees, desirable vegetation planting and management, access management, and snowpack retaining fences).

Shrub & Herb Wetland

Climate-related stressors can negatively affect Shrub & Herb Wetland habitats, which depend on reliable water sources at least part of the growing season. These stressors include reduced water supplies, prolonged drought, warming water, increasing evaporation, changing precipitation and snowpack trends, and shifting seasonal water runoff patterns and amounts. These stressors are also benefiting nonnative, invasive species (e.g., American Bullfrog, Common Carp, Eurasian Water-milfoil) and diseases that harm native SGCN (e.g., chytridiomycosis in amphibians). Warming water and drought are also increasing the frequency of harmful algal blooms (Fig. 3.11.4).

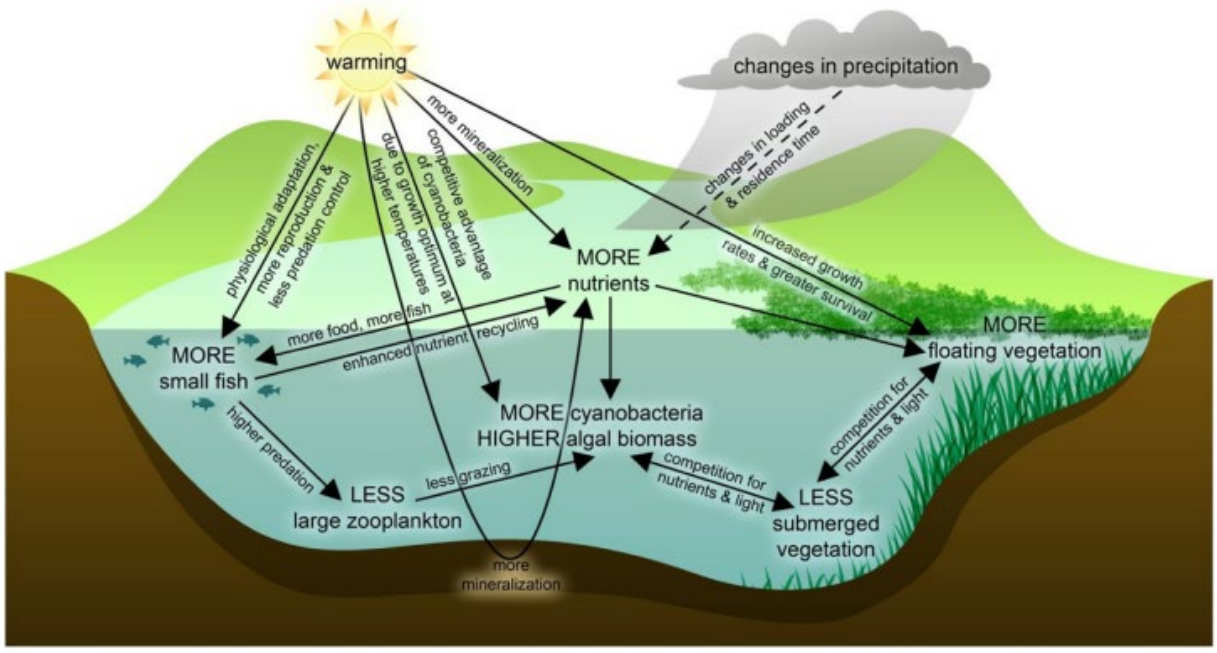


Fig. 3.11.4 General effects of warmer and drier conditions on Aquatic Habitat (from Short et al. 2016).

Examples of SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by climate-related stressors include Northern Leopard Frog, Silver-haired Bat, Townsend's Big-eared Bat, Moose, Western Grebe, Clark's Grebe, Sandhill Crane, Short-eared Owl, Western Bumble Bee, Monarch Butterfly, and Ute Ladies-tresses. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.3.

Table 3.11.3 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool	Wetland and riparian health are decreased by invasive species infestation, warming water, reduced water supplies, and other climate-related stressors.	Incentivize landowners and resource managers to conserve priority wetlands and riparian zones to benefit Idaho's SGCN, natural resource-based economy, and communities.

Table 3.11.3 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Shrub & Herb Wetland habitats (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Alkali–Saline Marsh, Playa & Shrubland		Improve water supplies and water quality to benefit SGCN and resilience to climate-related stressors (e.g., soil and water conservation, aquifer recharge, raised water tables and retention time, soil moisture retention, modernized water management infrastructure, stormwater management, erosion prevention and control, vegetated buffers, and pollution prevention and control).
		Restore and maintain priority wetlands and riparian zones to benefit SGCN and soil and water conservation (e.g., water supply and streamflow improvement, wetland and shoreline restoration, floodplain reconnection and restoration, BDAs/North American Beaver reintroduction, invasive species control, and desirable vegetation planting and management).
		Manage wetlands and riparian zones to benefit SGCN and resilience to climate-related stressors (e.g., riparian buffers to cool water and air, increased riparian shade, water supply and streamflow improvement, moist-soil and shallow-water management, soil health management, prescribed burning, mechanical treatments, access management, and snowpack retaining fences).

Desert & Semidesert

Desert & Semidesert habitats can tolerate extreme temperatures and little precipitation, but ultimately need appropriate winter and spring precipitation to persist. The following climate-related stressors are making many sagebrush shrublands even drier and prone to becoming annual grasslands: warming temperatures, prolonged drought, changing precipitation and snowpack trends, introduction and spread of invasive species (e.g., Cheatgrass), and unnatural wildfire frequency, extent, and severity. Severe wildfire fueled by Cheatgrass is especially harmful to sagebrush shrublands and related SGCN.

Examples of SGCN occurring in Desert & Semidesert habitats and potentially influenced by climate-related stressors include Pygmy Rabbit, Pronghorn, California Bighorn Sheep, Rocky Mountain Bighorn Sheep, Greater Sage-Grouse, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Morrison Bumble Bee, Slickspot Peppergrass, and Macfarlane's Four-o'clock. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.4.

Table 3.11.4 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Dry Shrubland & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation	Rangeland health is decreased by climate-related stressors. Shrublands are changing to grassland in hotter and drier sites. Shrublands are changing to pinyon–juniper in moister sites.	Incentivize landowners and resource managers to conserve priority rangelands to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Improve rangeland health to benefit SGCN and resilience to climate-related stressors (e.g., rangeland restoration, desirable drought- and heat-tolerant vegetation planting, and selection of favorable local climates near wetlands and riparian zones).
		Restore and maintain priority shrublands to benefit SGCN and soil and water conservation (e.g., rangeland restoration, soil health management, erosion prevention and control, and access and disturbance management).
		Manage shrublands to improve rangeland resilience and avoid conversion to grassland, especially invasive annual grassland.
		Manage shrublands to improve rangeland health and avoid conversion to Pinyon–Juniper Woodland.
		Protect relatively undisturbed areas with healthy native vegetation and unique plant communities that support SGCN (e.g., kipukas and Limberpine at Craters of the Moon National Monument & Preserve).
	Rangeland health is decreased by invasive species infestation, which increases risks of unnatural destructive wildfire. Rangelands are harmed by destructive wildfire.	Reduce risks of destructive wildfire (e.g., invasive species control, fuel reduction treatments, strategic fuel breaks, ignition risk reduction, wildfire mitigation and response planning, firefighting resources, rapid wildfire response and suppression, and information and education).
		Protect high-priority SGCN populations and habitat during firefighting unless beneficial effects are expected.
		Restore rangelands negatively affected by destructive wildfire and invasive species infestation (e.g., erosion control, invasive species control, and desirable vegetation planting and management).
Sparsely Vegetated Dune Scrub & Grassland	Sand dunes are stabilized by invasive vegetation and changing wind patterns.	Conserve SGCN associated with sand dunes by developing and implementing restoration strategies to prevent vegetation from establishing and permanently stabilizing dunes, especially in wildfire prone areas.

Polar & High Montane Scrub, Grassland & Barrens

Polar & High Montane Scrub, Grassland & Barrens habitat (hereafter Alpine Tundra) is diverse and influenced by localized and small-scale changes in snow, wind, and soil moisture, which

also change with aspect, slope, and elevation. This diverse habitat can support a diversity of SGCN. In some cases, topographic variability can help moderate negative effects of climate-related stressors. However, Alpine Tundra is expected overall to shrink from warming temperatures, longer growing seasons, less snowpack, and more precipitation as rain. These stressors can also cause more soil erosion and higher risks of unnatural wildfire.

Examples of SGCN occurring in Alpine Tundra and potentially influenced by climate-related stressors include American Pika, Wolverine, Grizzly Bear, Rocky Mountain Goat, Golden Eagle, Gray-crowned Rosy-Finch, and Black Rosy-Finch. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.5.

Table 3.11.5 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Alpine Tundra

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Alpine Tundra	Alpine Tundra distribution is decreased by climate-related stressors. Alpine meadows and tundra are changing to forest from invading conifer trees.	Protect priority Alpine Tundra as a connected network that will help SGCN move as the distribution of high-elevation habitat with colder conditions shrinks and shifts upslope.
		Manage priority alpine meadows and tundra to prevent invasion by conifer trees (e.g., prescribed burning and mechanical treatments).
		Restore priority Alpine Tundra harmed by unnatural disturbances such as increased soil erosion and unnatural destructive wildfire.

Agricultural Habitat

Agriculture is a vital part of Idaho's natural resource-based economy, rural communities, and way of life. Agricultural Habitat includes croplands, hayfields, pastures, orchards, and vineyards. In addition to essential products for society, Agricultural Habitat contributes importantly to SGCN conservation (e.g., Pronghorn, Greater Sage-Grouse, White-faced Ibis, and Bobolink). However, a warmer and drier climate can be especially difficult for Agricultural Habitat, which relies on supplemental irrigation in much of the state. Climate-related stressors affecting Agricultural Habitat include warming temperatures, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, prolonged and severe drought, and extreme weather events such as floods and heat waves. These stressors interact to decrease water supplies, increase uncertainty of year-to-year water availability, reduce soil moisture and health, and expand invasive weeds, pests, and crop diseases.

These stressors can also decrease crop yields and rangeland forage. To adapt to a warmer and drier climate, many agricultural producers and resource managers may need to adopt new practices including choices about drought- and disease-tolerant crops and livestock breeds, irrigation efficiencies, and changing livestock management practices. Eventually, agricultural producers may be faced with decisions about additional costs of adapting to climate-related stressors and remaining profitable. High property values compared to agricultural commodity prices is already a driver for urbanizing agricultural lands. For example, 11 million acres (4.5 million ha) of US agricultural lands were converted to nonagricultural uses between 2001 and 2016 (Freedgood et al. 2020). Therefore, collaboratively protecting lands and waters can be mutually beneficial for Idaho's SGCN conservation, agricultural economy, and rural communities.

Examples of SGCN occurring in Agricultural Habitat and potentially influenced by climate-related stressors include Little Brown Myotis, Hoary Bat, Silver-haired Bat, Pronghorn, Moose, Franklin's Gull, White-faced Ibis, Bobolink, Western Bumble Bee, and Monarch Butterfly. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.6.

Table 3.11.6 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Agricultural Habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Agricultural Habitat	Agricultural Habitat is changed to nonhabitat.	Incentivize agricultural producers and resource managers to conserve priority agricultural lands to benefit SGCN and Idaho's natural resource-based economy, culture and heritage, and rural communities.
	Agricultural Habitat health and availability is decreased by climate-related stressors, invasive species infestation, and crop diseases.	Conserve soil and water to benefit SGCN and Agricultural Habitat resilience to climate-related stressors (e.g., soil health management, conservation tillage, cover cropping, soil moisture retention, erosion prevention and control, vegetated buffers, pollution prevention and control, less water-intensive crops, irrigation efficiencies, water supply and streamflow improvement, increased water storage, aquifer recharge, and raised water tables and retention time).
		Improve water supplies to benefit SGCN and sustainable agriculture with water projects and BMPs to upgrade/modernize water management infrastructure (e.g., delivery system, impoundments, storage structures, conveyances, control structures, and irrigation equipment) (e.g., Rehman et al. 2022; NISIC 2023; NRCS 2023).

Table 3.11.6 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Agricultural Habitat (*continued*)

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
		Incentivize Agricultural Habitat projects and BMPs to enhance agricultural productivity and benefit SGCN (e.g., hayfield and hay meadow restoration and maintenance, field buffers and cover crops with diverse native vegetation, SGCN-friendly flood irrigation as appropriate, harvest timing to protect nesting birds and other SGCN, wet meadow and riparian pastures, desirable vegetation planting and management, and invasive species control) (e.g., NRCS 2023).

Aquatic Vegetation & Freshwater Habitat

Water is the most important natural resource sustaining Idaho's SGCN, resource-based economies, and communities. Most climate-related stressors affect water supply and water quality (e.g., Figure 3.11.4). Overarching and interrelated climate-related stressors affecting Aquatic Vegetation & Freshwater Habitat (hereafter aquatic habitat) include warming temperatures, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, prolonged and severe drought, pollutants decreasing water quality, changing wind patterns, and extreme weather events such as flooding. Drought and warming water also harm water quality, which can increase invasive species and harmful algal blooms (Fig. 3.11.4). Although some SGCN might benefit, an overall warming and drying climate will likely shrink distributions of many aquatic SGCN.

Examples of SGCN occurring in Aquatic Vegetation & Freshwater Habitat and potentially influenced by climate-related stressors include White Sturgeon, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, steelhead, Sockeye Salmon, Chinook Salmon, Bull Trout, Yuma Myotis, Moose, Western Grebe, Clark's Grebe, Common Loon, and Water Howellia. Proposed voluntary actions intended to benefit SGCN by addressing the negative effects of climate-related stressors if occurring, are listed in Table 3.11.7.

Table 3.11.7 Voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of aquatic habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Freshwater Aquatic Vegetation Rivers (5th order and higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Aquatic habitat distribution and health are decreased by invasive species infestation, warming temperatures, reduced water supplies, and other climate-related stressors.	Incentivize landowners and resource managers to conserve priority aquatic habitat to benefit Idaho's SGCN, natural resource-based economy, and communities.
		Improve water supplies and water quality to benefit SGCN and resilience to climate-related stressors (e.g., increase water storage, aquifer recharge, raise water tables, soil moisture retention, modernize water management infrastructure, stormwater management, erosion prevention and control, vegetated buffers, and pollution prevention and control).
		Restore and maintain priority aquatic habitat to benefit SGCN and soil and water conservation (e.g., streamflow improvement, in-water and shoreline restoration, floodplain reconnection, instream and shoreline habitat complexity, large woody debris, BDAs/North American Beaver reintroduction, invasive species control, and desirable vegetation planting and management).
		Manage aquatic habitat to benefit SGCN and resilience to climate-related stressors (e.g., riparian buffers to cool water and air, increase riparian shade, moist-soil and shallow-water management, soil moisture retention, raise water tables and retention time, and invasive species control).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.11.8 identifies voluntary priority actions based on estimates of effectiveness and feasibility to offset negative SGCN-specific effects of stressors, if they occur, during the next 10 years.

Table 3.11.8 Voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Steelhead Sockeye Salmon Chinook Salmon Bear Lake Whitefish Bonneville Whitefish Mountain Whitefish Bull Trout Burbot	Survival or spawning success is reduced by warming water, changing movement patterns, and spawning timing.	Increase the understanding of potential climate-related stressors on the survival, reproduction, movements, and migration timing of fish SGCN (e.g., heat stress effects, changing spawning and incubation periods, and adaptability).
		Identify, develop, prioritize, and implement feasible and practical actions to offset negative effects of changing climate conditions on fish SGCN (e.g., cold-water reservoir releases, trap and transport, and conservation relocation).
		Implement actions in the *Fisheries Management Plan 2019–2024* (IDFG 2019a).
		Implement the *Management Plan for Conservation of Yellowstone Cutthroat Trout in Idaho* (IDFG 2007).
		Implement the *Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho* (IDFG 2022b).
		Implement the *Management Plan for the Conservation of Snake River White Sturgeon in Idaho* (IDFG 2008).
Pronghorn Rocky Mountain Goat California Bighorn Sheep Rocky Mountain Bighorn Sheep	Survival or reproduction is reduced by warming temperatures and shifting growing seasons that change forage conditions and migration patterns.	Increase the understanding of potential effects of climate-related stressors on the survival and reproduction of migratory SGCN (e.g., changing growing seasons, declining forage conditions, and adaptability).
		Map, prioritize, and conserve movement and migration routes for migratory SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on migratory SGCN.

Table 3.11.8 Voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Moose Migratory bat and bird SGCN		
Upland game bird SGCN including: Greater Sage-Grouse Sharp-tailed Grouse	Brood survival is reduced by warming temperatures and shifting growing seasons changing forage conditions.	Increase the understanding of potential climate-related stressors on brood survival of upland game bird SGCN (e.g., insect emergence periods, brood foraging patterns, additional food sources, and adaptability to changing conditions).
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on brood survival of upland game bird SGCN.
Pollinating insect SGCN including: Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee	Survival or reproduction is reduced by warming temperatures and shifting growing seasons changing flower availability.	Increase the understanding of potential climate-related stressors on survival and reproduction of pollinating SGCN (e.g., shifting blooming periods, changed forage and host plant availability, emergence periods, additional food sources, and adaptability to changing conditions).
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on pollinating SGCN.
Cold-weather SGCN including: American Pika Hoary Marmot Wolverine Rocky Mountain Goat Moose Black Rosy-Finch Christ's Paintbrush	Survival or reproduction is reduced by heat or cold stress from warming temperatures and less insulating snowpack.	Increase understanding of potential heat stress consequences on the survival and reproduction of cold-weather SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset negative effects of heat stress on cold-weather SGCN (e.g., conserve and manage habitat if feasible to provide sites offering seasonal protection from heat or cold stress).

Table 3.11.8 Voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Hibernating SGCN including: Hoary Marmot Northern Idaho Ground Squirrel Southern Idaho Ground Squirrel Western Small-footed Myotis Little Brown Myotis Yuma Myotis Townsend's Big-eared Bat	Survival or reproduction is reduced by warming temperatures and declining snowpack changing hibernation and foraging patterns.	Increase the understanding of potential climate-related stressors on the survival and reproduction of SGCN that hibernate (e.g., hibernation period, physical health, foraging patterns, and adaptability to changing conditions).
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on SGCN that hibernate.
Food-caching SGCN including: American Pika Pinyon Jay Clark's Nutcracker Cassia Crossbill	Survival or reproduction is reduced by declining seed production and decaying food caches in warming temperatures.	Increase the understanding of potential climate-related stressors on the survival and reproduction of food-caching SGCN (e.g., foraging patterns, reduced Whitebark Pine, Lodgepole Pine, and Singleleaf Pinyon seed production, seasonal food-cache longevity, additional food sources, and adaptability to changing conditions).
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing conditions on food-caching SGCN.
Western Grebe Clark's Grebe	Abundance is reduced by decreasing water supplies and changing wind patterns limiting nesting and foraging.	Increase the understanding of potential climate-related stressors on the survival and reproduction of Western Grebe and Clark's Grebe.
		Identify, develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing conditions if occurring on Western Grebe and Clark's Grebe.

Table 3.11.8 Voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Aquatic invertebrate SGCN including: Western Ridged Mussel Western Pearlshell Banbury Springs Limpet Snake River Physa Bliss Rapids Snail Bruneau Hot Springsnail	Distribution and abundance are reduced by decreasing water supplies impairing water quality.	Increase the understanding of potential climate-related stressors on the distribution and abundance of aquatic invertebrate SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on aquatic invertebrate SGCN.
Amphibian SGCN	Distribution and abundance are reduced by warming temperatures and decreasing water supplies impairing water quality.	Increase the understanding of potential climate-related stressors on the distribution and abundance of amphibian SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on amphibian SGCN.
Dune-related SGCN including: Idaho Dunes Tiger Beetle Columbia River Tiger Beetle Bruneau Dune Tiger Beetle	Distribution and abundance are reduced by changing wind patterns affecting sand dunes.	Increase the understanding of potential climate-related stressors on the distribution and abundance of dune-related invertebrate SGCN (e.g., changing wind patterns, and sand dunes becoming stabilized by invasive plants).
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing conditions on dune-related invertebrate SGCN (e.g., moving tiger beetles to suitable but unoccupied dune habitat).

Table 3.11.8 Voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring (*continued*)

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Whitebark Pine	Survival or reproduction is reduced by warming temperatures and changing precipitation and snowpack trends, decreasing tree health, and seed production.	Increase the understanding of potential climate-related stressors on the health and seed production of Whitebark Pine.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on the health and seed production of Whitebark Pine (Keane 2018).
Aquatic plant SGCN including: A liverwort (*Sphaerocarpos hians*) Water Howellia	Abundance and distribution are reduced by habitat loss or degradation from warming temperatures and changing precipitation and seasonal runoff patterns (e.g., altered timing and volume of runoff).	Increase the understanding of potential climate-related stressors on the abundance and distribution of aquatic plant SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on aquatic plant SGCN.
Subalpine plant SGCN including: Bloom Peak Douglasia Christ's Paintbrush	Abundance and distribution are reduced by habitat loss or degradation from warming temperatures and changing precipitation and snowpack trends.	Increase the understanding of potential climate-related stressors on the abundance and distribution of subalpine plant SGCN.
		Develop, prioritize, and implement feasible and practical actions to offset potential negative effects of changing climate conditions on subalpine plant SGCN.

3.12 Insufficient Species & Conservation Information

Overview

With more than 8,000 species (vertebrates, invertebrates, and plants) native to Idaho, even basic information about distribution, abundance, or habitat requirements can understandably be lacking for many species. Unfortunately, a lack of basic information can prevent proper

assessment of stressors potentially affecting a species or its habitat, which likewise prevents the identification of appropriate conservation actions to offset stressors.

Species discussed in this section are considered SGIN (*n* = 132 species)—species potentially at-risk but lacking current scientific knowledge and expert understanding (Table 2.2). Information uncertainty includes: (1) taxonomic uncertainty (i.e., species' classification needs to be resolved), (2) distributional uncertainty (i.e., lack of basic inventory data on species presence, abundance, and distribution), or (3) ecological uncertainty (i.e., unknown trends, risks, or specific habitat requirements).

Taxonomic Uncertainty

Eight SGIN have taxonomic uncertainty: 3 invertebrates and 5 plants (designated by a "T" in Table 2.2). These species have small numbers of collected specimens, collected from widely varying ecological settings or locations, and varying physical appearances. Therefore, genetic analyses are needed to clarify the taxonomic status of these species. The following are examples:

- mountainsnail genus *Oreohelix* species group—This group includes 12 species associated with limestone soils and rock formations in the Lower Salmon River watershed. The validity of some of these species has been questioned (IDFG 2017b). Recent analysis by Linscott et al. (2020) suggested that species and subspecies designations in Idaho are uncertain and require additional evaluation.
- Columbia Oregonian (*Cryptomastix hendersoni*)—Recently under review for ESA protection, this snail species was previously thought to only occur along the Columbia and Snake rivers in Oregon, Washington, and Idaho. However, surveys in 2013 and 2014 documented this species in 2 areas of northern Idaho, representing a substantial expansion of its distribution and ecological setting (Lucid et al. 2016). Although potentially unreliable, *Cryptomastix* species are currently identified based on shell appearance and shape (Perez et al. 2014). Genetic analysis is needed to better identify *Cryptomastix* species, which might require an entire reevaluation of the *Cryptomastix* genus.
- Woolly Stanleya (*Stanleya tomentosa* var. *runcinata*)—This plant variety is recognized by Plants of the World Online (POWO 2023) as a synonym of *Stanleya tomentosa*. The conservation action for this variety in Idaho is to resolve its taxonomy.

Distributional Uncertainty

Eighty-nine SGIN have distributional uncertainty (designated by a "D" in Table 2.2): 63 invertebrates, 17 plants, 5 mammals, 2 reptiles, and 2 fish. In many cases, these species have not been documented in Idaho for more than 25 years. Survey data for these SGIN are insufficient to determine their status. The following 2 species are examples:

- Lake Chub—Only a few specimens have been documented in Idaho from the Kootenai River and Deep Creek. However, the species appears to prefer lake habitats and has

been documented downriver in Kootenay Lake, BC. Idaho specimens may therefore be misidentified as Peamouth Chub, which are common in the Kootenai River. Alternatively, Lake Chub might seasonally move from Kootenay Lake in BC upriver into the Kootenai River in Idaho.
- Nevada Goldenrod—This species is ranked SH and the only known Idaho collection is from Owyhee County in 1964. The priority action for this species is to search the vicinity of the Idaho collection, as well as an Oregon collection, which is just west of the state line in Malheur County.

In some cases, SGIN with distributional uncertainty are recently described species for which additional information is needed to determine the full extent of their range. Or these might be elusive species needing better survey methods (e.g., eDNA, DNA of fecal droppings, or remote cameras). The following is an example:

- Western Groundsnake—At the very northern extent of its range, this small snake has been documented only 12 times in Idaho since 2000, mostly in Owyhee County. The species tends to be nocturnal and often lives underground, making it difficult to survey. New survey methods might be needed.

In a few instances, distributional changes may represent recent range shifts, potentially due to changing habitat or climate patterns. Additional information is needed to document these shifts in distribution and abundance. The following are examples:

- Shoshone Sculpin—This species only occurs in Idaho and is limited to springs and tributaries of the Snake River along the Thousand Springs formation. Research in 2011 determined genetic diversity was highly variable among populations with some evidence of population expansion (Campbell et al. 2023). Additional population assessments are needed to document species distribution and abundance trends.
- Northern Bog Lemming—Under review for ESA protection as of this writing, the species' distribution is Idaho is known from 23 observations (most recently detected in 2003) in Bonner and Boundary Counties. Idaho represents the southern extent of the species' distribution and more intensive and extensive surveys over a wide range of habitats are needed to determine distribution accurately. The lack of understanding is in part due to difficulties in surveying for the species, and newer survey methods are being tested with Montana and Washington partners (e.g., DNA of fecal pellets and eDNA).
- Northern Alligator Lizard—Rarely encountered and poorly documented in Idaho, citizen naturalists (e.g., iNaturalist) have increased detections by 45% since 2017. Throughout its distribution, Northern Alligator Lizard is associated with cooler, wetter, and higher elevation forests.

Ecological Uncertainty

Thirty-six SGIN have ecological uncertainty: 4 amphibians, 7 birds, 10 mammals, 3 reptiles, 5 fish, and 7 invertebrates (designated by an "E" in Table 2.2). Although causes vary, ecological

uncertainty is most often due to limited information about species–habitat relationships or suspected but undocumented population declines from known risks, particularly for populations with small distributions.

The following are examples of SGIN with little information about biology, habitat relationships, or stressors:

- Green Sucker—Basic ecological information for this fish species is lacking including preferred spawning habitat and factors affecting survival. Although appearing to be widespread in some watersheds, surveys have repeatedly found few, if any, subadults or adults.
- Long-eared Myotis, Long-legged Myotis, and Big Brown Bat—In June 2022, the fungus *Pd* that causes WNS was detected in Minnetonka Cave in southeast Idaho. These 3 bat species are known to be vulnerable to the disease and have experienced related population declines in other states. Additional information on disease prevalence and population trends is needed, because Long-legged Myotis tested positive for *Pd* and all 3 species are known to hibernate in Minnetonka Cave.
- American White Pelican—IDFG manages this species per the commission-approved *Management Plan for the Conservation of American White Pelicans in Idaho 2016–2025* (IDFG 2016). The plan specifies statewide information needs: (1) determine trends in population size and productivity for Idaho and the western population; (2) summarize movement data and update survivorship estimates; and (3) obtain better information on the biology of Idaho's pelicans with specific emphasis on loafing, foraging behavior, home range size, habitat use, and percent of the overall population that are adult breeders.

The following are examples of distributionally-restricted SGIN with known risks to habitat, and in some cases, suspected, but undocumented, population declines:

- Pygmy Whitefish—This fish SGIN is known to occur only in 5 narrow and deep lakes: Upper Priest, Priest, Pend Oreille, Spirit, and Hayden. Although appearing to be relatively common in some lakes, current population data are insufficient to estimate trends.
- Wyoming Ground Squirrel (ssp. *nevadensis*)—This subspecies is limited to arid southwest Idaho and thought to be declining, but to an unknown degree. No Wyoming Ground Squirrel surveys have occurred since the 1980s.
- Boreal Owl and American Pipit—These 2 species occur in restricted alpine and subalpine habitats potentially affected by a loss of snowpack and changing seasonal runoff patterns. Both species are suspected to be declining, but current monitoring data are insufficient to estimate reliable trends. Breeding populations of the American Pipit may be especially limited and becoming more so with tree line advancement.
- Evening Grosbeak—Given the steady, continent-wide declines of this SGIN, better understanding relationships with, and the status of, key associated habitats (notably Dry Lower Montane–Foothill Forest, Mesic Lower Montane Forest, and Aspen Forest & Woodland) will be important.

Overarching Effects & Actions

Filling knowledge gaps is the overarching action for all SGIN: (1) clarify taxonomic uncertainty, (2) document distribution, and (3) assess status, trends, and habitat requirements. In addition, any additional gaps hindering conservation actions should be identified. Collaborating with partners to fill knowledge gaps is most efficient and effective, such as the Multi-Species Baseline Initiative that addressed a lack of information for 19 target species in northern Idaho (Lucid et al. 2016). Through an extensive partnership of more than 30 organizations, Lucid et al. (2016) improved the conservation status of target species (e.g., S1 to S3), found many target species were relatively abundant, detected 2 species thought to be extinct, discovered a new species previously unknown to science (Skade's Jumping-slug, a SGIN) and substantially increased the understanding of 163 other species. Similar proactive and collaborative efforts would be most efficient for filling existing SGIN knowledge gaps. Proposed voluntary actions intended to address knowledge gaps for SGIN are listed in Table 3.12.1.

Table 3.12.1 Voluntary actions to address knowledge gaps for SGIN (see Table 2.2)

Species	Information need	Voluntary actions for consideration
3 invertebrates 5 plants	Taxonomic uncertainty	Perform genetic analyses to clarify taxonomy.
2 fish 5 mammals 2 reptiles 63 invertebrates 17 plants	Distributional uncertainty	Implement collaborative multispecies inventories using a range of traditional and newer survey techniques to document SGIN presence, abundance, and distribution.
		Develop and implement effective and efficient survey techniques suitable for elusive or rare species (e.g., eDNA, DNA of fecal droppings, and remote cameras).
		Identify individual species of aquatic invertebrates existing in samples collected during past DEQ stream surveys, particularly samples from areas with past SGIN observations.

Table 3.12.1 Voluntary actions to address knowledge gaps for SGIN (see Table 2.2) (*continued*)

Species	Information need	Voluntary actions for consideration
5 fish 4 amphibians 11 mammals 2 reptiles 6 birds 7 invertebrates	Ecological uncertainty	Implement collaborative multispecies inventory efforts using a range of traditional and newer more efficient survey techniques to document SGIN species–habitat relationships, distribution, abundance, potential species and habitat stressors, and changing habitat conditions.
		Describe species–habitat relationships for SGIN.
		Estimate SGIN distribution, abundance, and productivity changes within changing conditions.
		Assess SGIN population status and trends.
		Determine factors affecting SGIN survival, reproduction, and potential species and habitat stressors.
		Identify and implement effective and efficient survey techniques suitable for elusive or rare species (e.g., eDNA, DNA of fecal droppings, and remote cameras).

Chapter 4 Monitoring & Evaluation

Monitoring and evaluation (M&E) play a critical role in assessing progress in implementing the strategies and actions of a conservation plan, and in evaluating whether a project's fundamental objectives are being achieved (Groves and Game 2016). Recognizing the importance of this role, Congress directed the states when developing their SWAPs to provide for periodic monitoring of SWAP species and their habitats, the effectiveness of conservation actions, and for adapting conservation actions as appropriate to respond to new information or changing conditions (Element 5).

Monitoring can be defined as the periodic collection and analysis of data related to goals, objectives, or key variables that may influence expected results (FOS 2019). Monitoring enables a team to generate the data necessary to evaluate the impact of its project. By extension, M&E design is the approach a team takes to structure monitoring or evaluation—including sampling methods, use (or not) of controls and comparisons, timing of interventions, and timing of observations (Margoluis et al. 2009).

In revising the SWAP, we have reviewed monitoring concepts and taken an iterative approach to developing our M&E design while recognizing the need to balance implementation and monitoring priorities. For example, we want the bulk of our budget to go toward SWAP implementation with approximately 10% earmarked for M&E (see FOS 2018). We also acknowledge that we will not monitor every action in our plan; for some, we may opt to schedule a periodic discussion and informal assessment among team members. We also recognize that it may not be possible or desirable to heavily invest in rigorous monitoring designs. The main purpose of M&E is to understand whether conservation efforts are effective (and why or why not) so that we implement effective conservation actions and take what we have learned to improve the Idaho SWAP over time, as needed (i.e., practice adaptive management).

As part of our SWAP revision, we created a spreadsheet that summarizes existing and planned monitoring for species, habitats, climate, and effectiveness. We include the target for monitoring, monitoring type (e.g., ambient, performance measurement, impact evaluation), indicator(s), methods, time frame and frequency, monitoring extent or data source, implementer, and purpose of monitoring (e.g., see "Water Howellia" sidebar). This spreadsheet is for IDFG internal use only and intended to serve as a dynamic database to guide SWAP implementation. Monitoring scale will be context driven (e.g., species/habitat) as illustrated in the Water Howellia example.

We identified the most appropriate level for monitoring (e.g., species, species group, or habitat). In some cases, particularly where the primary pressure is habitat based, we chose to monitor the habitat and one or more species tied to that habitat. In other cases (e.g., where the threat is species-specific), we focused monitoring at the species level. In cases where

monitoring a particular species/species group is not feasible, we provide an explanation for why we opted not to include it.

Where existing monitoring programs address data needs for SWAP species (e.g., North American Bat Monitoring Program, Breeding Bird Survey, Pacific Northwest Bumble Bee Atlas, Western States Wolverine Conservation Project, etc.), we identify these and plan to use these programs as a mechanism for both monitoring species as well as to develop products from the data in some cases, such as occupancy models, that can in turn serve as measures of the effectiveness of conservation actions. Analyses from some of these programs provide important inputs to conservation status assessments (e.g., trend data).

Our M&E program will enable us to answer different types of questions that will provide for flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become well understood.

Throughout this chapter, we draw from the following key monitoring references, and have designed our monitoring program for SWAP around these recommendations:

- AFWA. 2011. *Measuring the effectiveness of State Wildlife Grants: final report*. Washington (DC): Association of Fish and Wildlife Agencies.

- CMP. 2020. *Open standards for the practice of conservation. Ver. 4.0*. [place unknown]: Conservation Measures Partnership.

- Elzinga CL, Salzer DW, Willoughby JW. 1998. *Measuring and monitoring plant populations*. Denver (CO): US Department of the Interior, Bureau of Land Management, National Applied Resource Sciences Center. BLM/RS/ST-98/005+1730.FOS. 2019. *Designing monitoring and evaluation*

Water Howellia

Monitoring type: ambient

Monitoring program: FWS post-delisting monitoring

Measure (Indicator): e.g., # and % of sites (ponds) where Water Howellia is present/absent; # and % of quarter-acre sections where Water Howellia has high/moderate/low abundance; etc.

Methods: following monitoring methods outlined in the *Post-Delisting Monitoring Plan for Water Howellia (Howellia aquatilis)* (FWS 2020)

Time frame & frequency of data collection: once the ponds have filled and the growing season has progressed; during 3 distinct time periods over the 15-y post-delisting monitoring period

Monitoring extent or data source: subset of ponds identified by representative committee within known Water Howellia occurrences across its range

Implementer: FWS has the lead responsibility for this monitoring effort; Coeur d'Alene Tribe has indicated that occurrences on its respective jurisdictions in Idaho will continue to be monitored on an annual basis

Purpose: post-delisting monitoring to verify that Water Howellia remains secure from the risk of extinction after it has been removed from the protections of the ESA

approaches for learning: An FOS how-to guide. Bethesda (MD): Foundations of Success.FOS. 2021. *Planning for conservation: a conservation standards how-to guide*. Bethesda (MD): Foundations of Success.Groves CR, Game ET. 2016. *Conservation planning: informed decisions for a healthier planet*. Greenwood Village (CO): Roberts and Company Publishers.Nichols JD, Williams BK. 2006. *Monitoring for conservation*. Trends in Ecology and Evolution. 21(12):668–673.Stokes EJ, Johnson A, Rao M. 2010. *Monitoring wildlife populations for management. Training Module 7 for the Network of Conservation Educators and Practitioners*. Vientiane (Lao PDR): American Museum of Natural History, Wildlife Conservation Society.In this plan, we focus on 3 types of monitoring: (1) ambient monitoring, (2) performance measurement, and (3) impact evaluation (effectiveness). Performance measurement and impact evaluation most directly allow us to determine whether the strategies and actions we are proposing and implementing in the SWAP are having the desired impact. However, we also acknowledge the need to collect baseline information through ambient monitoring as a means of gathering information on the status of species or habitats before deciding on the appropriate course of conservation action to take (e.g., Nichols and Williams 2006; Stokes et al. 2010). We have adopted the Mascia et al. (2014) terminology as our standard for describing monitoring (also see Fig. 4.1):

1. Ambient monitoring—measures status and change in ambient social and ecological conditions, independent of any conservation intervention. Ambient monitoring is often referred to in other literature as "status assessment," "status monitoring," or "surveillance monitoring."

2. Performance measurement—assesses project or program progress toward desired levels of specific activities, outputs, and outcomes. This approach to monitoring is also referred to in some literature as "performance monitoring" or "performance evaluation." It is often the type of M&E associated with "performance-based," "results-based," "outcomes based," or adaptive management cycles that are commonly used in planning and management of conservation and natural resource initiatives. We follow Wholey (1996) in recognizing performance measurement as a mechanism to provide information necessary for management (i.e., decision-making).

3. Impact evaluation—the systematic process of measuring the intended and unintended causal effects of conservation interventions, with emphasis upon long-term impacts on ecological and social conditions. Experimental or quasi-experimental methods are required for rigorous impact evaluations. Thus they require substantial resources, and many conservation projects and programs are not conducive to this sort of experimental design.

Adaptive management (AM) is also incorporated into our SWAP. In its simplest form, AM can be defined as "learning by doing," meaning it combines the need to take conservation actions while trying to learn which actions will be most effective. A 2004 report by the National Research Council of The National Academies (National Research Council 2004) defined AM as:

Flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become well understood. Careful monitoring of these outcomes both advances scientific understanding and helps adjust policies or operations as part of an iterative learning process.

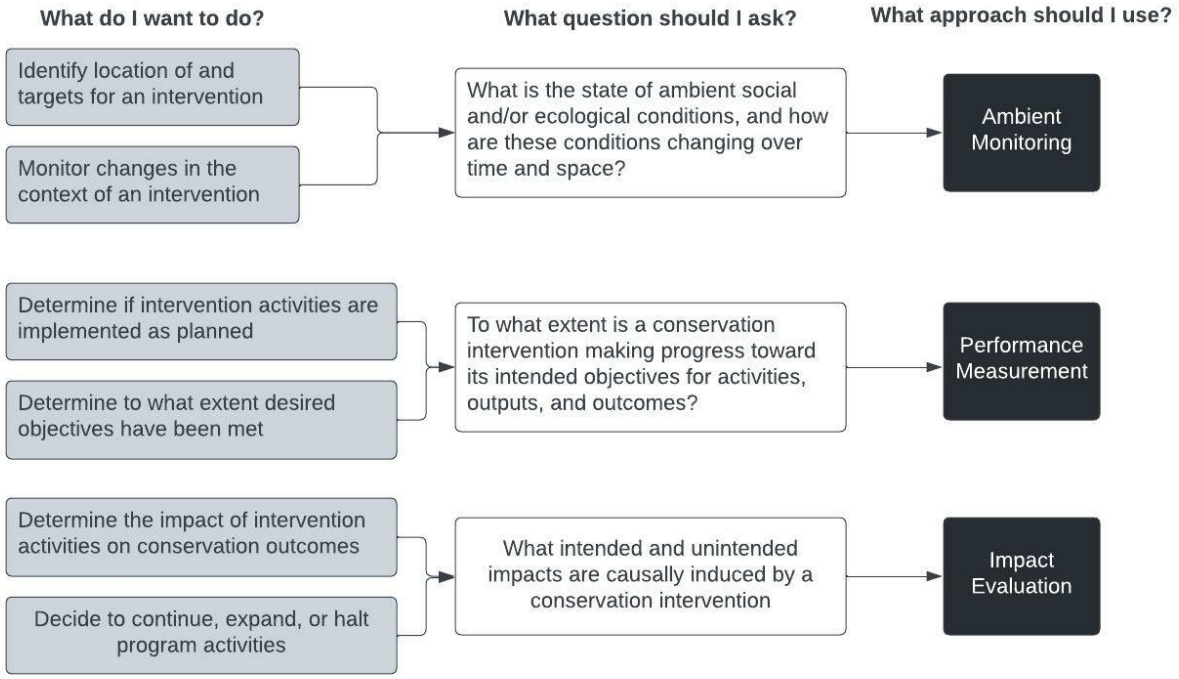


Fig. 4.1 Decision tree highlighting common information needs in conservation, and the question and approach to M&E that can best respond to those needs. Adapted from Mascia et al. (2014); Groves and Game (2016).

AM can be realized when information from monitoring allows a project team to learn about the effectiveness of their strategies and actions and make improvements. For example, if through inventory and monitoring efforts, we discover that a given SGIN is more imperiled than existing evidence had indicated at the time of its status assessment, the species can be transitioned to a SGCN using our existing criteria and selection process through a minor revision to the SWAP. Similarly, if actions intended to benefit a species or its habitat do not result in the desired outcome, we can adjust our strategy.

We also recognize that we must make investment choices when deciding what to monitor. As discussed by Groves and Game (2016), not all conservation projects should have M&E programs with rigorous designs. In some cases, evidence might exist to suggest that an action will be successful if appropriately implemented, and a low-rigor, inexpensive monitoring method may suffice. In other cases, the risks or consequences of a project failing may be so low that funding for monitoring could be better spent elsewhere. Recognizing the need to make more strategic choices about monitoring, McDonald-Madden et al. (2010) developed a simple framework to guide managers and policy makers toward an explicit and transparent

decision on whether or not to invest in monitoring, and what type of monitoring to take to improve management (Fig. 4.2). We plan to use this framework as a means to evaluate monitoring in the context of financial limitations and the urgency of conservation problems.

It is important to select M&E indicators that allow us to measure progress toward our objectives. A good indicator should be both representative and measurable. The Conservation Measures Partnership's (CMP) *Conservation Standards* (CMP 2020) provides additional advice on what constitutes good indicators. We plan to give considerable thought to what indicators will be most relevant and useful to our objectives. In most cases, the selection of indicators will be influenced by the cost-effectiveness of employing a particular indicator, the availability of existing data, its sensitivity to the action being taken, and how consistently it is defined and used. The availability of existing data is often a crucial factor because the need to gather new data can sometimes be too expensive.

The report *Measuring the Effectiveness of State Wildlife Grants* (AFWA 2011) describes a framework that states and their partners can use to assess the effectiveness of conservation actions. This framework includes a list of common or generic conservation actions and a process for developing results, objectives, effectiveness measures (indicators), and data collection questionnaires. Identifying effectiveness measures for SWAPs not only improves conservation work, but also helps demonstrate to policy makers that the STWG program is leading to the outcomes intended by Congress and therefore is a good investment of public funds. We plan to use this report to inform our effectiveness measures.

As recommended by Groves and Game (2016), we also plan to pay particular attention to identifying indicators that may result in a go/no-go decision or serve as decision-making triggers for later actions in a conservation project. Nie and Schultz (2012) describe how such triggers can be used in an adaptive management context where these types of indicators can be predefined to result in specific actions when the indicator reaches an ecological or regulatory threshold, which once reached, may not be reversible, or more cautiously, to serve as a warning sign that a resource is in decline. For example, a trigger in a conservation project aimed at addressing salmon and steelhead recovery might be the component of the Snake River basin aggregate of wild- and natural-origin salmon and steelhead that return to spawn in Idaho tributaries. We plan to include such trigger points in our monitoring plan for SWAP and to develop specific plans for management actions that will be initiated once trigger point thresholds are reached (e.g., Lindenmayer et al. 2013). Ultimately, what we choose to measure needs to be related to the overall objectives of the SWAP and within our sphere of influence (e.g., Groves and Game 2016).

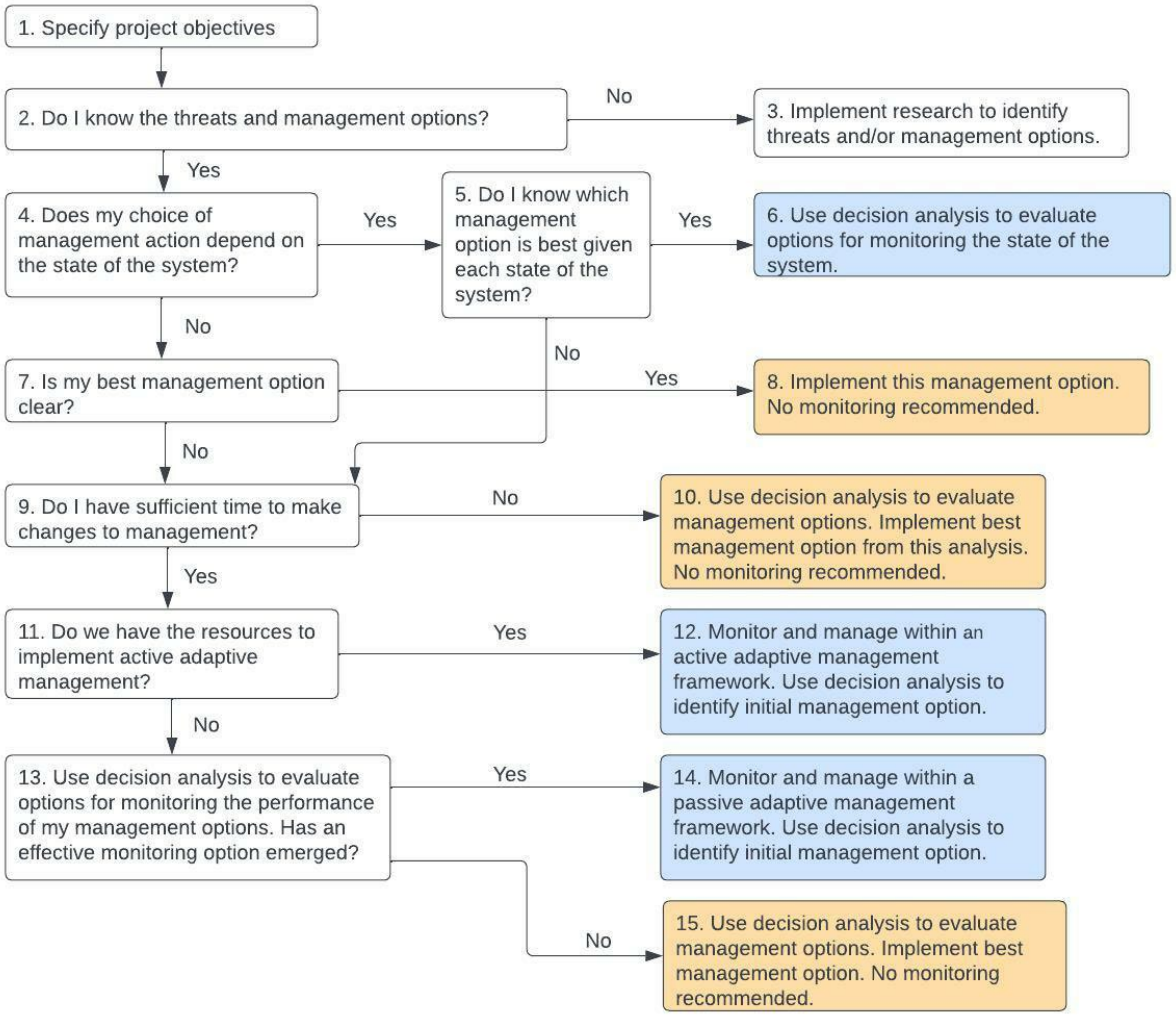


Fig. 4.2 Decision tree for helping decide whether and when to invest in monitoring conservation projects. Source: McDonald-Madden et al. (2010).

Learning is an important aspect of any monitoring program. As defined by Groves and Game (2016), "learning" in its simplest form can be defined as: a change in an understanding of, or relationship to the world (also see Evely et al. 2011). In a study that evaluated how learning by participants differs among projects with different levels and types of engagement, Evely et al. (2011) found that all participatory approaches to conservation projects fostered learning, learning outcomes were greatest when participants were involved in making project management decisions through open, participatory meetings of collaborators, and that higher levels of learning take place early in a project, which implies that projects need to invest in participatory processes at the outset.

From an environmental problem perspective, 3 types of learning have been defined: social, conceptual, and technical (Groves and Game 2016). **Social learning** refers to learning that happens as the result of a dialogue among stakeholders or through engaging new collaborators in different ways. **Conceptual learning** involves redefining a conservation

problem or developing new objectives in a conservation project. **Technical learning** in conservation refers to undertaking new or revised conservation actions that will help in achieving a project's objectives. We plan to use these types of learning to make adjustments to SWAP strategies and actions as a result of feedback from monitoring data.

Conservation Success Stories

As articulated at the beginning of this chapter, M&E play a critical role in assessing progress in implementing the strategies and actions of a conservation plan. The following wildlife summaries highlight a subset of conservation success stories that have occurred in part as a result of implementing actions identified in earlier SWAPs, and that provide examples of what we mean by the phrase "monitoring and evaluation for conservation impact." Primarily supported by the STWG program, conservation actions have focused on preventing new federal listings of threatened and endangered species and accelerating efforts to recover species that are already listed. An important component of these actions has been the collection of survey and monitoring data that provides critical information to the FWS to inform species listing determinations, and when appropriate, to provide scientific evidence that federal listing is not warranted.

Conservation Success Story: COLUMBIA SPOTTED FROG

The Columbia Spotted Frog (Great Basin population) lives in southwest Idaho and spends its entire life in water; the species faced the challenge of declining water quantity and quality. After a proposed designation as an endangered species, IDFG staff worked with federal agencies and private landowners in Owyhee County to protect the frogs by advising on and supporting sustainable grazing practices while building ponds to help Columbia Spotted Frogs thrive.

To further conserve the species and its habitat for the future, in 2003, IDFG bought a 101-acre (40.9 ha) conservation lease on the Sam Noble Springs wetlands to protect and ensure it remained suitable wetland habitat for the Columbia Spotted Frog.

As a result of these collaborative conservation efforts, this Columbia Spotted Frog population rebounded. In 2015, the FWS determined an ESA listing was not warranted due to a population rebound and efforts to protect habitat. As a result, Idaho retained full management responsibility for the Columbia Spotted Frog and avoided complicated federal land restrictions that come with the ESA.

The purchase of the conservation lease not only protected a key Columbia Spotted Frog population; it also allowed livestock grazing to continue on adjacent lands benefiting both wildlife and people on working lands.



Columbia Spotted Frog (cc) BY IDFG

Conservation Success Story: GREATER SAGE-GROUSE

After numerous petitions, the FWS determined that Greater Sage-Grouse warranted protection under the ESA based on habitat loss and inadequate regulatory mechanisms. In 2012, then-Governor Butch Otter convened Idaho's "Sage-Grouse Task Force" to develop an Idaho-specific sage-grouse conservation plan and address shortcomings outlined in the ESA listing petitions.

IDFG partnered with state and federal agencies to incorporate the updated conservation strategy into BLM and FS management plans. The state continued to collaborate with federal agencies to develop solutions for sage-grouse conservation in Idaho, which culminated in the 2015 final plan for sage-grouse conservation on federal lands.

Due in part to these efforts, the FWS in 2015 concluded that the sage-grouse did not require protections under the ESA, and Idaho retained full management authority for this iconic western bird.

By retaining state control, Idaho avoided potentially negative impacts to the many land-based industries across southern Idaho, such as livestock grazing, agriculture, and energy development. Greater Sage-Grouse also remains a favorite upland game bird that hunters enjoy pursuing each fall during a carefully managed hunting season.



Greater Sage-Grouse (cc) BY IDFG

Conservation Success Story: NORTHERN ROCKY MOUNTAIN FISHER

SWAP funding helped organize and implement a multiyear, multiorganization effort to better understand the habitat needs of Fishers in north-central Idaho. Prior to this, Fisher conservation had received little attention, and the animal's low population densities and association with mature, unlogged forests led many to believe future petitions for listing under the ESA were likely.

To address the knowledge gap of Fisher conservation and habitat use, IDFG initiated a project to learn more about the species' distribution and habitat requirements. DNA hair snaring and satellite radio collars were used to collect occurrence and movement data, and that information was used to show Fisher distribution and habitat preferences.

The effort provided valuable new information about Fishers and their habitat and distribution in Idaho that contributed to the FWS deciding that an ESA listing was not needed. Idaho retained management authority for the species and helped preserve timber-based jobs to the benefit of local economies in north-central Idaho.

Gaining a better understanding of this species by using best available science not only produced more knowledge about its habitat requirements; it also helped forest managers better understand the Fisher's needs and take that into consideration when planning forest management projects.



Fisher (cc) BY Holly Kuchera, Shutterstock

Conservation Success Story: PYGMY RABBIT

Pygmy Rabbits live in sagebrush habitat that faces numerous challenges in Idaho (see Chapter 3). Perceived declines in Pygmy Rabbit populations due to loss and degradation of their rangewide habitat triggered a 2003 petition for ESA protection. That same year, IDFG and collaborators at the University of Idaho started a 5-year project in southern and eastern Idaho to study Pygmy Rabbit populations and provide data on their range and dispersal.

Surveys were conducted to determine Pygmy Rabbit occurrence, and genetic studies were conducted to validate the species' presence based on analysis of fecal pellet samples. In general, Pygmy Rabbits in Idaho were found to be more widespread and populations better connected than previously thought.

This information directly contributed to the 2010 decision by the FWS to not list the rabbit under the ESA, thereby avoiding unnecessary federal oversight that could have negatively impacted land-based economies across southern and eastern Idaho, such as livestock grazing, agricultural production, and energy development.

Continuing sagebrush habitat work across southern Idaho benefits Pygmy Rabbits, as well as Greater Sage-Grouse, Mule Deer, Slickspot Peppergrass and other important plant and animal species that rely on this habitat.



Pygmy Rabbit (cc) BY Rita Dixon/IDFG

Conservation Success Story: SOUTHERN IDAHO GROUND SQUIRREL

Southern Idaho Ground Squirrels are found in lower-elevation, shrub-steppe habitat of the lower Weiser and Payette river basins and are native to only 4 Counties (Adams, Gem, Payette, and Washington) in southwest Idaho.

The FWS was petitioned to list the species under the ESA in 2001, and that same year, IDFG began a 5-year survey in collaboration with the College of Idaho to better document Southern Idaho Ground Squirrel distribution and abundance. In addition, a Candidate Conservation Agreement with Assurances (CCAA) encompassing almost 10% of the squirrel's known range was completed between the State of Idaho, private landowners, and FWS.

Surveys generated distribution and abundance information showing that the Southern Idaho Ground Squirrel existed throughout most of its historical range and populations appeared stable. Combined with the CCAA, the efforts directly contributed to the 2015 decision by FWS that Southern Idaho Ground Squirrels did not warrant ESA protection.

Idaho retained management authority, thereby alleviating the need for costly conservation actions, and avoiding potential legal challenges. Federal regulations associated with an ESA-listed species could have been detrimental to private landowners and agricultural producers who operate on lands that have Southern Idaho Ground Squirrel occupied habitat.



Southern Idaho Ground Squirrel (cc) BY IDFG

Conservation Success Story: WOLVERINE

In 2015, IDFG partnered with a diverse group including neighboring state fish and wildlife agencies, federal, tribal, university, and NGOs on a vast project using motion-triggered cameras to establish a baseline of Wolverine distribution across the western US.

The magnitude of the project, both in terms of geographic scale and collaboration between agencies and organizations, was unprecedented, and the collaborative effort successfully documented the presence of Wolverines across their known range encompassing nearly 55,000 mi^2 (142,449 km^2).

Following 2 petitions for listing (1994 and 2000), listing proposals, proposed listing withdrawals, not warranted findings, and a decades-long series of court actions, the Wolverine has most recently been listed as threatened in the contiguous US as a DPS under the ESA.

Regardless of this latest decision, IDFG continues to lead in providing the best available science to inform the conservation of this species by repeating and expanding the multistate camera survey on a regular basis, participating in US–Canada population genetics work, and supporting additional research on the relationship between Wolverine behavior and winter recreation. The Management Plan for the Conservation of Wolverines in Idaho 2014–2019 (IDFG 2014), prepared primarily to lead state efforts to maintain viable populations of Wolverines in Idaho, has recently been updated and incorporated into the *Management Plan for the Conservation of Fisher, Wolverine, and Canada Lynx in Idaho 2023–2028* (IDFG 2023b).



Wolverine (cc) BY Andrea Bohl, Pixabay

Conservation Success Story: BONNEVILLE CUTTHROAT TROUT

Within the Idaho portion of their range, Bonneville Cutthroat Trout are exclusively found within the Bear River drainage in southeastern Idaho. Historic population declines caused by irrigation for agriculture, hydropower, grazing, overfishing, and competition from introduced fish species, such as Brook Trout, led biologists in the 1950s to mistakenly believe the species had been extirpated from the state.

Federal, state, and tribal wildlife agencies, along with NGOs such as Trout Unlimited and Western Native Trout Initiative worked for decades to implement a multitude of conservation and restoration projects to benefit Bonneville Cutthroat Trout.

To improve the distribution and abundance of these fish, IDFG continues to work with many partners on habitat restoration, population surveys, nonnative trout removal, irrigation fish screens, and removing migration barriers. Since 2011, more than 200,000 8-inch Bonneville Cutthroat Trout have been stocked under IDFG's conservation aquaculture program, which is helping to reestablish the species in several streams.

As a result of these actions, wild-origin fish now make up most of the Bonneville Cutthroat Trout in Bear Lake, and Idaho's fishing regulations were changed in 2022 to allow harvest of both hatchery and wild fish for the first time in decades. While the species still faces many challenges, conservation actions have stabilized its populations throughout Idaho.



Bonneville Cutthroat Trout (cc) BY Kirk Dahle

Chapter 5 Coordination & Review

Coordination & Public Participation

All wildlife in Idaho belongs to the citizens of the state. It is held in trust by the state for the benefit of its people. The Idaho Fish and Game Commission (hereafter commission) holds most of the regulatory authority for fish and wildlife management. The commission's purpose is to implement the wildlife policy of the state consistent with the provisions of state law.

In addition to implementing wildlife policy as directed by the commission, IDFG is the agency vested with overall responsibility and accountability for the SWAP. Congress requires state fish and wildlife agencies to coordinate with federal, state, and local agencies and American Indian tribes that manage significant areas of land or water within the state, or administer programs that significantly affect the conservation of SWAP species or their habitats, during the development, implementation, review, and revision of their SWAPs (Element 7). In addition to coordination with appropriate agencies and entities described above, states are also required to provide for broad public participation in the process of development, revision, and implementation of their SWAPs (Element 8).

To that end, we conducted a stakeholder[a] analysis to ensure that we both involved the appropriate stakeholders in the SWAP planning process and that the revised plan was reflective of the diverse social–ecological setting in Idaho. As defined by Reed et al. (2009), a stakeholder analysis is a process that: (1) defines aspects of a social and natural phenomenon affected by a decision or action; (2) identifies individuals, groups, and organizations who are affected by or can affect those parts of the phenomenon; and (3) prioritizes these individuals and groups for involvement in the decision-making process. Because natural resource management often deals with competing interests of various stakeholders (they use the same resources for different purposes), understanding the different perspectives of interested or affected parties is essential (Reed et al. 2009).

In identifying and categorizing stakeholders for the SWAP, we included multiple staff levels within IDFG as well as a wide range of external stakeholders, with roles and involvement appropriately scaled to the stakeholder. Examples of stakeholder types included technical experts such as consultants or academics, NGOs, special interest groups, key partners we expect to collaborate with in the future, agency and tribal biologists who can help develop alternative management strategies, or decision-makers who can help build ownership for the

[a] Stakeholders include those individuals, groups, or institutions that have a vested interest in or can influence the natural resources of Idaho or that potentially will be affected by SWAP activities and have something to gain or lose if conditions change or stay the same. Stakeholders are all those who need to be considered in achieving SWAP revision goals and whose participation and support are crucial to its success.

SWAP. We also gathered broad-based input from stakeholders through the public participation process (e.g., individuals, interest groups, communities, recreationists).

To address Element 7 coordination, we created a list of all state, federal, local government, and tribal partners relevant to the SWAP revision effort (Appendix 6). In recognizing the importance of cross-boundary conservation, we also included adjacent state and provincial fish and wildlife agencies. We invited representatives to participate in a SWAP revision virtual meeting held on June 28, 2022. During the virtual meeting, we described how the revised plan differs from the 2015 plan, explained the purpose and timeline of the revision, and provided an overview of the structure and format of the new plan. We acknowledged that because the plan was actively being revised, we could not present a draft plan for review during the meeting. However, during the meeting, we invited comment and feedback on considerations such as the general structure of the revised plan, information missed in the 2015 plan, elements no longer needed, important features to retain, and ultimately how the plan can most effectively help us to achieve mutual conservation goals. We recorded the meeting and made the recording available to everyone on the original invitee list via a follow-up email. In addition to this interactive opportunity to provide general feedback on the revision, we offered partners an additional opportunity to provide specific comment on the details of the plan during the public review period scheduled for August 2022.

Throughout the course of the SWAP revision effort, we hosted various ad hoc peer-review meetings and workshops to enlist the help of key partners, stakeholder groups, and individuals—both governmental and nongovernmental (e.g., Idaho At-Risk Animal Workshop held in conjunction with the 2020 Idaho Chapter of The Wildlife Society Annual Meeting, Idaho Bird Conservation Partnership, Idaho Partners in Amphibian and Reptile Conservation, Idaho Bat Working Group, BLM Idaho, Idaho Rangeland Conservation Partnership, and the Idaho Army National Guard). In addition, we enlisted the help of technical experts (e.g., academics, biologists) to assist in our efforts to assess the conservation status of species and current range extent in Idaho. We also participated in other efforts organized by partners that had relevance to one or more required elements for SWAP planning or implementation (e.g., USGS refugia mapping effort, NABat coordination, Western Partners in Amphibian and Reptile Conservation).

To address Element 8, public participation, we hosted a 30-day public comment period on the IDFG website in August 2022 where anyone could provide input to our plan. We developed a set of questions designed to gauge the level of public support for the SWAP (i.e., generally support, support with concerns, or do not support). We also included a comments box where the respondent could provide additional information. In addition, the online application included the option to upload files for those who preferred to provide a formal letter or additional documentation (e.g., formal organizations). We also made every effort to accommodate those stakeholders who wished to convey their input verbally over the phone or in person. We also encouraged public participation by sending a targeted email announcing the public comment period to a comprehensive list of known entities we had coordinated with in the past as well as newly identified stakeholders (Appendix 7).

Following approval of the SWAP by the FWS, we anticipate and will encourage ongoing coordination with all interested parties. This will help ensure the development of well-designed and implemented conservation actions that truly benefit SWAP species and the habitats they depend on.

Plan Review & Revision

In the enacting legislation for SWAPs, Congress directed the states to describe how the plan will be reviewed, and if necessary, revised within the next 10 years (Element 6). Guidance for future plan review and revisions is outlined in a joint 2017 FWS–AFWA memorandum (FWS and AFWA 2017), which identifies the process and specific procedural requirements for the 3 revision types: comprehensive, major, and minor. Following this guidance, which was designed to provide a flexible framework for states to incorporate new information and changing circumstances into their plans, we plan to review and revise our SWAP as often as is useful with a comprehensive review and revision slated for no later than January 2033.

Fundamental to any SWAP revision is a review of the conservation status of native species and ecosystems. To determine relative risk for plants, animals, and ecosystems, we will continue to use NatureServe's standardized approach to conservation status assessment (Faber-Langendoen et al. 2012; Master et al. 2012). This approach involves gathering information from the literature and compiling field data from an array of sources for each of the core factors (e.g., range extent, environmental specificity, area of occupancy, number of occurrences, population size, threats, intrinsic vulnerability, and trend) and then assigning a controlled value score to each factor using a tool called the "Rank Calculator" (NatureServe 2020). The resulting conservation status rank (i.e., "S-Rank" for Idaho) can be used as a criterion when selecting SWAP species in future revisions for our plan. NatureServe's methods continue to evolve, and the release of a new online version is expected sometime in the next year or two.

In advance of the planned comprehensive review and revision, we intend to further develop existing species catalog pages on the IDFG website (https://idfg.idaho.gov/species/) to provide additional information, similar to what was included in the species conservation status assessment appendix in the 2015 SWAP (https://idfg.idaho.gov/sites/default/files/swap-appendix-f.pdf). For example, in addition to the core factors used to assess status (e.g., range extent, area of occupancy, population size, trend, threats), we will also include information on habitat and ecology, a summary of conservation actions, and additional information sources.

Example data sources that we can use to obtain information needed to assess species status include the North American Bat Monitoring Program (NABat; status and trends, occupancy), North American Breeding Bird Survey (BBS; status and trends of North American bird populations), Pacific Northwest Bumble Bee Atlas (PNW Bumble Bee Atlas; tracks bumble bees), and Partners in Flight (PIF) Population Estimates Database (the latest landbird population estimates for Idaho). We will continue to explore available and emerging data sources for future SWAP revisions.

The Idaho Native Plant Society (INPS) hosts the biennial Rare Plant Conference (RPC), where the status of a subset of Idaho's rare plants is updated. Leading up to these conferences, new information about plant species is presented and discussed at Regional Rare Plant Working Group (RPWG) meetings and used to review and update ranks. Results of the RPWG status assessments are then shared and ratified at the RPC. Methods for ranking plants follow NatureServe's standardized methodology as described above. We will continue to coordinate with and support the INPS in its efforts to assess the status of plant species, subspecies, and varieties, and incorporate the resulting ranks into our database.

With respect to climate change, an AFWA work group recently updated the 2009 *Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans & Other Management Plans* (AFWA 2009). We considered and included additional climate-related actions in our plan following the updated AFWA voluntary guidance on incorporating climate change into SWAPs (AFWA 2022). We will also continue to coordinate with the USGS Climate Adaptation Science Centers (CASCs), a partnership-driven program that teams scientists with natural and cultural resource managers and local communities to help fish, wildlife, water, land, and people to adapt to a changing climate.

Scientific and common names of vertebrates, invertebrates, and plants continue to change and will be updated to reflect the most current taxonomy and nomenclature published by the leading authority for each respective taxonomic group (e.g., American Fisheries Society, American Ornithological Society, Society for the Study of Amphibians and Reptiles, American Society of Mammalogists, Bats of the World, etc.). In addition, a persistent problem with many invertebrate groups is a lack of any common name at all. Recognizing that effective communication in something as simple as a common name can help advance science and conservation, we plan to create and submit proposals for new names of insect species found in Idaho to the Entomological Society of America's Better Common Names Project. Similarly, although the USDA PLANTS Database provides a standardized list of accepted nomenclature, taxonomy, and symbols for vascular plants, mosses, liverworts, hornworts, and lichens of the US and its territories, plant names used by the botany community in Idaho often do not adhere to this recognized standard. A necessary step toward greater consistency in plant names in Idaho is to work with INPS, the National Plant Data Team, Flora of North America Association, and the Biota of North America Program (BONAP) (Kartesz and BONAP 2015) to resolve these issues.

We will also assess the value of continuing to use the Conservation Measures Partnership Direct Threats and Actions Classifications (CMP 2016b) as a common nomenclature for describing challenges and actions in SWAP. The use of such a framework can facilitate cross-project learning and allows us to create general summaries for broader organizational purposes. As new information becomes available on challenges and actions, we will update relevant sections of our SWAP to reflect these changes.

The methodology and literature on prioritizing species for conservation action (i.e., that can be used to inform the selection of SWAP species), continues to evolve. We intend to stay abreast of current methodology for consideration in revising our criteria and process for identifying SWAP species.

We expect that in the next 10 years, land cover data will continue to improve. For example, the National Land Cover Database (NLCD), which is updated every 5 years, is the definitive land cover database for the US. In addition, the LANDFIRE 2020 Update (LF 2.2.0) represents the 2nd step in moving toward an annual update in which disturbances from the prior year are represented in current year products. The IDFG Wildlife Research Program's fine-scale vegetation model will also provide data at a scale that can be used to identify habitat associations for many SWAP species. Taken together, these spatial products can help inform habitat extent and condition, as well as extent of disturbance and fire regime, in future SWAP revisions.

We plan to continue to coordinate with relevant federal, state, local agencies, and American Indian tribes as well as provide for public input and partner involvement. To ensure that the public has ample opportunity to review and comment on any substantial future revisions of the plan, we will initiate a formal public comment period for both major and comprehensive review and revisions.

Appendixes

Appendix 1: Common and Scientific Names of Animal Species in this Plan. [I] = Nonnative (Introduced or Invasive) and Established in Idaho.

Common name	Scientific name
a caddisfly	*Apatania barri*
a caddisfly	*Arctopora salmon*
a caddisfly	*Glossosoma idaho*
a caddisfly	*Goereilla baumanni*
a caddisfly	*Homophylax auricularis*
a caddisfly	*Limnephilus challisa*
a caddisfly	*Manophylax annulatus*
a caddisfly	*Philocasca banksi*
a caddisfly	*Psychoglypha smithi*
a caddisfly	*Rhyacophila oreia*
a caddisfly	*Rhyacophila robusta*
a cave obligate harvestman	*Speleomaster lexi*
a cave obligate harvestman	*Speleomaster pecki*
a cave obligate mite	*Flabellorhagidia pecki*
a click beetle	*Beckerus barri*
a flower moth	*Schinia edwardsii*
a grasshopper	*Argiacris amissuli*
a grasshopper	*Argiacris keithi*
a grasshopper	*Argiacris militaris*
a grasshopper	*Barracris petraea*
a harvestman	*Acuclavella cosmetoides*
a harvestman	*Acuclavella shoshone*
a harvestman	*Acuclavella. merickeli*
a harvestman	*Acuclavella. quattuor*
a harvestman	*Acuclavella sheari*
a leafcutting bee	*Ashmeadiella sculleni*
a mayfly	*Ameletus tolae*
a mayfly	*Paraleptophlebia jenseni*
a mayfly	*Paraleptophlebia traverae*
a metallic wood-boring beetle	*Chrysobothris horningi*
a metallic wood-boring beetle	*Chrysobothris idahoensis*
a miner bee	*Calliopsis barri*
a miner bee	*Perdita barri*
a miner bee	*Perdita wyomingensis sculleni*
a moth	*Protogygia arena*
a skiff beetle	*Hydroscapha redfordi*
a spur-throat grasshopper	*Melanoplus aix*
a spur-throat grasshopper	*Melanoplus alector*
a spur-throat grasshopper	*Melanoplus artemisiae*
a spur-throat grasshopper	*Melanoplus baldi*
a spur-throat grasshopper	*Melanoplus cinereus*
a spur-throat grasshopper	*Melanoplus daemon*
a spur-throat grasshopper	*Melanoplus digitifer*
a spur-throat grasshopper	*Melanoplus idaho*
a spur-throat grasshopper	*Melanoplus illash*
a spur-throat grasshopper	*Melanoplus indigens*
a spur-throat grasshopper	*Melanoplus ixalus*
a spur-throat grasshopper	*Melanoplus latah*
a spur-throat grasshopper	*Melanoplus lemhiensis*
a spur-throat grasshopper	*Melanoplus lemurus*
a spur-throat grasshopper	*Melanoplus lolo*
a spur-throat grasshopper	*Melanoplus marshallii*
a spur-throat grasshopper	*Melanoplus militaris*
a spur-throat grasshopper	*Melanoplus obex*
a spur-throat grasshopper	*Melanoplus ohadi*
a spur-throat grasshopper	*Melanoplus papoosense*
a spur-throat grasshopper	*Melanoplus papyraedus*
a spur-throat grasshopper	*Melanoplus payettei*
a spur-throat grasshopper	*Melanoplus phobetico*

Common name	Scientific name
a spur-throat grasshopper	*Melanoplus pyro*
a spur-throat grasshopper	*Melanoplus salmonis*
a spur-throat grasshopper	*Melanoplus shoshoni*
a spur-throat grasshopper	*Melanoplus sol*
a spur-throat grasshopper	*Melanoplus stipes*
a spur-throat grasshopper	*Melanoplus tendoyense*
a spur-throat grasshopper	*Melanoplus tincupense*
a spur-throat grasshopper	*Melanoplus trigeminus*
a spur-throat grasshopper	*Melanoplus washingtonius*
a spur-throat grasshopper	*Melanoplus xenus*
a spur-throat grasshopper	*Melanoplus zeus*
a tiger beetle	*Cicindela decemnotata montevolans*
a yellow-masked bee	*Hylaeus lunicraterius*
American Bittern	*Botaurus lentiginosus*
American Bullfrog	*Lithobates catesbeianus* [I]
American Golden-Plover	*Pluvialis dominica*
American Marten	*Martes americana*
American Pika	*Ochotona princeps*
American Pipit	*Anthus rubescens*
American White Pelican	*Pelecanus erythrorhynchos*
amphipods	Malacostraca: Amphipoda
an ant-like flower beetle	*Amblyderus owyhee*
Baird's Sandpiper	*Calidris bairdii*
Banbury Springs Limpet	*Idaholanx fresti*
beetles	Insecta: Coleoptera
Bear Lake Sculpin	*Cottus extensus*
Bear Lake Springsnail	*Pyrgulopsis pilsbryana*
Bear Lake Whitefish	*Prosopium abyssicola*
Beartooth Copper	*Lycaena phlaeas arctodon*
Big Brown Bat	*Eptesicus fuscus*
Bighorn Sheep	*Ovis canadensis*
Black Rosy-Finch	*Leucosticte atrata*
Black Swift	*Cypseloides niger*
Black Tern	*Chlidonias niger*
Blind Cave Leiodid Beetle	*Glacicavicola bathyscioides*
Bliss Rapids Snail	*Taylorconcha serpenticola*
Blue-gray Taildropper	*Prophysaon coeruleum*
Bobolink	*Dolichonyx oryzivorus*
Boise Snowfly	*Utacapnia nedia*
Bonneville Cisco	*Prosopium gemmifer*
Bonneville Cutthroat Trout	*Oncorhynchus virginalis utah*
Bonneville Whitefish	*Prosopium spilonotus*
Boreal Owl	*Aegolius funereus*
Boulder Pile Mountainsnail	*Oreohelix jugalis*
Brewer's Sparrow	*Spizella breweri*
Brook Trout	*Salvelinus fontinalis* [I]
Bruneau Dune Tiger Beetle	*Cicindela waynei*
Bruneau Hot Springsnail	*Pyrgulopsis bruneauensis*
Bull Trout	*Salvelinus confluentus*
Burbot	*Lota lota*
Burrowing Owl	*Athene cunicularia*
caddisflies	Insecta: Trichoptera
California Gull	*Larus californicus*
Canada Jay	*Perisoreus canadensis*
Canada Lynx, Canadian Lynx	*Lynx canadensis*
Canyon Bat	*Parastrellus hesperus*
Caribou	*Rangifer tarandus*
Cascades Needlefly	*Megaleuctra kincaidi*
Caspian Tern	*Hydroprogne caspia*
Cassia Crossbill	*Loxia sinesciuris*
Cassin's Finch	*Haemorhous cassinii*
Cedar Sculpin	*Cottus schitsuumsh*
Chinook Salmon	*Oncorhynchus tshawytscha*
Cinnamon Teal	*Spatula cyanoptera*
Clark's Grebe	*Aechmophorus clarkii*
Clark's Nutcracker	*Nucifraga columbiana*

Common name	Scientific name
Clearwater Roachfly	*Soliperla salish*
Coeur d'Alene Salamander	*Plethodon idahoensis*
Columbia Oregonian	*Cryptomastix hendersoni*
Columbia Primitive Minnow Mayfly	*Parameletus columbiae*
Columbia River Tiger Beetle	*Cicindela columbica*
Columbia Spotted Frog	*Rana luteiventris*
Common Carp	*Cyprinus carpio* [I]
Common Gartersnake	*Thamnophis sirtalis*
Common Loon	*Gavia immer*
Common Nighthawk	*Chordeiles minor*
Constricted Fairy Shrimp	*Branchinecta constricta*
Costate Mountainsnail	*Oreohelix idahoensis*
Cottonwood Oregonian	*Cryptomastix populi*
Dark Kangaroo Mouse	*Microdipodops megacephalus*
Deep Slide Mountainsnail	*Oreohelix intersum*
deer	genus *Odocoileus*
Deseret Mountainsnail	*Oreohelix peripherica*
Desert Horned Lizard	*Phrynosoma platyrhinos*
Desert Valvata	*Valvata utahensis*
dipterans	Insecta: Diptera
Duckhead Snowfly	*Capnura anas*
Dunlin	*Calidris alpina*
Dwarf Shrew	*Sorex nanus*
Eared Grebe	*Podiceps nigricollis*
Elk, Wapiti	*Cervus canadensis*
Evening Grosbeak	*Coccothraustes vespertinus*
fairy shrimp	Branchiopoda: Anostraca
Ferruginous Hawk	*Buteo regalis*
Fisher	*Pekania pennanti*
Franklin's Gull	*Leucophaeus pipixcan*
freshwater mussels	Mollusca: Bivalvia: Unionoida
Fringed Myotis	*Myotis thysanodes*
Giant Palouse Earthworm	*Driloleirus americanus*
Gillette's Checkerspot	*Euphydryas gillettii*
Golden Eagle	*Aquila chrysaetos*
Grasshopper Sparrow	*Ammodramus savannarum*
Gray-crowned Rosy-Finch	*Leucosticte tephrocotis*
Great Basin Collared Lizard	*Crotaphytus bicinctores*
Great Basin Spadefoot	*Spea intermontana*
Great Gray Owl	*Strix nebulosa*
Greater Sage-Grouse	*Centrocercus urophasianus*
Greater Yellowlegs	*Tringa melanoleuca*
Green Sucker	*Pantosteus virescens*
Grizzly Bear, Brown Bear	*Ursus arctos*
Harlequin Duck	*Histrionicus histrionicus*
harvestman	genus *Acuclavella* or *Speleomaster*
High Country Bumble Bee	*Bombus kirbiellus*
Hoary Bat	*Lasiurus cinereus*
Hoary Marmot	*Marmota caligata*
Idaho Amphipod	*Stygobromus idahoensis*
Idaho Dunes Tiger Beetle	*Cicindela arenicola*
Idaho Forestfly	*Soyedina potteri*
Idaho Giant Salamander	*Dicamptodon aterrimus*
Idaho Lava Tube Millipede	*Idagona westcotti*
Idaho Point-headed Grasshopper	*Acrolophitus pulchellus*
Idaho Snowfly	*Capnia zukeli*
Kit Fox	*Vulpes macrotis*
Lake Chub	*Couesius plumbeus*
Lava Rock Mountainsnail	*Oreohelix waltoni*
Least Sandpiper	*Calidris minutilla*
Leopard Dace	*Rhinichthys falcatus*
Lesser Yellowlegs	*Tringa flavipes*
Lewis's Woodpecker	*Melanerpes lewis*
Lined June Beetle	*Polyphylla devestiva*
Little Brown Myotis	*Myotis lucifugus*
Loggerhead Shrike	*Lanius ludovicianus*

Common name	Scientific name
Lolo Mayfly	*Caurinella idahoensis*
Lolo Sallfly	*Sweltsa durfeei*
Long-billed Curlew	*Numenius americanus*
Long-billed Dowitcher	*Limnodromus scolopaceus*
Long-eared Myotis	*Myotis evotis*
Long-legged Myotis	*Myotis volans*
Lyrate Mountainsnail	*Oreohelix haydeni*
Marbled Disc	*Discus marmorensis*
Marbled Godwit	*Limosa fedoa*
mayflies	Insecta: Ephemeroptera
Merriam's Ground Squirrel	*Urocitellus canus*
Mission Creek Oregonian	*Cryptomastix magnidentata*
Monarch Butterfly	*Danaus plexippus*
Moose	*Alces alces*
Morrison Bumble Bee	*Bombus morrisoni*
Mountain Quail	*Oreortyx pictus*
Mountain Pine Beetle	*Dendroctonus ponderosae*
Mountain Whitefish	*Prosopium williamsoni*
mountainsnail	genus *Oreohelix*
Mule Deer	*Odocoileus hemionus*
Nimapuna Disc	*Anguispira nimapuna*
North American Beaver	*Castor canadensis*
Northern Alligator Lizard	*Elgaria coerulea*
Northern Bog Lemming	*Synaptomys borealis*
Northern Idaho Ground Squirrel	*Urocitellus brunneus*
Northern Leatherside Chub	*Lepidomeda copei*
Northern Leopard Frog	*Lithobates pipiens*
Northern Pintail	*Anas acuta*
Olive-sided Flycatcher	*Contopus cooperi*
Pacific Lamprey	*Entosphenus tridentatus*
Pallid Bat	*Antrozous pallidus*
Palouse Snowfly	*Isocapnia palousa*
Papillose Taildropper	*Prophysaon dubium*
Pectoral Sandpiper	*Calidris melanotos*
Pilose Crayfish	*Pacifastacus gambelii*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Pixie Pebblesnail	*Fluminicola minutissimus*
Pronghorn	*Antilocapra americana*
Pygmy Rabbit	*Sylvilagus idahoensis*
Pygmy Short-Horned Lizard	*Phrynosoma douglasii*
Pygmy Whitefish	*Prosopium coulterii*
Rainbow Trout	*Oncorhynchus mykiss*
Raptor Fairy Shrimp	*Branchinecta raptor*
Red-necked Phalarope	*Phalaropus lobatus*
Ring-billed Gull	*Larus delawarensis*
Rocky Mountain Axetail	*Securicauda hermani*
Rocky Mountain Goat	*Oreamnos americanus*
Rocky Mountain Parnassian	*Parnassius smintheus*
Rocky Mountain Tailed Frog	*Ascaphus montanus*
Rocky Mountainsnail	*Oreohelix strigosa*
Sage Thrasher	*Oreoscoptes montanus*
Sagebrush Sparrow	*Artemisiospiza nevadensis*
Salmon Oregonian	*Cryptomastix harfordiana*
Salmon River Pebblesnail	*Fluminicola gustafsoni*
Sanderling	*Calidris alba*
Sandhill Crane	*Antigone canadensis*
Selway Forestsnail	*Allogona lombardii*
Semipalmated Plover	*Charadrius semipalmatus*
Semipalmated Sandpiper	*Calidris pusilla*
Seven Devils Mountainsnail	*Oreohelix hammeri*
Sharp-tailed Grouse	*Tympanuchus phasianellus*
Short-eared Owl	*Asio flammeus*
Shortface Lanx	*Fisherola nuttalli*
Shortspire Pondsnail	*Ladislavella idahoensis*
Shoshone Sculpin	*Cottus greenei*
Silver-haired Bat	*Lasionycteris noctivagans*

Common name	Scientific name
Skade's Jumping-slug	*Hemphillia skadei*
Slimy Sculpin	*Cottus cognatus*
snails	Mollusca: Gastropoda
Snake River Physa	*Physella natricina*
Snake River Pilose Crayfish	*Pacifastacus connectens*
Sockeye Salmon	*Oncorhynchus nerka*
Solitary Sandpiper	*Tringa solitaria*
Southern Idaho Ground Squirrel	*Urocitellus endemicus*
spur-throat grasshopper	genus *Melanoplus*
Spotted Bat	*Euderma maculatum*
Spruce Grouse	*Canachites canadensis*
steelhead	*Oncorhynchus mykiss*
Stilt Sandpiper	*Calidris himantopus*
stoneflies	Insecta: Plecoptera
Straight Snowfly	*Capnia lineata*
Subalpine Mountainsnail	*Oreohelix subrudis*
Suckley Cuckoo Bumble Bee	*Bombus suckleyi*
tadpole shrimp	Branchiopoda: Notostraca
Thin-ribbed Mountainsnail	*Oreohelix tenuistriata*
Tiny Forestfly	*Malenka tina*
Townsend's Big-eared Bat	*Corynorhinus townsendii*
Trumpeter Swan	*Cygnus buccinator*
Umatilla Willowfly	*Taenionema umatilla*
Unexpected Pebblesnail	*Taylorconcha insperata*
Utah Sallfly	*Gaufinia gaufini*
Western Bumble Bee	*Bombus occidentalis*
Western Grebe	*Aechmophorus occidentalis*
Western Groundsnake	*Sonora semiannulata*
Western Pearlshell	*Margaritifera falcata*
Western Ridged Mussel	*Gonidea angulata*
Western Sandpiper	*Calidris mauri*
Western Small-footed Myotis	*Myotis ciliolabrum*
Western Spotted Skunk	*Spilogale gracilis*
Western Toad	*Anaxyrus boreas*
White Sturgeon	*Acipenser transmontanus*
White-faced Ibis	*Plegadis chihi*
White-headed Woodpecker	*Dryobates albolarvatus*
Whitepine Mountainsnail	*Oreohelix hemphilli*
Whorled Mountainsnail	*Oreohelix vortex*
Wiest's Primrose Sphinx	*Euproserpinus wiesti*
Wilson's Warbler	*Cardellina pusilla*
Wolverine	*Gulo gulo*
Wood River Sculpin	*Cottus leiopomus*
Woodhouse's Toad	*Anaxyrus woodhousii*
Wyoming Ground Squirrel	*Urocitellus elegans nevadensis*
Yellow Bumble Bee	*Bombus fervidus*
Yellow-billed Cuckoo	*Coccyzus americanus*
Yellowstone Cutthroat Trout	*Oncorhynchus virginalis bouvieri?*
Yuma Myotis	*Myotis yumanensis*

Appendix 2: Common and Scientific Names of Plant Species in this Plan Listed Alphabetically by Common Name. [I] = Nonnative (Introduced or Invasive) and Established in Idaho.

Common name	Scientific name
Alaska Wheatgrass	*Elymus violaceus* (Hornem.) J. Feilberg
alder	*Alnus* Mill.
Alder Buckthorn	*Rhamnus alnifolia* L'Hér.
Alfalfa, Lucerne	*Medicago sativa* L. [I]
Alkali Cordgrass	*Sporobolus hookerianus* P.M. Peterson & Saarela
Alkali Muhly, Scratchgrass	*Muhlenbergia asperifolia* (Nees & Meyen ex Trin.) Parodi
Alkali Plantain, Saline Plantain	*Plantago eriopoda* Torr.
Alkali Sacaton, Hairgrass Dropseed	*Sporobolus airoides* (Torr.) Torr.
alkaligrass	*Puccinellia* Parl.
Alkali-mallow	*Malvella leprosa* (Ortega) Krapov.
Alkaline Primrose	*Primula alcalina* Cholewa & D.M. Hend.
Alpine Aster	*Oreostemma alpigenum* (Torr. & A. Gray) Greene
Alpine Bluegrass	*Poa alpina* L.
Alpine Fescue	*Festuca brachyphylla* Schult. & Schult. f.
Alpine Hulsea or Alpinegold	*Hulsea algida* A. Gray
Alpine Knotweed, Pokeweed	*Koenigia phytolaccifolia* (Meisn. ex Small) T.M. Schust. & Reveal
Alpine Mitrewort, Five-stamened Mitrewort	*Pectiantia pentandra* (Hook.) Rydb.
Alpine Prickly Currant, Mountain Gooseberry	*Ribes montigenum* McClatchie
alumroot; heuchera	*Heuchera* L.
American Elm	*Ulmus americana* L. [I]
American Licorice, Wild Licorice	*Glycyrrhiza lepidota* Pursh
American Mannagrass	*Glyceria grandis* S. Watson
American or Olney's Three-square	*Schoenoplectus americanus* (Pers.) Volkart
American Saw-wort	*Saussurea americana* Eaton
American Thorough-Wax	*Bupleurum americanum* J.M. Coult. & Rose
angelica	*Angelica* L.
Annual Hairgrass	*Deschampsia danthonioides* (Trin.) Benth.
Antelope-brush, Bitter-brush	*Purshia tridentata* (Pursh) DC.
antelope-brush; bitter-brush	*Purshia* DC. ex Poir.
apple; crabapple	*Malus* Mill. [I]
Apricot	*Prunus armeniaca* L.
Arctic Willow	*Salix arctica* Pall.
arnica	*Arnica* L.
arrow-grass	*Triglochin* Riv. ex L.
arrowhead	*Sagittaria* Ruppius ex L.
Arrowleaf Balsamroot	*Wyethia sagittata* (Pursh) Mabb.
Arrowleaf Groundsel	*Senecio triangularis* Hook.
Arroyo Willow	*Salix lasiolepis* Benth.
Asotin Milk-vetch	*Astragalus asotinensis* Björk & Fishbein
aster	*Doellingeria* Nees
aster	*Eurybia* (Cass.) Cass.
aster	*Symphyotrichum* Nees
Awlwort	*Subularia aquatica* L.
Baldhip or Little Wild Rose	*Rosa gymnocarpa* Nutt.
Baltic Rush	*Juncus balticus* Willd.
Barestemmed Biscuit-root	*Lomatium nudicaule* (Nutt.) J.M. Coult. & Rose
barley	*Hordeum* L.
Barnyard-grass	*Echinochloa crus-galli* (L.) P. Beauv. [I]
Basin Big Sagebrush	*Artemisia tridentata* subsp. *tridentata*
Beaked Ditch-grass, Widgeon-grass	*Ruppia maritima* L.
Bearberry Honeysuckle, Black Twin-berry	*Lonicera involucrata* (Richardson) Banks ex Spreng.
Beardless Wildrye	*Leymus triticoides* (Buckley) Pilg.
beardtongue; penstemon	*Penstemon* Schmidel
Beargrass, Western Turkey-beard	*Xerophyllum tenax* (Pursh) Nutt.
Beautiful Bryum Moss	*Bryum calobryoides* J.R. Spence
Bebb's Willow	*Salix bebbiana* Sarg.
bedstraw; cleavers	*Galium* L.
beggar-ticks; bur-marigold; sticktight	*Bidens* L.
Bellard's Kobresia	*Carex myosuroides* Vill.

Common name	Scientific name
bentgrass	*Agrostis* L.
Big Sagebrush	*Artemisia tridentata* Nutt.
Big, Alkali, or Nevada Bluegrass	*Poa secunda* subsp. *juncifolia* (Scribn.) Soreng
Big-head Clover	*Trifolium macrocephalum* (Pursh) Poir.
Bigtooth Maple	*Acer grandidentatum* Nutt.
bilberry; blueberry; huckleberry; cranberry	*Vaccinium* L.
biscuit-root, lomatium	*Lomatium* Raf.
bistort	*Bistorta* (L.) Scop.
Bitter Cherry	*Prunus emarginata* (Douglas ex Hook.) Eaton
Bittersweet, Climbing Nightshade, Felonwort, Blue Bindweed	*Solanum dulcamara* L. [I]
Black Alpine Sedge	*Carex nigricans* C.A. Mey.
Black Cottonwood	*Populus tristis* Fisch.
Black Greasewood	*Sarcobatus vermiculatus* (Hook.) Torr.
Black Locust	*Robinia pseudoacacia* L. [I]
Black Sagebrush, Black Sage	*Artemisia nova* A. Nelson
Black-root Sedge	*Carex elynoides* Holm
Blanket-flower; Gaillardia	*Gaillardia aristata* Pursh
blazing-star; mentzelia	*Mentzelia* Plum. ex L.
Bloom Peak Douglasia	*Douglasia conservatorum* Björk
Blue Elderberry	*Sambucus cerulea* Raf.
Blue Garden Flax	*Linum perenne* L. [I]
Blue Mustard	*Chorispora tenella* (Pall.) DC. [I]
Blue Wild-rye	*Elymus glaucus* Buckley
bluebells; lungwort, mertensia	*Mertensia* Roth
Bluebunch Wheatgrass	*Pseudoroegneria spicata* (Pursh) Á. Löve
bluegrass	*Poa* L.
Bluejoint Reedgrass	*Calamagrostis canadensis* (Michx.) P. Beauv.
Blueleaf or Mountain Strawberry	*Fragaria virginiana* Mill.
Blueleaf or Vari-leaved Cinquefoil	*Potentilla glaucophylla* Lehm.
Bodin's Milk-vetch	*Astragalus bodinii* E. Sheld.
Bog Birch, Dwarf Birch	*Betula pumila* L.
Bog Blueberry, Bog Bilberry	*Vaccinium uliginosum* L.
Bog St. John's-wort	*Hypericum anagalloides* Cham. & Schltdl.
Bog-rosemary	*Andromeda polifolia* L.
Booth's Mooncup or Evening Primrose	*Eremothera boothii* (Douglas) W.L. Wagner & Hoch
Booth's Willow	*Salix boothii* Dorn
Bottlebrush, Squirreltail	*Elymus elymoides* (Raf.) Swezey
Box-elder	*Acer negundo* L. [I]
Bracken; Brake-fern	*Pteridium aquilinum* (L.) Kuhn
bramble; blackberry; raspberry	*Rubus* L.
brickellia; brickellbush; thoroughwort	*Brickellia* Elliott
Bristle-stalked Sedge	*Carex leptalea* Wahlenb.
Broad Fleabane	*Erigeron latus* (A. Nelson & J.F. Macbr.) Cronquist
Broad-leaf or Floating-leaf Pondweed	*Potamogeton natans* L.
brome	*Bromus* L.
Broom Snakeweed	*Gutierrezia sarothrae* (Pursh) Britton & Rusby
Brunsfeld's Biscuit-root	*Lomatium brunsfeldianum* Kemper & R.P. McNeill
Buckbean; Bogbean	*Menyanthes trifoliata* L.
Bud Sagebrush, Spring Sagebrush	*Artemisia spinescens* D.C. Eaton
bugleweed; water-horehound	*Lycopus* L.
Bulbous Bluegrass	*Poa bulbosa* L. [I]
bulrush	*Scirpus* Tourn. ex L.
bulrush; naked-stem bulrush; club-rush	*Schoenoplectus* (Rchb.) Palla
Bunchberry, Puddingberry, Dwarf Cornel	*Cornus canadensis* L.
Bur Buttercup, Hornseed Buttercup, Curveseed Butterwort	*Ranunculus testiculatus* Crantz [I]
Bur Ragweed, Annual Bursage	*Ambrosia acanthicarpa* Hook.
bur-reed	*Sparganium* L.
Bushy Stanleya	*Stanleya pinnata* (Pursh) Britton
buttercup; crowfoot; water-buttercup	*Ranunculus* L.
Butterweed Groundsel, Tall Butterweed	*Senecio* serra Hook.
butterweed; groundsel	*Packera* Á. Löve & D. Löve
Buxbaum's Sedge	*Carex buxbaumii* Wahlenb.
California False Hellebore	*Veratrum californicum* Durand

Common name	Scientific name
California Oatgrass	*Danthonia californica* Bol.
camas	*Camassia* Lindl.
Canada Bluegrass	*Poa compressa* L. [I]
Canada Buffalo-berry, Russett Buffalo-berry, Soopolallie, Soapberry	*Shepherdia canadensis* (L.) Nutt.
Canada or Rocky Mountain Waterweed	*Elodea canadensis* Michx.
Canada Yew	*Taxus canadensis* Marshall
Canada, Creeping, or Field Thistle	*Cirsium arvense* (L.) Scop. [I]
Canby's Lovage, Canby's Licorice-root	*Ligusticum canbyi* J.M. Coult. & Rose
Canby's, Pacific, Pine, Curly, Sandberg's, or Rough Bluegrass	*Poa secunda* subsp. *secunda*
catalpa	*Catalpa* Scop.
Catnip, Catmint	*Nepeta cataria* L. [I]
cat-tail; reedmace	*Typha* L.
Cheatgrass, Downy Brome	*Bromus tectorum* L. [I]
Chick-pea Milk-vetch	*Astragalus cicer* L. [I]
Chinese Yew	*Taxus chinensis* (Pilg.) Rehder
Chokecherry	*Prunus virginiana* L.
Christ's Elk-Season Lupine	*Lupinus lyallii* subsp. *alcis-temporis* (C.P. Sm.) B.J. Cox
Christ's Paintbrush	*Castilleja christii* N.H. Holmgren
cinquefoil; five-finger	*Potentilla* L.
Clasping Pepperweed	*Lepidium perfoliatum* L. [I]
Clasping-leaved Twisted-stalk, Cucumber-root	*Streptopus amplexifolius* (L.) DC.
Clasping-leaved, Common, or Hemp Dogbane	*Apocynum cannabinum* L.
claytonia; springbeauty; miner's lettuce	*Claytonia* L.
Clearwater Phlox	*Phlox idahonis* Wherry
Cleft-leaf Groundsel	*Packera streptanthifolia* (Greene) W.A. Weber & Á. Löve
clover; trefoil	*Trifolium* Tourn. ex L.
Columbian Monkshood	*Aconitum columbianum* Nutt.
Common Bladderwort, Greater Bladderwort	*Utricularia macrorhiza* Leconte
Common Brome	*Bromus vulgaris* (Hook.) Shear
Common Camas	*Camassia quamash* (Pursh) Greene
Common Cat-tail, Broad-leaved Cat-tail	*Typha latifolia* L.
Common Duckweed, Water Lentil	*Lemna minor* L.
Common Horsetail, Field Horsetail	*Equisetum arvense* L.
Common Mare's-tail	*Hippuris vulgaris* L.
Common Mullein, Flannel Mullein	*Verbascum thapsus* L. [I]
Common Oak-fern	*Gymnocarpium dryopteris* (L.) Newman
Common or Creeping Spike-rush	*Eleocharis palustris* (L.) Roem. & Schult.
Common or Mountain Juniper	*Juniperus communis* L.
Common or Spear Orache	*Atriplex patula* L. [I]
Common Purslane	*Portulaca oleracea* L. [I]
Common Rabbit-brush	*Ericameria nauseosa* (Pursh) G.L. Nesom & G.I. Baird
Common Reed	*Phragmites australis* (Cav.) Trin. ex Steud. [I]
Common Snowberry	*Symphoricarpos albus* (L.) S.F. Blake
Common Tansy	*Tanacetum vulgare* L. [I]
Common Teasel	*Dipsacus fullonum* L. [I]
Common Three-square	*Schoenoplectus pungens* (Vahl) Palla
Common Velvet-grass, Yorkshire-fog	*Holcus lanatus* L.
Common Willow-herb	*Epilobium ciliatum* Raf.
Common Yarrow, Milfoil	*Achillea millefolium* L.
Common Yellow Sweet-clover	*Melilotus officinalis* (L.) Lam. [I]
Common Yew, English Yew, Golden Irish Yew, Golden Yew, Irish Yew, Silver Yew, Yellow-berried Yew	*Taxus baccata* L.
Cottonhorn or Catclaw Horse-brush	*Tetradymia spinosa* Hook. & Arn.
Cow-parsnip, American Hogweed	*Heracleum maximum* W. Bartram
Coyote Willow	*Salix exigua* Nutt.
crack willow	*Salix ×fragilis* L. [I]
Crag Ankle-aster, Lava Ankle-aster	*Ionactis alpina* (Nutt.) Greene
crane's-bill; geranium	*Geranium* Tourn. ex L.
Creambush Ocean-spray	*Holodiscus discolor* (Pursh) Maxim.
Creeping Bentgrass	*Agrostis stolonifera* L. [I]

Common name	Scientific name
Creeping Oregon-grape, Low Oregon-grape	*Berberis repens* Lindl.
Creeping Sibbaldia	*Sibbaldia procumbens* L.
Crested Wheatgrass	*Agropyron cristatum* (L.) Gaertn. [I]
cryptantha; white forget-me-not	*Cryptantha* Lehm. ex G. Don
Cultivated Rye	*Secale cereale* L. [I]
Curled Pondweed	*Potamogeton crispus* L. [I]
Curl-leaf Mountain-mahogany	*Cercocarpus ledifolius* Nutt.
Curly Sedge	*Carex rupestris* All.
Curly, Sour, or Yellow Dock	*Rumex crispus* L. [I]
currant; gooseberry	*Ribes* L.
Cushion Phlox, Compact Phlox	*Phlox pulvinata* (Wherry) Cronquist
Cusick's Sedge	*Carex cusickii* Mack.
Cut-leaved Water Parsnip, Stalky Berula	*Berula erecta* (Huds.) Coville
daisy; fleabane; erigeron	*Erigeron* L.
Dalmatian Toadflax	*Linaria dalmatica* (L.) Mill. [I]
Dark Alpine Sedge	*Carex subnigricans* Stacey
Davis's Pepperwort	*Lepidium davisii* Rollins
dendroalsia moss	*Dendroalsia abietina* (Hook.) E. Britton ex Broth.
desert dandelion	*Malacothrix* DC.
Desert Gooseberry	*Ribes velutinum* Greene
Devil's Club	*Oplopanax horridus* (Sm.) Miq.
Dewey's Sedge	*Carex deweyana* Schwein.
Diamondleaf Willow	*Salix planifolia* Pursh
Disappearing Monkey-flower	*Erythranthe inflatula* (Suksd.) G.L. Nesom
dock; sorrel	*Rumex* L.
Dog Rose	*Rosa canina* L. [I]
doorweed; knotweed; smartweed	*Polygonum* L.
Douglas Fir	*Pseudotsuga menziesii* (Mirb.) Franco
Douglas's Cusickiella	*Cusickiella douglasii* (A. Gray) Rollins
Douglas's Hawthorn	*Crataegus douglasii* Lindl.
Douglas's Spirea	*Spiraea douglasii* Hook.
downingia	*Downingia* Torr.
Drummond's Rush	*Juncus drummondii* E. Mey.
Drummond's Willow	*Salix drummondiana* Barratt ex Hook.
duckweed	*Lemna* L.
Dusky Willow	*Salix melanopsis* Nutt.
Dwarf Bilberry or Huckleberry	*Vaccinium cespitosum* Michx.
Dwarf Enchanter's Nightshade	*Circaea alpina* L.
Dwarf Goldenbrush	*Ericameria nana* Nutt.
Dwarf or Alpine Meadowrue	*Thalictrum alpinum* L.
Dwarf Penstemon	*Penstemon pumilus* Nutt.
Dwarf Woolly-heads	*Psilocarphus brevissimus* Nutt.
Eastern Cottonwood	*Populus deltoides* W. Bartram ex Marshall [I]
Eastwood's Willow	*Salix eastwoodiae* Cockerell ex A. Heller
elderberry; elder	*Sambucus* L.
Elusive Polemonium	*Polemonium elusum* J.J. Irwin & R.L. Hartm.
Engelmann Spruce	*Picea engelmannii* Parry ex Engelm.
Engelmann's Aster	*Doellingeria engelmannii* (D.C. Eaton) Semple, Brouillet & G.A. Allen
English Sundew	*Drosera anglica* Huds.
eriogonum; buckwheat; wild buckwheat; umbrella-plant; sulfur flower	*Eriogonum* Michx.
Eurasian or Spiked Water-milfoil	*Myriophyllum spicatum* L.
European or Alpine Bistort, Viviparous Bistort	*Bistorta vivipara* (L.) Delarbre
fairy-bell	*Prosartes* D. Don
False Bugbane	*Trautvetteria caroliniensis* (Walter) Vail
false hellebore; corn-lily	*Veratrum* L.
False Indigo	*Amorpha fruticosa* L. [I]
false-yarrow; chaenactis	*Chaenactis* DC.
Fendler's Meadowrue	*Thalictrum fendleri* Engelm. ex A. Gray
Fern-bush; Desert-sweet	*Chamaebatiaria millefolium* (Torr.) Maxim.
fescue	*Festuca* Tourn. ex L.
Few-flowered Spike-rush	*Eleocharis quinqueflora* (Hartmann) O. Schwarz
fiddleneck; tarweed; amsinckia	*Amsinckia* Lehm.
Field Pennycress, Fanweed, Stinkweed	*Thlaspi arvense* L. [I]

Common name	Scientific name
Fineleaf Hymenopappus, Columbia Cut-leaf	*Hymenopappus filifolius* Hook.
Fireweed	*Epilobium angustifolium* L.
Fivehorn Smotherweed	*Bassia hyssopifolia* (Pall.) Kuntze [I]
flatsedge; cyperus	*Cyperus* L.
Flat-top Pussy-toes	*Antennaria corymbosa* E.E. Nelson
Flixweed	*Descurainia sophia* (L.) Webb ex Prantl [I]
Floating Crystalwort	*Riccia fluitans* L.
fontinalis moss	*Fontinalis* Hedw.
Fool's Huckleberry, Mock Azalea, Rusty Menziesia	*Rhododendron menziesii* Craven
Forage Kochia, Prostrate Kochia, Prostrate Summer-cypress	*Bassia prostrata* (L.) Beck [I]
forget-me-not; scorpion-grass	*Myosotis* L.
Fowl Bluegrass	*Poa palustris* L.
Fowl Mannagrass	*Glyceria striata* (Lam.) Hitchc.
Foxtail Barley	*Hordeum jubatum* L.
Franklin's Sandwort	*Eremogone franklinii* (Douglas ex Hook.) R.L. Hartm. & Rabeler
Freeway or Black Creeper Sedge	*Carex praegracilis* W. Boott
Fremont Cottonwood	*Populus fremontii* S. Watson [I]
Fringed or Star Water-plantain; Damasonium	*Damasonium californicum* Torr.
Gairdner's Penstemon	*Penstemon gairdneri* Hook.
Gairdner's Yampah	*Perideridia gairdneri* (Hook. & Arn.) Mathias
Gardner's Saltbush	*Atriplex gardneri* (Moq.) D. Dietr.
gentian	*Gentiana* Tourn. ex L.
Geyer's Milk-vetch	*Astragalus geyeri* A. Gray
Geyer's Sedge	*Carex geyeri* Boott
Geyer's Willow	*Salix geyeriana* Andersson
giant-hyssop; horse-mint; agastache	*Agastache* Clayton ex Gronov.
gilia	*Gilia* Ruiz & Pav.
Glaucous Bluegrass	*Poa glauca* Vahl
Globe Huckleberry, Thin-leaved Huckleberry	*Vaccinium membranaceum* Douglas ex Torr.
Globe Penstemon	*Penstemon globosus* (Piper) Pennell & D.D. Keck
globe-mallow	*Sphaeralcea* A. St.-Hil.
Golden Currant	*Ribes aureum* Pursh
goldenbrush; rabbit-brush	*Ericameria* Nutt.
goldenrod	*Solidago* L.
goldenweed	*Pyrrocoma* Hook.
Gooseberry-leaved Globe-mallow	*Sphaeralcea grossulariifolia* (Hook. & Arn.) Rydb.
Gordon's Ivesia	*Potentilla gordonii* (Hook.) Greene
Grand Fir	*Abies grandis* (Douglas ex D. Don) Lindl.
Granite Prickly-phlox	*Linanthus pungens* (Torr.) J.M. Porter & L.A. Johnson
Grass-leaved Pondweed	*Potamogeton gramineus* L.
Gray Ball Sage	*Salvia dorrii* (Kellogg) Abrams
Gray's Biscuit-root	*Lomatium grayi* (J. M. Coult. & Rose) J.M. Coult. & Rose
Great Basin Wildrye	*Leymus cinereus* (Scribn. & Merr.) Á. Löve
Great Northern Aster	*Canadanthus modestus* (Lindl.) G.L. Nesom
Greater Duckweed	*Spirodela polyrhiza* (L.) Schleid.
Green Molly	*Neokochia americana* (S. Watson) G.L. Chu & S.C. Sand.
Green or Red Ash	*Fraxinus pennsylvanica* Marshall [I]
Green Rabbit-brush	*Chrysothamnus viscidiflorus* Nutt.
groundsel; ragwort; butterweed	*Senecio* L.
Grouseberry, Whortleberry	*Vaccinium scoparium* Leiberg ex Coville
Gumbo Biscuit-root	*Lomatium bicolor* var. *leptocarpum* (Torr. & A. Gray) Schlessman
Hairy Goldaster	*Heterotheca villosa* (Pursh) Shinners
Hairy Waterclover	*Marsilea vestita* Hook. & Grev.
Halogeton, Saltlover	*Halogeton glomeratus* (M. Bieb.) Ledeb. [I]
Hardstem Bulrush, Tule	*Schoenoplectus acutus* (Muhl. ex Bigelow) Á. Löve & D. Löve
harebell; bellflower	*Campanula* L.
haw; hawthorn; thornapple	*Crataegus* L.
hawksbeard	*Crepis* L.
Heart-leaf Arnica	*Arnica cordifolia* Hook.
heath family	Ericaceae Durande
hedge-nettle; woundwort; betony	*Stachys* L.
Hillman's Stinkweed	*Cleomella hillmanii* var. *goodrichii* (S.L. Welsh) P.K. Holmgren
Himalayan or European Blackberry	*Rubus bifrons* Vest [I]

Common name	Scientific name
Hitchcock's or Smooth Woodrush	*Luzula hitchcockii* Hämet-Ahti
Hoary Chaenactis or False-yarrow	*Chaenactis douglasii* Hook. & Arn.
Hoary-aster	*Dieteria canescens* (Pursh) Nutt.
Holy-clover, Sainfoin	*Onobrychis viciifolia* Scop. [I]
Hood's Phlox, Carpet Phlox	*Phlox hoodii* Richardson
Hood's Sedge	*Carex hoodii* Boott
Hooker's Balsamroot	*Balsamorhiza hookeri* Nutt.
Hooker's or White Dryas or Mountain-avens	*Dryas hookeriana* Juz.
Horned Pondweed	*Zannichellia palustris* L.
Hornwort, Rigid Hornwort, Coontail	*Ceratophyllum demersum* L.
horse-brush	*Tetradymia* DC.
horsetail; scouring-rush	*Equisetum* L.
Hot-rock Penstemon	*Penstemon deustus* Douglas
hound's-tongue	*Cynoglossum* L. [I]
Idaho Fescue	*Festuca idahoensis* Elmer
Idaho Stonecrop	*Sedum valens* Björk
Idaho Xanthoparmelia Lichen	*Xanthoparmelia idahoensis* Hale
Indian rice; wild rice	*Zizania* L.
Indian Ricegrass	*Eriocoma hymenoides* (Roem. & Schult.) Rydb.
Indian Valley Sedge	*Carex aboriginum* M.E. Jones
Inflated Sedge	*Carex vesicaria* L.
Intermediate Wheatgrass	*Thinopyrum intermedium* (Host) Barkworth & D.R. Dewey [I]
Interrupted Windgrass	*Apera interrupta* (L.) P. Beauv. [I]
Iodine Bush	*Allenrolfea occidentalis* (S. Watson) Kuntze
Jagged Chickweed	*Holosteum umbellatum* L. [I]
Japanese Yew	*Taxus cuspidata* Siebold & Zucc.
Jeffrey's or Tall Mountain Shooting Star	*Primula jeffreyi* (Van Houtte) A.R. Mast & Reveal
juniper	*Juniperus* L.
Katie's Daisy	*Erigeron katiae* S.L. Welsh & N.D. Atwood
Kellogg's or Lakeshore Sedge	*Carex kelloggii* W. Boott
Kelsey's Phlox	*Phlox kelseyi* subsp. *glandulosa* Wherry
Kentucky Bluegrass	*Poa pratensis* L. [I]
King's Sandwort	*Eremogone kingii* (S. Watson) Ikonn.
Kinnikinnick, Bearberry, Sandberry	*Arctostaphylos uva-ursi* (L.) Spreng.
Klamath Weed, Common St. John's-wort	*Hypericum perforatum* L.
knapweed	*Centaurea* L. [I]
knotweed; smartweed; tearthumb	*Persicaria* Mill.
Lady-fern	*Athyrium filix-femina* (L.) Roth
Lamb's Quarters, White Goosefoot or Pigweed	*Chenopodium album* L. [I]
lamb's quarters; goosefoot; pigweed	*Chenopodium* L.
Lance-leaf Scurf-pea	*Ladeania lanceolata* (Pursh) Reveal & A.N. Egan
Large-leaved Avens	*Geum macrophyllum* Willd.
larkspur; delphinium	*Delphinium* Tourn. ex L.
Leafy Lousewort, Sickletop Lousewort	*Pedicularis racemosa* Douglas ex Benth.
Leafy or Close-leaved Pondweed	*Potamogeton foliosus* Raf.
Leafy or Leaf-bracted Aster	*Symphyotrichum foliaceum* (Lindl. ex DC.) G.L. Nesom
Leafy Spurge	*Euphorbia virgata* Waldst. & Kit. [I]
Least Bladdery Milk-vetch	*Astragalus microcystis* A. Gray
Lemmon's Willow	*Salix lemmonii* Bebb
Lemonade Sumac, Smooth Sumac, Skunkbush	*Rhus trilobata* Nutt.
Leslie Gulch Monardella	*Monardella angustifolia* Elvin, Ertter & Mansfield
Lewis's Mock Orange	*Philadelphus lewisii* Pursh
lewisia; bitterroot	*Lewisia* Pursh
Limberpine	*Pinus flexilis* E. James
Little False Solomon's Seal, Starry Solomon's Seal, Star-flowered Solomon's Seal	*Maianthemum stellatum* (L.) Link
Little-leaf Horse-brush	*Tetradymia glabrata* Torr. & A. Gray
Little-leaf Pussy-toes	*Antennaria microphylla* Rydb.
little-sunflower; helianthella	*Helianthella* Torr. & A. Gray
liverwort	*Ptilidium ciliare* (L.) Hampe
liverwort	*Sphaerocarpos hians* Haynes
locoweed; milk-vetch; poison-vetch; rattle-pod	*Astragalus* L.

Common name	Scientific name
locoweed; oxytrope; crazyweed	*Oxytropis* DC.
Lodgepole Pine	*Pinus contorta* Douglas ex Loudon
Long-bracted or Slender-beaked Sedge	*Carex athrostachya* Olney
Long-leaf Phlox	*Phlox longifolia* Nutt.
Longleaved or Tapertip Hawksbeard	*Crepis acuminata* Nutt.
loosestrife	*Lythrum* L. [I]
lovage; licorice-root	*Ligusticum* L.
Low Sagebrush (subsp. *longiloba*)	*Artemisia arbuscula* subsp. *longiloba* (Osterh.) L.M. Shultz
Low Sagebrush, Dwarf Sagebrush	*Artemisia arbuscula* Nutt.
lupine	*Lupinus* L.
Lyall's Angelica, Sharptooth Angelica	*Angelica arguta* Nutt.
Macfarlane's Four-o'clock	*Mirabilis macfarlanei* Constance & Rollins
Madwort; Catchweed	*Asperugo procumbens* L. [I]
Mallow Ninebark	*Physocarpus malvaceus* (Greene) Kuntze
mannagrass	*Glyceria* R. Br.
Many-flowered Stickseed	*Hackelia floribunda* (Lehm.) I.M. Johnst.
Many-spiked Bog Cotton or Cotton-grass	*Eriophorum angustifolium* Honck.
marsh-marigold	*Caltha* L.
Mat Buckwheat	*Eriogonum caespitosum* Nutt.
Mat or Short-leaved Muhly	*Muhlenbergia richardsonis* (Trin.) Rydb.
Meadow Barley	*Hordeum brachyantherum* Nevski
Meadow Foxtail	*Alopecurus pratensis* L. [I]
Meadow Milk-vetch	*Astragalus diversifolius* A. Gray
meadowrue	*Thalictrum* Tourn. ex L.
Medusahead	*Taeniatherum caput-medusae* (L.) Nevski [I]
Mertens's Mountain-heather	*Cassiope mertensiana* (Bong.) G. Don
Midget Quillwort	*Isoetes minima* A.A. Eaton
milkweed	*Asclepias* L.
mitrewort; bishop's cap	*Mitella* Tourn. ex L.
monkshood	*Aconitum* L.
mosquito-fern	*Azolla* Lam.
Moss Campion or Pink, Cushion Pink	*Silene acaulis* (L.) Jacq.
Moss Phlox	*Phlox hoodii* subsp. *muscoides* (Nutt.) Wherry
mosses, liverworts, and hornworts	*Bryophyta* Schimp.
Mountain Alder	*Alnus incana* (L.) Moench
Mountain Big Sagebrush	*Artemisia tridentata* subsp. *vaseyana* (Rydb.) Beetle
Mountain Blue-curls	*Trichostema oblongum* Benth.
Mountain Brome	*Bromus marginatus* Nees ex Steud.
Mountain Death Camas	*Anticlea elegans* (Pursh) Rydb.
Mountain Hemlock	*Tsuga mertensiana* (Bong.) Carrière
Mountain or Thread-leaved Sandwort	*Eremogone capillaris* (Poir.) Fenzl
Mountain Penstemon	*Penstemon montanus* Greene
Mountain Sedge	*Carex scopulorum* Holm
Mountain Snowberry	*Symphoricarpos rotundifolius* A. Gray
mountain-ash; service tree; whitebeam	*Sorbus* L.
Mountain-box, Mountain-lover, Myrtle Boxwood, Oregon Boxwood	*Paxistima myrsinites* (Pursh) Raf.
mountain-heath	*Phyllodoce* Salisb.
mountain-mahogany	*Cercocarpus* Kunth
Mouse, Smooth, or Wall Barley	*Hordeum murinum* L. [I]
Mud Sedge	*Carex limosa* L.
mugwort; sagebrush; wormwood; artemesia	*Artemisia* L.
muhly; muhlenbergia	*Muhlenbergia* Schreb.
Naked-stemmed Sunray	*Enceliopsis nudicaulis* A. Nelson
Narrowleaf or Floating Bur-reed	*Sparganium angustifolium* Michx.
Narrow-leaved Cat-tail	*Typha angustifolia* L. [I]
Narrow-leaved Cottonwood	*Populus angustifolia* E. James
Narrow-leaved Sedge	*Carex angustata* Boott
navarretia; pincushion-plant	*Navarretia* Ruiz & Pav.
Nebraska Sedge	*Carex nebrascensis* Dewey
Needle Spike-rush	*Eleocharis acicularis* (L.) Roem. & Schult.
Needle-and-Thread	*Hesperostipa comata* (Trin. & Rupr.) Barkworth
needlegrass	*Achnatherum* P. Beauv.
Nelson's Needlegrass	*Eriocoma nelsonii* (Scribn.) Romasch.
Netleaf Hackberry	*Celtis reticulata* Torr.

Common name	Scientific name
Nettle-leaf Horse-mint or Nettle-leaf Giant-hyssop	*Agastache urticifolia* (Benth.) Kuntze
Nevada Clubrush	*Amphiscirpus nevadensis* (S. Watson) Oteng-Yeb.
Nevada Goldenrod	*Solidago spectabilis* (D.C. Eaton) A. Gray
Nevada Rush	*Juncus nevadensis* S. Watson
Nez Perce Monkey-flower	*Erythranthe ampliata* (A.L. Grant) G.L. Nesom
ninebark	*Physocarpus* (Cambess.) Raf.
North Africa Grass	*Ventenata dubia* (Leers) Coss. & Durieu [I]
Northern Bedstraw	*Galium boreale* L.
Northern Deergrass	*Trichophorum cespitosum* (L.) Hartm.
Northern Goldenrod	*Solidago multiradiata* Aiton
Northern Grass-of-Parnassus, Wideworld Grass-of-Parnassus	*Parnassia palustris* L.
Northern Maidenhair Fern	*Adiantum aleuticum* (Rupr.) C.A. Paris
Northern Meadow Sedge	*Carex praticola* Rydb.
Northern Mule's-ears or Wyethia	*Wyethia amplexicaulis* (Nutt.) Nutt.
Northern or Siberian Water-milfoil	*Myriophyllum sibiricum* Kom.
Northern Water-plantain	*Alisma triviale* Pursh
Northwestern Paintbrush	*Castilleja angustifolia* (Nutt.) G. Don
Northwestern Yellow Hard Flax	*Linum digynum* A. Gray
Nuttall's Crinklemat	*Tiquilia nuttallii* (Hook.) A.T. Richardson
Nuttall's Povertyweed	*Blitum nuttallianum* Schult.
Nuttall's Waterweed	*Elodea nuttallii* (Planch.) H. St. John
oatgrass; heathgrass	*Danthonia* DC.
Old Man's Whiskers, Prairie Smoke	*Geum triflorum* Pursh
Old-man-of-the-mountain, Graylocks Rubberweed	*Hymenoxys grandiflora* (Torr. & A. Gray) K.F. Parker
One-flower Kelseya	*Kelseya uniflora* Rydb.
One-spike or Few-flowered Wild Oatgrass	*Danthonia unispicata* (Thurb.) Munro ex Macoun
onion	*Allium* L.
orache; greasewood; shadscale; saltbush; silverscale	*Atriplex* L.
Orchard-grass; Cock's-foot Grass	*Dactylis glomerata* L. [I]
orthotrichum moss	*Orthotrichum pulchellum* Brunt.
Oval-leaved Eriogonum, Cushion Buckwheat	*Eriogonum ovalifolium* Nutt.
Owyhee Forget-me-not	*Hackelia ophiobia* R.L. Carr
Owyhee Ivesia	*Potentilla baileyi* (S. Watson) Greene
Owyhee Sagebrush	*Artemisia papposa* S.F. Blake & Cronquist
Oxeye- or Moon-daisy, Marguerite	*Leucanthemum vulgare* Lam. [I]
Pacific Ninebark	*Physocarpus capitatus* (Pursh) Kuntze
Pacific Sagewort, Northern Wormwood	*Artemisia campestris* L.
Packard's Milk-vetch	*Astragalus packardiae* (Barneby) J.F. Sm. & Zimmers
Packard's Wormwood	*Artemisia packardiae* J.W. Grimes & Ertter
Pahove Sandverbena	*Abronia mellifera* var. *pahoveorum* Ertter & Nosratinia
Pahute Weed	*Suaeda calceoliformis* (Hook.) Moq.
paintbrush; Indian-paintbrush; owl-clover	*Castilleja* Mutis ex L. f.
Pale Evening-primrose	*Oenothera pallida* Lindl.
Pale Sedge	*Carex livida* (Wahlenb.) Willd.
Pale Yellow Jewelweed	*Impatiens aurella* Rydb.
Paper Birch	*Betula papyrifera* Marshall
Parish's Snowberry	*Symphoricarpos parishii* Rydb.
Parry's Clover	*Trifolium parryi* A. Gray
Parry's Sedge	*Carex parryana* Dewey
Partridgefoot	*Luetkea pectinata* (Pursh) Kuntze
Pasture Sagebrush, Fringed Sagebrush, Prairie Sagewort	*Artemisia frigida* Willd.
Payson's Sedge	*Carex paysonis* Clokey
Peach-leaf Willow	*Salix amygdaloides* Andersson
pear	*Pyrus* L. [I]
Pearly-everlasting	*Anaphalis margaritacea* (L.) Benth. & Hook. f.
peppergrass; pepperweed; hoarycress	*Lepidium* L.
Pepperwort, Broadleaved Pepperweed	*Lepidium latifolium* L. [I]
phlox, wild sweet-william	*Phlox* L.
Pinegrass	*Calamagrostis rubescens* Buckley
Pink Alumroot	*Heuchera rubescens* Torr.

Common name	Scientific name
Pink Elephants, Elephant's Head	*Pedicularis groenlandica* Retz.
Piper's Milk-vetch	*Astragalus riparius* Barneby
plantain	*Plantago* L.
Plantainleaved Buttercup	*Ranunculus alismifolius* Geyer ex Benth.
plum; cherry; laurel	*Prunus* L.
Poison-hemlock	*Conium maculatum* L. [I]
polypogon; beard-grass	*Polypogon* Desf. [I]
Ponderosa Pine	*Pinus ponderosa* Douglas ex C. Lawson
pondweed	*Potamogeton* L.
pondweed	*Stuckenia* Börner
popcorn-flower; plagiobothrys	*Plagiobothrys* Fisch. & C.A. Mey.
poplar; cottonwood; aspen	*Populus* L.
Porterella	*Porterella carnosula* (Hook. & Arn.) Torr.
Poverty-weed, Deeproot	*Iva axillaris* Pursh
Prairie Junegrass	*Koeleria macrantha* (Ledeb.) Schult.
Prickly Lettuce	*Lactuca serriola* L. [I]
Prickly Sandwort, Needleleaf Sandwort	*Eremogone aculeata* (S. Watson) Ikonn.
pricklypear cactus	*Opuntia* Mill.
Prince's-pine, Common Prince's-pine	*Chimaphila umbellata* (L.) W.P.C. Barton
Pullup or Slender Muhly	*Muhlenbergia filiformis* (Thurb.) Rydb.
Purple Loosestrife	*Lythrum salicaria* L. [I]
Purple Nama, Ground Nama	*Nama aretioides* (Hook. & Arn.) Brand
Purple or Marsh Cinquefoil	*Comarum palustre* L.
Purple Reedgrass	*Calamagrostis purpurascens* R. Br.
Purslane Speedwell	*Veronica peregrina* L.
pussy-toes	*Antennaria* Gaertn.
Quackgrass	*Elymus repens* (L.) Gould [I]
Quaking Aspen	*Populus tremuloides* Michx.
Queen's Cup, Bluebead, Bride's Bonnet	*Clintonia uniflora* (Menzies ex Schult. & Schult. f.) Kunth
quillwort	*Isoetes* L.
rabbit-brush	*Chrysothamnus* Nutt.
Rabbitsfoot Grass, Annual Beard-grass	*Polypogon monspeliensis* (L.) Desf. [I]
Raynold's Sedge	*Carex raynoldsii* Dewey
Red Alder	*Alnus rubra* Bong.
Red Baneberry	*Actaea rubra* (Aiton) Willd.
Red Columbine, Sitka Columbine	*Aquilegia formosa* Fisch. ex DC.
Red Glasswort	*Salicornia rubra* A. Nelson
Red Mountain-heath, Pink Mountain-heath	*Phyllodoce empetriformis* (Sm.) D. Don
Red Raspberry	*Rubus idaeus* L.
Red-osier Dogwood	*Cornus sericea* L.
Redstem Ceanothus	*Ceanothus sanguineus* Pursh
Redstem Stork's-bill	*Erodium cicutarium* (L.) L'Hér. [I]
Reed Canarygrass	*Phalaris arundinacea* L. [I]
Rice Cutgrass	*Leersia oryzoides* (L.) Sw.
Richardson's Pondweed	*Potamogeton richardsonii* (A. Benn.) Rydb.
River Hawthorn	*Crataegus rivularis* Nutt.
Robbin's Pondweed	*Potamogeton robbinsii* Oakes
Robinson's Starwort	*Hartmaniella oxyphylla* (B.L. Rob.) M.L. Zhang
rockcress	*Arabis* L.
rockcress (*Boechera rollinsiorum*)	*Boechera rollinsiorum* Windham & Al-Shehbaz
Rock-loving Spring Parsley	*Cymopterus petraeus* M.E. Jones
rockmat	*Petrophytum* (Nutt.) Rydb.
Rocky Mountain Butterweed, Cleft-leaf Groundsel	*Packera streptanthifolia* (Greene) W.A. Weber & Á. Löve
Rocky Mountain Helianthella	*Helianthella uniflora* Torr. & A. Gray
Rocky Mountain Juniper	*Juniperus scopulorum* Sarg.
Rocky Mountain Maple, Douglas's Maple	*Acer glabrum* Torr.
rose	*Rosa* L.
Ross's Avens	*Geum rossii* (R.Br.) Ser.
Ross's Sedge	*Carex rossii* Boott
Rough Fescue	*Festuca campestris* Rydb.
Round-headed Eriogonum, Rock Buckwheat	*Eriogonum sphaerocephalum* Douglas ex Benth.
Round-leaved or Darkwoods Violet	*Viola orbiculata* (A. Gray) Geyer ex B.D. Jacks.
rush	*Juncus* L.
Rush Skeletonweed	*Chondrilla juncea* L. [I]

Common name	Scientific name
Russian Olive	*Elaeagnus angustifolia* L. [I]
Rusty or Pale Broom Sedge	*Carex subfusca* W. Boott
ryegrass	*Lolium* L.
Sago Pondweed	*Stuckenia pectinata* (L.) Börner
Salmon Wildrye	*Leymus salina* (M.E. Jones) Á. Löve
Saltgrass	*Distichlis spicata* (L.) Greene
Saltwort, Sea Milkwort	*Lysimachia maritima* (L.) Galasso, Banfi & Soldano
Sand Dropseed	*Sporobolus cryptandrus* (Torr.) A. Gray
Sand Dune or Sharp-leaved Penstemon	*Penstemon acuminatus* Douglas ex Lindl.
Sand-lily; Star-lily	*Leucocrinum montanum* Nutt. ex A. Gray
sandwort	*Eremogone* Fenzl
saxifrage	*Saxifraga* Tourn. ex L.
Scentless or False Mayweed	*Tripleurospermum inodorum* (L.) Sch. Bip.
Scot's Broom	*Cytisus scoparius* (L.) Link
Scotch Thistle	*Onopordum acanthium* L. [I]
Scouler's Willow	*Salix scouleriana* Barratt ex Hook.
Seacoast Tuberous Bulrush	*Bolboschoenus maritimus* (L.) Palla
Seaside Arrow-grass	*Triglochin maritima* L.
sedge	*Carex* L.
Sedge Mouse-tail, Bristly Mouse-tail	*Ranunculus aristatus* (B. Boivin) Christenh. & Byng
serviceberry	*Amelanchier* Medik.
Shaggy Fleabane	*Erigeron pumilus* Nutt.
Sheep Sedge	*Carex illota* L.H. Bailey
Sheep, Horse, or Field Sorrel, Sour Weed	*Rumex acetosella* L. [I]
Sheepfat, Shadscale, Spiny Saltbush	*Atriplex confertifolia* (Torr. & Frém.) S. Watson
Sheldon's Sedge	*Carex sheldonii* Mack.
Shiny-leaf Spirea	*Spiraea lucida* Douglas ex Greene
Short-beaked or Analog Sedge	*Carex simulata* Mack.
Short-rayed Aster, Alkali Aster	*Symphyotrichum frondosum* (Nutt.) G.L. Nesom
Showy Milkweed, Greek Milkweed	*Asclepias speciosa* Torr.
Showy Polemonium	*Polemonium pulcherrimum* Hook.
Showy Townsend Daisy	*Townsendia florifera* (Hook.) A. Gray
Shrubby Cinquefoil	*Dasiphora fruticosa* (L.) Rydb.
Shrubby or Big-head Goldenbrush	*Ericameria suffruticosa* (Nutt.) G.L. Nesom
Shrubby or Bush Penstemon	*Penstemon fruticosus* (Pursh) Greene
Siberian Elm	*Ulmus pumila* L. [I]
Siberian Wheatgrass	*Agropyron fragile* (Roth) P. Candargy [I]
Silver Chickensage	*Artemisia nuttallii* (Torr. & A. Gray) Mosyakin, L.M. Shultz & G.V. Boiko
Silver Maple	*Acer saccharinum* L. [I]
Silver Sagebrush, Hoary Sagebrush	*Artemisia cana* Pursh
Silverweed	*Argentina anserina* (L.) Rydb.
Silvery Lupine	*Lupinus argenteus* Pursh
Simple Kobresia	*Carex simpliciuscula* Wahlenb.
Simpson's Ball Cactus	*Pediocactus simpsonii* (Engelm.) Britton & Rose
Singleleaf Pinyon	*Pinus monophylla* Torr. & Frém.
Single-spike Sedge	*Carex scirpoidea* Michx.
Sitka Alder	*Alnus alnobetula* subsp. *sinuata* (Regel) Raus
Sitka Burnet	*Sanguisorba stipulata* Raf.
skeletonweed	*Pleiacanthus* (Nutt.) Rydb.
skullcap	*Scutellaria* L.
Skunk Cabbage	*Lysichiton americanus* Hultén & H. St. John
Skunk Polemonium, Sticky Polemonium	*Polemonium viscosum* Nutt.
Slender Cinquefoil	*Potentilla gracilis* Douglas ex Hook.
Slender Moonwort	*Botrychium lineare* W.H. Wagner
Slenderbush Buckwheat	*Eriogonum microtheca* Nutt.
Slickspot Peppergrass	*Lepidium papilliferum* (L.F. Hend.) A. Nelson & J.F. Macbr.
Slimstem Reedgrass	*Calamagrostis stricta* (Timm) Koeler
Small Bindweed	*Convolvulus arvensis* L. [I]
Small Bur-reed	*Sparganium natans* L.
Small-fruit Bulrush	*Scirpus microcarpus* J. Presl & C. Presl
Small-winged Sedge	*Carex microptera* Mack.
Smooth Brome	*Bromus inermis* Leyss. [I]
Smooth Spike-primrose	*Epilobium campestre* (Jeps.) Hoch & W.L. Wagner
Snake River Wheatgrass	*Elymus wawawaiensis* J.R. Carlson & Barkworth

Common name	Scientific name
Snow Willow	*Salix nivalis* Hook.
snowberry	*Symphoricarpos* Duhamel
Snowbrush Ceanothus	*Ceanothus velutinus* Douglas ex Hook.
Soft Rush	*Juncus effusus* L.
Soft-leaved or Two-seed Sedge	*Carex disperma* Dewey
Softstem Bulrush, Tule	*Schoenoplectus tabernaemontani* (C.C. Gmel.) Palla
Southern Beaked Sedge	*Carex utriculata* Boott
Spalding's Catchfly, Spalding's Silene	*Silene spaldingii* S. Watson
Spatterdock, Indian Pond Lily, Wakas	*Nuphar polysepala* Engelm.
speedwell	*Veronica* L.
sphagnum	*Sphagnum* L.
spiderflower	*Cleome* L.
Spike-fescue	*Festuca kingii* (S. Watson) Cassidy
spike-moss; lesser-clubmoss	*Selaginella* P. Beauv.
spike-rush	*Eleocharis* R. Br.
Spiny Green-bush, Nevada Greasewood	*Glossopetalon spinescens* A. Gray
Spiny Hopsage	*Grayia spinosa* (Hook.) Moq.
spirea; spiraea; meadowsweet	*Spiraea* L.
Spokane False Goldenaster	*Heterotheca hirsuta* (Greene) G.L. Nesom
Spreading Dogbane, Flytrap Dogbane, Bitter-root	*Apocynum androsaemifolium* L.
spring parsley	*Cymopterus* Raf.
stanleya; prince's plume	*Stanleya* Nutt.
Stemless Goldenweed, Cushion Stenotus	*Stenotus acaulis* (Nutt.) Nutt.
stickseed	*Lappula* Moench
stickseed; wild forget-me-not; hackelia	*Hackelia* Opiz
Sticky Purple Geranium	*Geranium viscosissimum* Fisch. & C.A. Mey.
Stiff Sagebrush	*Artemisia rigida* (Nutt.) A. Gray
Stinging Nettle	*Urtica dioica* L.
Stinking Currant, Northern Black Currant	*Ribes hudsonianum* Richardson
stonecrop	*Sedum* L.
stoneseed; gromwell	*Lithospermum* L.
stonewort	*Chara* L.
stonewort	*Nitella* C. Agardh
Subalpine Fir	*Abies lasiocarpa* (Hook.) Nutt.
Subalpine Larch	*Larix lyallii* Parl.
Summer or Mock Cypress, Burning-bush, Red Belvedere	*Bassia scoparia* (L.) A.J. Scott [I]
sun cup	*Camissonia* Link
Swallen's Needlegrass	*Eriocoma swallenii* (C.L. Hitchc. & Spellenb.) Romasch.
Swamp Gooseberry, Swamp Black Gooseberry, Prickly Currant	*Ribes lacustre* (Pers.) Poir.
Swamp Milkweed	*Asclepias incarnata* L.
Sweet Vernalgrass	*Anthoxanthum odoratum* L. [I]
Sweet-berry Honeysuckle, Bluefly Honeysuckle	*Lonicera caerulea* L.
Sweetbrier, Eglantine	*Rosa rubiginosa* L. [I]
Sweet-cicely	*Osmorhiza berteroi* DC.
sweet-root; sweet-cicely	*Osmorhiza* Raf.
Sweetscented or Fragrant Bedstraw	*Galium triflorum* Michx.
Swinger's Biscuit-root	*Lomatium swingerae* R.P. McNeill
Switchgrass	*Panicum virgatum* L.
Tall Tumblemustard, Jim Hill Mustard	*Sisymbrium altissimum* L. [I]
Tall Wheatgrass	*Thinopyrum obtusiflorum* (DC.) Banfi [I]
tamarisk; saltcedar	*Tamarix* L. [I]
Tapertip Onion, Hooker's Onion	*Allium acuminatum* Hook.
Thick-leaved Peavine, Nevada Peavine	*Lathyrus lanszwertii* Kellogg
Thickspike Wheatgrass	*Elymus lanceolatus* (Scribn. & J.G. Sm.) Gould
Thimbleberry	*Rubus nutkanus* Moc. ex Ser.
Thorny Skeletonweed	*Pleiacanthus spinosus* (Nutt.) Rydb.
Threeawn	*Aristida purpurea* Nutt.
Threetip Sagebrush, Cut-leaf Sagebrush	*Artemisia tripartita* Rydb.
Thurber's Needlegrass	*Eriocoma thurberiana* (Piper) Romasch.
Thyme Buckwheat, Thyme-leaved Eriogonum	*Eriogonum thymoides* Benth.

Common name	Scientific name
Timber Oatgrass	*Danthonia intermedia* Vasey
Timothy	*Phleum pratense* L. [I]
Tiny Mouse-tail, Common Mouse-tail	*Ranunculus minimus* (L.) E.H.L. Krause
Torrey's Rush	*Juncus torreyi* Coville
Trapper's Tea, Smooth Labrador-tea	*Rhododendron columbianum* (Piper) Harmaja
Trefoil Foamflower	*Tiarella trifoliata* L.
Truckee Rabbit-brush	*Chrysothamnus humilis* Greene
Tufted Hairgrass	*Deschampsia cespitosa* (L.) P. Beauv.
Tufted or Carolina Foxtail	*Alopecurus carolinianus* Walter
Tufted or Rocky Mountain Rockmat	*Petrophytum caespitosum* (Nutt.) Rydb.
Tumbleweed, Wind Witch	*Salsola tragus* L. [I]
Twinflower	*Linnaea borealis* L.
Twinflower Sandwort	*Cherleria biflora* (L.) A.J. Moore & Dillenb.
Utah Juniper	*Juniperus osteosperma* (Torr.) Little
Utah Serviceberry or Shadbush	*Amelanchier utahensis* Koehne
Ute Ladies-tresses	*Spiranthes diluvialis* Sheviak
valerian	*Valeriana* L.
Veiny or Winged Dock, Wild Begonia	*Rumex venosus* Pursh
violet	*Viola* L.
Walking or Beaked Spike-rush	*Eleocharis rostellata* (Torr.) Torr.
Wandering Daisy or Fleabane	*Erigeron peregrinus* Greene
Water Birch, Spring Birch, Red Birch	*Betula occidentalis* Hook.
Water Bulrush	*Schoenoplectus subterminalis* (Torr.) Soják
Water Horsetail, Water Pipes	*Equisetum fluviatile* L.
Water Howellia	*Howellia aquatilis* A. Gray
Water Pygmy-weed	*Crassula aquatica* (L.) Schönland
Water Sedge	*Carex aquatilis* Wahlenb.
Water Smartweed	*Persicaria amphibia* (L.) Delarbre
Watercress	*Nasturtium officinale* W.T. Aiton [I]
water-hemlock	*Cicuta* L.
water-nymph	*Najas* L.
Water-shield	*Brasenia schreberi* J.F. Gmel.
water-starwort	*Callitriche* L.
waterweed; ditchmoss	*Elodea* Michx.
waterwort; mud-purslane	*Elatine* L.
Wax Currant	*Ribes cereum* Douglas
Weedy Milk-vetch	*Astragalus miser* Douglas ex Hook.
Western Blue Flag, Rocky Mountain Iris	*Iris missouriensis* Nutt.
Western Bog Laurel	*Kalmia microphylla* (Hook.) A. Heller
Western Centaury	*Zeltnera exaltata* (Griseb.) G. Mans.
Western Clematis or Virgin's-bower	*Clematis ligusticifolia* Nutt.
Western Coneflower	*Rudbeckia occidentalis* Nutt.
Western False-asphodel	*Triantha occidentalis* (S. Watson) R.R. Gates
Western Goldthread, Idaho Goldthread	*Coptis occidentalis* (Nutt.) Torr. & A. Gray
Western Groundsel, One-stemmed Butterweed	*Senecio integerrimus* Nutt.
Western Hemlock	*Tsuga heterophylla* (Raf.) Sarg.
Western Larch	*Larix occidentalis* Nutt.
Western Meadowrue	*Thalictrum occidentale* A. Gray
Western Mugwort, Prairie Sage	*Artemisia ludoviciana* Nutt.
Western or Scouler's Hawkweed	*Hieracium scouleri* Hook.
Western or Sierra Juniper	*Juniperus occidentalis* Hook.
Western or Smooth Sumac	*Rhus glabra* L.
Western Poison Ivy	*Toxicodendron rydbergii* (Small ex Rydb.) Greene
Western Prairie-clover	*Dalea ornata* (Douglas ex Hook.) Eaton & Wright
Western Red Cedar	*Thuja plicata* Donn ex D. Don
Western Serviceberry or Shadbush, Saskatoon	*Amelanchier alnifolia* (Nutt.) Nutt. ex M. Roem.
Western Stickseed	*Lappula occidentalis* (S. Watson) Greene
Western Sweet-root	*Osmorhiza occidentalis* (Nutt.) Torr.
Western Sword-fern	*Polystichum munitum* (Kaulf.) C. Presl
Western Valerian	*Valeriana occidentalis* A. Heller
Western Wheatgrass	*Elymus smithii* (Rydb.) Gould
Western White Pine	*Pinus monticola* Douglas ex D. Don
wheatgrass	*Agropyron* Gaertn. [I]

Common name	Scientific name
wheatgrass	*Pseudoroegneria* (Nevski) Á. Löve
wheatgrass	*Thinopyrum* Á. Löve [I]
Wheeler's Bluegrass	*Poa wheeleri* Vasey
Whiplash Willow	*Salix lasiandra* var. *caudata* (Nutt.) Sudw.
White Alder	*Alnus rhombifolia* Nutt.
White Bryony	*Bryonia alba* L. [I]
White Marsh-marigold, Mountain Marsh-marigold	*Caltha leptosepala* DC.
White Mulberry	*Morus alba* L. [I]
White Pine Blister Rust	*Cronartium ribicola* J.C. Fisch.
White Poplar	*Populus alba* L. [I]
White Sandverbena	*Abronia mellifera* Douglas ex Hook.
White Trillium, Western Wake-robin or Trillium	*Trillium ovatum* Pursh
White Water-buttercup, Water Crowfoot	*Ranunculus aquatilis* L.
White Willow	*Salix alba* L. [I]
Whitebark Pine	*Pinus albicaulis* Engelm.
Whiteleaf Phacelia, Silverleaf Phacelia	*Phacelia hastata* Douglas ex Lehm.
White-margined Knotweed	*Polygonum polygaloides* Meisn.
Whitestem Gooseberry	*Ribes inerme* Rydb.
White-stemmed Mentzelia, Small-flowered Mentzelia	*Mentzelia albicaulis* (Douglas ex Hook.) Douglas ex Torr. & A. Gray
whitlow-grass; whitlow-wort; draba	*Draba* Dill. ex L.
Whitlow-wort	*Paronychia sessiliflora* Nutt.
Wild Ginger	*Asarum caudatum* Lindl.
Wild Mint	*Mentha canadensis* L.
Wild Sarsaparilla	*Aralia nudicaulis* L.
wildrye	*Leymus* Hochst.
wild-rye; wheatgrass; squirreltail	*Elymus* L.
willow	*Salix* L.
Willow Dock	*Rumex salicifolius* Weinm.
willow-herb	*Epilobium* Dill. ex L.
Wingscale, Fourwing Saltbush, Hoary Saltbush, Shadscale	*Atriplex canescens* (Pursh) Nutt.
Winterfat, White Sage, Winter Sage	*Krascheninnikovia lanata* (Pursh) A. Meeuse & A. Smit
Winward's Goldenbrush	*Ericameria winwardii* (Dorn & Delmatier) R.P. Roberts & Urbatsch
Wolf's Graphephorum	*Graphephorum wolfii* (Vasey) Coult.
Wolf's Willow	*Salix wolfii* Bebb
wood-fern	*Dryopteris* Adans.
Woodland Strawberry	*Fragaria vesca* L.
Woodrush Sedge	*Carex luzulina* Olney
Woods' Rose	Rosa woodsii Lindl.
Wool-fruit Sedge, Slender Sedge	*Carex lasiocarpa* Ehrh.
Wool-grass	*Scirpus cyperinus* (L.) Kunth
Woolly Pussy-toes	*Antennaria lanata* Greene
Woolly Sedge	*Carex pellita* Muhl. ex Willd.
Woolly Stanleya (var. *runcinata*)	*Stanleya tomentosa* var. *runcinata* (Rydb.) Rollins
Woollypod Milk-vetch, Pursh's Milk-vetch	*Astragalus purshii* Douglas ex G. Don
Wyeth Biscuit-root	*Lomatium ambiguum* (Nutt.) J.M. Coult. & Rose
Wyeth Buckwheat, Parsnip-flowered Eriogonum	*Eriogonum heracleoides* Nutt.
Wyoming Big Sagebrush	*Artemisia tridentata* subsp. *wyomingensis* Beetle & A.M. Young
xanthoparmelia lichen	*Xanthoparmelia norchlorochroa* Hale
yampah; false-caraway	*Perideridia* Rchb.
Yellow Flag or Iris	*Iris pseudacorus* L. [I]
Yellow Phacelia	*Phacelia lutea* (Hook. & Arn.) J.T. Howell
Yellow Salsify	*Tragopogon dubius* Scop. [I]
Yellow Star-thistle	*Centaurea solstitialis* L. [I]
Yellow Wildrye	*Leymus flavescens* (Scribn. & J. G. Sm.) Pilg.
Yellow Willow	*Salix lutea* Nutt.

Appendix 3: Common and Scientific Names of Plant Species in this Plan Listed Alphabetically by Scientific Name. [I] = Nonnative (Introduced or Invasive) and Established in Idaho.

Scientific name	Common name
Abies grandis (Douglas ex D. Don) Lindl.	Grand Fir
Abies lasiocarpa (Hook.) Nutt.	Subalpine Fir
Abronia mellifera Douglas ex Hook.	White Sandverbena
Abronia mellifera var. *pahoveorum* Ertter & Nosratinia	Pahove Sandverbena
Acer glabrum Torr.	Rocky Mountain Maple, Douglas's Maple
Acer grandidentatum Nutt.	Bigtooth Maple
Acer negundo L. [I]	Box-elder
Acer saccharinum L. [I]	Silver Maple
Achillea millefolium L.	Common Yarrow, Milfoil
Achnatherum P. Beauv.	needlegrass
Aconitum columbianum Nutt.	Columbian Monkshood
Aconitum L.	monkshood
Actaea rubra (Aiton) Willd.	Red Baneberry
Adiantum aleuticum (Rupr.) C.A. Paris	Northern Maidenhair Fern
Agastache Clayton ex Gronov.	giant-hyssop; horse-mint; agastache
Agastache urticifolia (Benth.) Kuntze	Nettle-leaf Horse-mint or Nettle-leaf Giant-hyssop
Agropyron cristatum (L.) Gaertn. [I]	Crested Wheatgrass
Agropyron fragile (Roth) P. Candargy [I]	Siberian Wheatgrass
Agropyron Gaertn. [I]	wheatgrass
Agrostis L.	bentgrass
Agrostis stolonifera L. [I]	Creeping Bentgrass
Alisma triviale Pursh	Northern Water-plantain
Allenrolfea occidentalis (S. Watson) Kuntze	Iodine Bush
Allium acuminatum Hook.	Tapertip Onion, Hooker's Onion
Allium L.	onion
Alnus alnobetula subsp. *sinuata* (Regel) Raus	Sitka Alder
Alnus incana (L.) Moench	Mountain Alder
Alnus Mill.	alder
Alnus rhombifolia Nutt.	White Alder
Alnus rubra Bong.	Red Alder
Alopecurus carolinianus Walter	Tufted or Carolina Foxtail
Alopecurus pratensis L. [I]	Meadow Foxtail
Ambrosia acanthicarpa Hook.	Bur Ragweed, Annual Bursage
Amelanchier alnifolia (Nutt.) Nutt. ex M. Roem.	Western Serviceberry or Shadbush, Saskatoon
Amelanchier Medik.	serviceberry
Amelanchier utahensis Koehne	Utah Serviceberry or Shadbush
Amorpha fruticosa L. [I]	False Indigo
Amphiscirpus nevadensis (S. Watson) Oteng-Yeb.	Nevada Clubrush
Amsinckia Lehm.	fiddleneck; tarweed; amsinckia
Anaphalis margaritacea (L.) Benth. & Hook. f.	Pearly-everlasting
Andromeda polifolia L.	Bog-rosemary
Angelica arguta Nutt.	Lyall's Angelica, Sharptooth Angelica
Angelica L.	angelica
Antennaria corymbosa E.E. Nelson	Flat-top Pussy-toes
Antennaria Gaertn.	pussy-toes
Antennaria lanata Greene	Woolly Pussy-toes
Antennaria microphylla Rydb.	Little-leaf Pussy-toes
Anthoxanthum odoratum L. [I]	Sweet Vernalgrass
Anticlea elegans (Pursh) Rydb.	Mountain Death Camas
Apera interrupta (L.) P. Beauv. [I]	Interrupted Windgrass
Apocynum androsaemifolium L.	Spreading Dogbane, Flytrap Dogbane, Bitter-root
Apocynum cannabinum L.	Clasping-leaved, Common, or Hemp Dogbane
Aquilegia formosa Fisch. ex DC.	Red Columbine, Sitka Columbine
Arabis L.	rockcress
Aralia nudicaulis L.	Wild Sarsaparilla

Scientific name	Common name
Arctostaphylos uva-ursi (L.) Spreng.	Kinnikinnick, Bearberry, Sandberry
Argentina anserina (L.) Rydb.	Silverweed
Aristida purpurea Nutt.	Threeawn
Arnica cordifolia Hook.	Heart-leaf Arnica
Arnica L.	arnica
Artemisia arbuscula Nutt.	Low Sagebrush, Dwarf Sagebrush
Artemisia arbuscula subsp. *longiloba* (Osterh.) L.M. Shultz	Low Sagebrush (subsp. *longiloba*)
Artemisia campestris L.	Pacific Sagewort, Northern Wormwood
Artemisia cana Pursh	Silver Sagebrush, Hoary Sagebrush
Artemisia frigida Willd.	Pasture Sagebrush, Fringed Sagebrush, Prairie Sagewort
Artemisia L.	mugwort; sagebrush; wormwood; artemesia
Artemisia ludoviciana Nutt.	Western Mugwort, Prairie Sage
Artemisia nova A. Nelson	Black Sagebrush, Black Sage
Artemisia nuttallii (Torr. & A. Gray) Mosyakin, L.M. Shultz & G.V. Boiko	Silver Chickensage
Artemisia packardiae J.W. Grimes & Ertter	Packard's Wormwood
Artemisia papposa S.F. Blake & Cronquist	Owyhee Sagebrush
Artemisia rigida (Nutt.) A. Gray	Stiff Sagebrush
Artemisia spinescens D.C. Eaton	Bud Sagebrush, Spring Sagebrush
Artemisia tridentata Nutt.	Big Sagebrush
Artemisia tridentata subsp. *tridentata*	Basin Big Sagebrush
Artemisia tridentata subsp. *vaseyana* (Rydb.) Beetle	Mountain Big Sagebrush
Artemisia tridentata subsp. *wyomingensis* Beetle & A.M. Young	Wyoming Big Sagebrush
Artemisia tripartita Rydb.	Threetip Sagebrush, Cut-leaf Sagebrush
Asarum caudatum Lindl.	Wild Ginger
Asclepias incarnata L.	Swamp Milkweed
Asclepias L.	milkweed
Asclepias speciosa Torr.	Showy Milkweed, Greek Milkweed
Asperugo procumbens L. [I]	Madwort; Catchweed
Astragalus asotinensis Björk & Fishbein	Asotin Milk-vetch
Astragalus bodinii E. Sheld.	Bodin's Milk-vetch
Astragalus cicer L. [I]	Chick-pea Milk-vetch
Astragalus diversifolius A. Gray	Meadow Milk-vetch
Astragalus geyeri A. Gray	Geyer's Milk-vetch
Astragalus L.	locoweed; milk-vetch; poison-vetch; rattle-pod
Astragalus microcystis A. Gray	Least Bladdery Milk-vetch
Astragalus miser Douglas ex Hook.	Weedy Milk-vetch
Astragalus packardiae (Barneby) J.F. Sm. & Zimmers	Packard's Milk-vetch
Astragalus purshii Douglas ex G. Don	Woollypod Milk-vetch, Pursh's Milk-vetch
Astragalus riparius Barneby	Piper's Milk-vetch
Athyrium filix-femina (L.) Roth	Lady-fern
Atriplex canescens (Pursh) Nutt.	Wingscale, Fourwing Saltbush, Hoary Saltbush, Shadscale
Atriplex confertifolia (Torr. & Frém.) S. Watson	Sheepfat, Shadscale, Spiny Saltbush
Atriplex gardneri (Moq.) D. Dietr.	Gardner's Saltbush
Atriplex L.	orache; greasewood; shadscale; saltbush; silverscale
Atriplex patula L. [I]	Common or Spear Orache
Azolla Lam.	mosquito-fern
Balsamorhiza hookeri Nutt.	Hooker's Balsamroot
Bassia hyssopifolia (Pall.) Kuntze [I]	Fivehorn Smotherweed
Bassia prostrata (L.) Beck [I]	Forage Kochia, Prostrate Kochia, Prostrate Summer-cypress
Bassia scoparia (L.) A.J. Scott [I]	Summer or Mock Cypress, Burning-bush, Red Belvedere
Berberis repens Lindl.	Creeping Oregon-grape, Low Oregon-grape
Berula erecta (Huds.) Coville	Cut-leaved Water Parsnip, Stalky Berula
Betula occidentalis Hook.	Water Birch, Spring Birch, Red Birch
Betula papyrifera Marshall	Paper Birch
Betula pumila L.	Bog Birch, Dwarf Birch
Bidens L.	beggar-ticks; bur-marigold; sticktight
Bistorta (L.) Scop.	bistort

Scientific name	Common name
Bistorta vivipara (L.) Delarbre	European or Alpine Bistort, Viviparous Bistort
Blitum nuttallianum Schult.	Nuttall's Povertyweed
Boechera rollinsiorum Windham & Al-Shehbaz	rockcress (*Boechera rollinsiorum*)
Bolboschoenus maritimus (L.) Palla	Seacoast Tuberous Bulrush
Botrychium lineare W.H. Wagner	Slender Moonwort
Brasenia schreberi J.F. Gmel.	Water-shield
Brickellia Elliott	brickellia; brickellbush; thoroughwort
Bromus inermis Leyss. [I]	Smooth Brome
Bromus L.	brome
Bromus marginatus Nees ex Steud.	Mountain Brome
Bromus tectorum L. [I]	Cheatgrass, Downy Brome
Bromus vulgaris (Hook.) Shear	Common Brome
Bryonia alba L. [I]	White Bryony
Bryophyta Schimp.	mosses, liverworts, and hornworts
Bryum calobryoides J.R. Spence	Beautiful Bryum Moss
Bupleurum americanum J.M. Coult. & Rose	American Thorough-Wax
Calamagrostis canadensis (Michx.) P. Beauv.	Bluejoint Reedgrass
Calamagrostis purpurascens R. Br.	Purple Reedgrass
Calamagrostis rubescens Buckley	Pinegrass
Calamagrostis stricta (Timm) Koeler	Slimstem Reedgrass
Callitriche L.	water-starwort
Caltha L.	marsh-marigold
Caltha leptosepala DC.	White Marsh-marigold, Mountain Marsh-marigold
Camassia Lindl.	camas
Camassia quamash (Pursh) Greene	Common Camas
Camissonia Link	sun cup
Campanula L.	harebell; bellflower
Canadanthus modestus (Lindl.) G.L. Nesom	Great Northern Aster
Carex aboriginum M.E. Jones	Indian Valley Sedge
Carex angustata Boott	Narrow-leaved Sedge
Carex aquatilis Wahlenb.	Water Sedge
Carex athrostachya Olney	Long-bracted or Slender-beaked Sedge
Carex buxbaumii Wahlenb.	Buxbaum's Sedge
Carex cusickii Mack.	Cusick's Sedge
Carex deweyana Schwein.	Dewey's Sedge
Carex disperma Dewey	Soft-leaved or Two-seed Sedge
Carex elynoides Holm	Black-root Sedge
Carex geyeri Boott	Geyer's Sedge
Carex hoodii Boott	Hood's Sedge
Carex illota L.H. Bailey	Sheep Sedge
Carex kelloggii W. Boott	Kellogg's or Lakeshore Sedge
Carex L.	sedge
Carex lasiocarpa Ehrh.	Wool-fruit Sedge, Slender Sedge
Carex leptalea Wahlenb.	Bristle-stalked Sedge
Carex limosa L.	Mud Sedge
Carex livida (Wahlenb.) Willd.	Pale Sedge
Carex luzulina Olney	Woodrush Sedge
Carex microptera Mack.	Small-winged Sedge
Carex myosuroides Vill.	Bellard's Kobresia
Carex nebrascensis Dewey	Nebraska Sedge
Carex nigricans C.A. Mey.	Black Alpine Sedge
Carex parryana Dewey	Parry's Sedge
Carex paysonis Clokey	Payson's Sedge
Carex pellita Muhl. ex Willd.	Woolly Sedge
Carex praegracilis W. Boott	Freeway or Black Creeper Sedge
Carex praticola Rydb.	Northern Meadow Sedge
Carex raynoldsii Dewey	Raynold's Sedge
Carex rossii Boott	Ross's Sedge
Carex rupestris All.	Curly Sedge
Carex scirpoidea Michx.	Single-spike Sedge
Carex scopulorum Holm	Mountain Sedge
Carex sheldonii Mack.	Sheldon's Sedge
Carex simpliciuscula Wahlenb.	Simple Kobresia

Scientific name	Common name
Carex simulata Mack.	Short-beaked or Analog Sedge
Carex subfusca W. Boott	Rusty or Pale Broom Sedge
Carex subnigricans Stacey	Dark Alpine Sedge
Carex utriculata Boott	Southern Beaked Sedge
Carex vesicaria L.	Inflated Sedge
Cassiope mertensiana (Bong.) G. Don	Mertens's Mountain-heather
Castilleja angustifolia (Nutt.) G. Don	Northwestern Paintbrush
Castilleja christii N.H. Holmgren	Christ's Paintbrush
Castilleja Mutis ex L. f.	paintbrush; Indian-paintbrush; owl-clover
Catalpa Scop.	catalpa
Ceanothus sanguineus Pursh	Redstem Ceanothus
Ceanothus velutinus Douglas ex Hook.	Snowbrush Ceanothus
Celtis reticulata Torr.	Netleaf Hackberry
Centaurea L. [I]	knapweed
Centaurea solstitialis L. [I]	Yellow Star-thistle
Ceratophyllum demersum L.	Hornwort, Rigid Hornwort, Coontail
Cercocarpus Kunth	mountain-mahogany
Cercocarpus ledifolius Nutt.	Curl-leaf Mountain-mahogany
Chaenactis DC.	false-yarrow; chaenactis
Chaenactis douglasii Hook. & Arn.	Hoary Chaenactis or False-yarrow
Chamaebatiaria millefolium (Torr.) Maxim.	Fern-bush; Desert-sweet
Chara L.	stonewort
Chenopodium album L. [I]	Lamb's Quarters, White Goosefoot or Pigweed
Chenopodium L.	lamb's quarters; goosefoot; pigweed
Cherleria biflora (L.) A.J. Moore & Dillenb.	Twinflower Sandwort
Chimaphila umbellata (L.) W.P.C. Barton	Prince's-pine, Common Prince's-pine
Chondrilla juncea L. [I]	Rush Skeletonweed
Chorispora tenella (Pall.) DC. [I]	Blue Mustard
Chrysothamnus humilis Greene	Truckee Rabbit-brush
Chrysothamnus Nutt.	rabbit-brush
Chrysothamnus viscidiflorus Nutt.	Green Rabbit-brush
Cicuta L.	water-hemlock
Circaea alpina L.	Dwarf Enchanter's Nightshade
Cirsium arvense (L.) Scop. [I]	Canada, Creeping, or Field Thistle
Claytonia L.	claytonia; springbeauty; miner's lettuce
Clematis ligusticifolia Nutt.	Western Clematis or Virgin's-bower
Cleome L.	spiderflower
Cleomella hillmanii var. *goodrichii* (S.L. Welsh) P.K. Holmgren	Hillman's Stinkweed
Clintonia uniflora (Menzies ex Schult. & Schult. f.) Kunth	Queen's Cup, Bluebead, Bride's Bonnet
Comarum palustre L.	Purple or Marsh Cinquefoil
Conium maculatum L. [I]	Poison-hemlock
Convolvulus arvensis L. [I]	Small Bindweed
Coptis occidentalis (Nutt.) Torr. & A. Gray	Western Goldthread, Idaho Goldthread
Cornus canadensis L.	Bunchberry, Puddingberry, Dwarf Cornel
Cornus sericea L.	Red-osier Dogwood
Crassula aquatica (L.) Schönland	Water Pygmy-weed
Crataegus douglasii Lindl.	Douglas's Hawthorn
Crataegus L.	haw; hawthorn; thornapple
Crataegus rivularis Nutt.	River Hawthorn
Crepis acuminata Nutt.	Longleaved or Tapertip Hawksbeard
Crepis L.	hawksbeard
Cronartium ribicola J.C. Fisch.	White Pine Blister Rust
Cryptantha Lehm. ex G. Don	cryptantha; white forget-me-not
Cusickiella douglasii (A. Gray) Rollins	Douglas's Cusickiella
Cymopterus petraeus M.E. Jones	Rock-loving Spring Parsley
Cymopterus Raf.	spring parsley
Cynoglossum L. [I]	hound's-tongue
Cyperus L.	flatsedge; cyperus
Cytisus scoparius (L.) Link	Scot's Broom
Dactylis glomerata L. [I]	Orchard-grass; Cock's-foot Grass
Dalea ornata (Douglas ex Hook.) Eaton & Wright	Western Prairie-clover
Damasonium californicum Torr.	Fringed or Star Water-plantain; Damasonium
Danthonia californica Bol.	California Oatgrass
Danthonia DC.	oatgrass; heathgrass

Scientific name	Common name
Danthonia intermedia Vasey	Timber Oatgrass
Danthonia unispicata (Thurb.) Munro ex Macoun	One-spike or Few-flowered Wild Oatgrass
Dasiphora fruticosa (L.) Rydb.	Shrubby Cinquefoil
Delphinium Tourn. ex L.	larkspur; delphinium
Dendroalsia abietina (Hook.) E. Britton ex Broth.	dendroalsia moss
Deschampsia cespitosa (L.) P. Beauv.	Tufted Hairgrass
Deschampsia danthonioides (Trin.) Benth.	Annual Hairgrass
Descurainia sophia (L.) Webb ex Prantl [I]	Flixweed
Dieteria canescens (Pursh) Nutt.	Hoary-aster
Dipsacus fullonum L. [I]	Common Teasel
Distichlis spicata (L.) Greene	Saltgrass
Doellingeria engelmannii (D.C. Eaton) Semple, Brouillet & G.A. Allen	Engelmann's Aster
Doellingeria Nees	aster
Douglasia conservatorum Björk	Bloom Peak Douglasia
Downingia Torr.	downingia
Draba Dill. ex L.	whitlow-grass; whitlow-wort; draba
Drosera anglica Huds.	English Sundew
Dryas hookeriana Juz.	Hooker's or White Dryas or Mountain-avens
Dryopteris Adans.	wood-fern
Echinochloa crus-galli (L.) P. Beauv. [I]	Barnyard-grass
Elaeagnus angustifolia L. [I]	Russian Olive
Elatine L.	waterwort; mud-purslane
Eleocharis acicularis (L.) Roem. & Schult.	Needle Spike-rush
Eleocharis palustris (L.) Roem. & Schult.	Common or Creeping Spike-rush
Eleocharis quinqueflora (Hartmann) O. Schwarz	Few-flowered Spike-rush
Eleocharis R. Br.	spike-rush
Eleocharis rostellata (Torr.) Torr.	Walking or Beaked Spike-rush
Elodea canadensis Michx.	Canada or Rocky Mountain Waterweed
Elodea Michx.	waterweed; ditchmoss
Elodea nuttallii (Planch.) H. St. John	Nuttall's Waterweed
Elymus elymoides (Raf.) Swezey	Bottlebrush, Squirreltail
Elymus glaucus Buckley	Blue Wild-rye
Elymus L.	wild-rye; wheatgrass; squirreltail
Elymus lanceolatus (Scribn. & J.G. Sm.) Gould	Thickspike Wheatgrass
Elymus repens (L.) Gould [I]	Quackgrass
Elymus smithii (Rydb.) Gould	Western Wheatgrass
Elymus violaceus (Hornem.) J. Feilberg	Alaska Wheatgrass
Elymus wawawaiensis J.R. Carlson & Barkworth	Snake River Wheatgrass
Enceliopsis nudicaulis A. Nelson	Naked-stemmed Sunray
Epilobium angustifolium L.	Fireweed
Epilobium campestre (Jeps.) Hoch & W.L. Wagner	Smooth Spike-primrose
Epilobium ciliatum Raf.	Common Willow-herb
Epilobium Dill. ex L.	willow-herb
Equisetum arvense L.	Common Horsetail, Field Horsetail
Equisetum fluviatile L.	Water Horsetail, Water Pipes
Equisetum L.	horsetail; scouring-rush
Eremogone aculeata (S. Watson) Ikonn.	Prickly Sandwort, Needleleaf Sandwort
Eremogone capillaris (Poir.) Fenzl	Mountain or Thread-leaved Sandwort
Eremogone Fenzl	sandwort
Eremogone franklinii (Douglas ex Hook.) R.L. Hartm. & Rabeler	Franklin's Sandwort
Eremogone kingii (S. Watson) Ikonn.	King's Sandwort
Eremothera boothii (Douglas) W.L. Wagner & Hoch	Booth's Mooncup or Evening Primrose
Ericaceae Durande	heath family
Ericameria nana Nutt.	Dwarf Goldenbrush
Ericameria nauseosa (Pursh) G.L. Nesom & G.I. Baird	Common Rabbit-brush
Ericameria Nutt.	goldenbrush; rabbit-brush
Ericameria suffruticosa (Nutt.) G.L. Nesom	Shrubby or Big-head Goldenbrush
Ericameria winwardii (Dorn & Delmatier) R.P. Roberts & Urbatsch	Winward's Goldenbrush
Erigeron katiae S.L. Welsh & N.D. Atwood	Katie's Daisy
Erigeron L.	daisy; fleabane; erigeron
Erigeron latus (A. Nelson & J.F. Macbr.) Cronquist	Broad Fleabane
Erigeron peregrinus Greene	Wandering Daisy or Fleabane
Erigeron pumilus Nutt.	Shaggy Fleabane
Eriocoma hymenoides (Roem. & Schult.) Rydb.	Indian Ricegrass
Eriocoma nelsonii (Scribn.) Romasch.	Nelson's Needlegrass

Scientific name	Common name
Eriocoma swallenii (C.L. Hitchc. & Spellenb.) Romasch.	Swallen's Needlegrass
Eriocoma thurberiana (Piper) Romasch.	Thurber's Needlegrass
Eriogonum caespitosum Nutt.	Mat Buckwheat
Eriogonum heracleoides Nutt.	Wyeth Buckwheat, Parsnip-flowered Eriogonum
Eriogonum Michx.	eriogonum; buckwheat; wild buckwheat; umbrella-plant; sulfur flower
Eriogonum microtheca Nutt.	Slenderbush Buckwheat
Eriogonum ovalifolium Nutt.	Oval-leaved Eriogonum, Cushion Buckwheat
Eriogonum sphaerocephalum Douglas ex Benth.	Round-headed Eriogonum, Rock Buckwheat
Eriogonum thymoides Benth.	Thyme Buckwheat, Thyme-leaved Eriogonum
Eriophorum angustifolium Honck.	Many-spiked Bog Cotton or Cotton-grass
Erodium cicutarium (L.) L'Hér. [I]	Redstem Stork's-bill
Erythranthe ampliata (A.L. Grant) G.L. Nesom	Nez Perce Monkey-flower
Erythranthe inflatula (Suksd.) G.L. Nesom	Disappearing Monkey-flower
Euphorbia virgata Waldst. & Kit. [I]	Leafy Spurge
Eurybia (Cass.) Cass.	aster
Festuca brachyphylla Schult. & Schult. f.	Alpine Fescue
Festuca campestris Rydb.	Rough Fescue
Festuca idahoensis Elmer	Idaho Fescue
Festuca kingii (S. Watson) Cassidy	Spike-fescue
Festuca Tourn. ex L.	fescue
Fontinalis Hedw.	fontinalis moss
Fragaria vesca L.	Woodland Strawberry
Fragaria virginiana Mill.	Blueleaf or Mountain Strawberry
Fraxinus pennsylvanica Marshall [I]	Green or Red Ash
Gaillardia aristata Pursh	Blanket-flower; Gaillardia
Galium boreale L.	Northern Bedstraw
Galium L.	bedstraw; cleavers
Galium triflorum Michx.	Sweetscented or Fragrant Bedstraw
Gentiana Tourn. ex L.	gentian
Geranium Tourn. ex L.	crane's-bill; geranium
Geranium viscosissimum Fisch. & C.A. Mey.	Sticky Purple Geranium
Geum macrophyllum Willd.	Large-leaved Avens
Geum rossii (R. Br.) Ser.	Ross's Avens
Geum triflorum Pursh	Old Man's Whiskers, Prairie Smoke
Gilia Ruiz & Pav.	gilia
Glossopetalon spinescens A. Gray	Spiny Green-bush, Nevada Greasewood
Glyceria grandis S. Watson	American Mannagrass
Glyceria R. Br.	mannagrass
Glyceria striata (Lam.) Hitchc.	Fowl Mannagrass
Glycyrrhiza lepidota Pursh	American Licorice, Wild Licorice
Graphephorum wolfii (Vasey) Coult.	Wolf's Graphephorum
Grayia spinosa (Hook.) Moq.	Spiny Hopsage
Gutierrezia sarothrae (Pursh) Britton & Rusby	Broom Snakeweed
Gymnocarpium dryopteris (L.) Newman	Common Oak-fern
Hackelia floribunda (Lehm.) I.M. Johnst.	Many-flowered Stickseed
Hackelia ophiobia R.L. Carr	Owyhee Forget-me-not
Hackelia Opiz	stickseed; wild forget-me-not; hackelia
Halogeton glomeratus (M. Bieb.) Ledeb. [I]	Halogeton, Saltlover
Hartmaniella oxyphylla (B.L. Rob.) M.L. Zhang	Robinson's Starwort
Helianthella Torr. & A. Gray	little-sunflower; helianthella
Helianthella uniflora Torr. & A. Gray	Rocky Mountain Helianthella
Heracleum maximum W. Bartram	Cow-parsnip, American Hogweed
Hesperostipa comata (Trin. & Rupr.) Barkworth	Needle-and-Thread
Heterotheca hirsuta (Greene) G.L. Nesom	Spokane False Goldenaster
Heterotheca villosa (Pursh) Shinners	Hairy Goldaster
Heuchera L.	alumroot; heuchera
Heuchera rubescens Torr.	Pink Alumroot
Hieracium scouleri Hook.	Western or Scouler's Hawkweed
Hippuris vulgaris L.	Common Mare's-tail
Holcus lanatus L.	Common Velvet-grass, Yorkshire-fog
Holodiscus discolor (Pursh) Maxim.	Creambush Ocean-spray
Holosteum umbellatum L. [I]	Jagged Chickweed

Scientific name	Common name
Hordeum brachyantherum Nevski	Meadow Barley
Hordeum jubatum L.	Foxtail Barley
Hordeum L.	barley
Hordeum murinum L. [I]	Mouse, Smooth, or Wall Barley
Howellia aquatilis A. Gray	Water Howellia
Hulsea algida A. Gray	Alpine Hulsea or Alpinegold
Hymenopappus filifolius Hook.	Fineleaf Hymenopappus, Columbia Cut-leaf
Hymenoxys grandiflora (Torr. & A. Gray) K.F. Parker	Old-man-of-the-mountain, Graylocks Rubberweed
Hypericum anagalloides Cham. & Schltdl.	Bog St. John's-wort
Hypericum perforatum L.	Klamath Weed, Common St. John's-wort
Impatiens aurella Rydb.	Pale Yellow Jewelweed
Ionactis alpina (Nutt.) Greene	Crag Ankle-aster, Lava Ankle-aster
Iris missouriensis Nutt.	Western Blue Flag, Rocky Mountain Iris
Iris pseudacorus L. [I]	Yellow Flag or Iris
Isoetes L.	quillwort
Isoetes minima A.A. Eaton	Midget Quillwort
Iva axillaris Pursh	Poverty-weed, Deeproot
Juncus balticus Willd.	Baltic Rush
Juncus drummondii E. Mey.	Drummond's Rush
Juncus effusus L.	Soft Rush
Juncus L.	rush
Juncus nevadensis S. Watson	Nevada Rush
Juncus torreyi Coville	Torrey's Rush
Juniperus communis L.	Common or Mountain Juniper
Juniperus L.	juniper
Juniperus occidentalis Hook.	Western or Sierra Juniper
Juniperus osteosperma (Torr.) Little	Utah Juniper
Juniperus scopulorum Sarg.	Rocky Mountain Juniper
Kalmia microphylla (Hook.) A. Heller	Western Bog Laurel
Kelseya uniflora Rydb.	One-flower Kelseya
Koeleria macrantha (Ledeb.) Schult.	Prairie Junegrass
Koenigia phytolaccifolia (Meisn. ex Small) T.M. Schust. & Reveal	Alpine Knotweed, Pokeweed
Krascheninnikovia lanata (Pursh) A. Meeuse & A. Smit	Winterfat, White Sage, Winter Sage
Lactuca serriola L. [I]	Prickly Lettuce
Ladeania lanceolata (Pursh) Reveal & A.N. Egan	Lance-leaf Scurf-pea
Lappula Moench	stickseed
Lappula occidentalis (S. Watson) Greene	Western Stickseed
Larix lyallii Parl.	Subalpine Larch
Larix occidentalis Nutt.	Western Larch
Lathyrus lanszwertii Kellogg	Thick-leaved Peavine, Nevada Peavine
Leersia oryzoides (L.) Sw.	Rice Cutgrass
Lemna L.	duckweed
Lemna minor L.	Common Duckweed, Water Lentil
Lepidium davisii Rollins	Davis's Pepperwort
Lepidium L.	peppergrass; pepperweed; hoarycress
Lepidium latifolium L. [I]	Pepperwort, Broadleaved Pepperweed
Lepidium papilliferum (L.F. Hend.) A. Nelson & J.F. Macbr.	Slickspot Peppergrass
Lepidium perfoliatum L. [I]	Clasping Pepperweed
Leucanthemum vulgare Lam. [I]	Oxeye- or Moon-daisy, Marguerite
Leucocrinum montanum Nutt. ex A. Gray	Sand-lily; Star-lily
Lewisia Pursh	lewisia; bitterroot
Leymus cinereus (Scribn. & Merr.) Á. Löve	Great Basin Wildrye
Leymus flavescens (Scribn. & J.G.Sm.) Pilg.	Yellow Wildrye
Leymus Hochst.	wildrye
Leymus salina (M.E. Jones) Á. Löve	Salmon Wildrye
Leymus triticoides (Buckley) Pilg.	Beardless Wildrye
Ligusticum canbyi J.M. Coult. & Rose	Canby's Lovage, Canby's Licorice-root
Ligusticum L.	lovage; licorice-root
Linanthus pungens (Torr.) J.M. Porter & L.A. Johnson	Granite Prickly-phlox
Linaria dalmatica (L.) Mill. [I]	Dalmatian Toadflax
Linnaea borealis L.	Twinflower
Linum digynum A. Gray	Northwestern Yellow Hard Flax
Linum perenne L. [I]	Blue Garden Flax
Lithospermum L.	stoneseed; gromwell

Scientific name	Common name
Lolium L.	ryegrass
Lomatium ambiguum (Nutt.) J.M. Coult. & Rose	Wyeth Biscuit-root
Lomatium bicolor var. *leptocarpum* (Torr. & A. Gray) Schlessman	Gumbo Biscuit-root
Lomatium brunsfeldianum Kemper & R.P. McNeill	Brunsfeld's Biscuit-root
Lomatium grayi (J.M. Coult. & Rose) J.M. Coult. & Rose	Gray's Biscuit-root
Lomatium nudicaule (Nutt.) J.M. Coult. & Rose	Barestemmed Biscuit-root
Lomatium Raf.	biscuit-root, lomatium
Lomatium swingerae R.P. McNeill	Swinger's Biscuit-root
Lonicera caerulea L.	Sweet-berry Honeysuckle, Bluefly Honeysuckle
Lonicera involucrata (Richardson) Banks ex Spreng.	Bearberry Honeysuckle, Black Twin-berry
Luetkea pectinata (Pursh) Kuntze	Partridgefoot
Lupinus argenteus Pursh	Silvery Lupine
Lupinus L.	lupine
Lupinus lyallii subsp. *alcis-temporis* (C.P. Sm.) B.J. Cox	Christ's Elk-Season Lupine
Luzula hitchcockii Hämet-Ahti	Hitchcock's or Smooth Woodrush
Lycopus L.	bugleweed; water-horehound
Lysichiton americanus Hultén & H. St. John	Skunk Cabbage
Lysimachia maritima (L.) Galasso, Banfi & Soldano	Saltwort, Sea Milkwort
Lythrum L. [I]	loosestrife
Lythrum salicaria L. [I]	Purple Loosestrife
Maianthemum stellatum (L.) Link	Little False Solomon's Seal, Starry Solomon's Seal, Star-flowered Solomon's Seal
Malacothrix DC.	desert dandelion
Malus Mill. [I]	apple; crabapple
Malvella leprosa (Ortega) Krapov.	Alkali-mallow
Marsilea vestita Hook. & Grev.	Hairy Waterclover
Medicago sativa L. [I]	Alfalfa, Lucerne
Melilotus officinalis (L.) Lam. [I]	Common Yellow Sweet-clover
Mentha canadensis L.	Wild Mint
Mentzelia albicaulis (Douglas ex Hook.) Douglas ex Torr. & A. Gray	White-stemmed Mentzelia, Small-flowered Mentzelia
Mentzelia Plum. ex L.	blazing-star; mentzelia
Menyanthes trifoliata L.	Buckbean; Bogbean
Mertensia Roth	bluebells; lungwort, mertensia
Mirabilis macfarlanei Constance & Rollins	Macfarlane's Four-o'clock
Mitella Tourn. ex L.	mitrewort; bishop's cap
Monardella angustifolia Elvin, Ertter & Mansfield	Leslie Gulch Monardella
Morus alba L. [I]	White Mulberry
Muhlenbergia asperifolia (Nees & Meyen ex Trin.) Parodi	Alkali Muhly, Scratchgrass
Muhlenbergia filiformis (Thurb.) Rydb.	Pullup or Slender Muhly
Muhlenbergia richardsonis (Trin.) Rydb.	Mat or Short-leaved Muhly
Muhlenbergia Schreb.	muhly; muhlenbergia
Myosotis L.	forget-me-not; scorpion-grass
Myriophyllum sibiricum Kom.	Northern or Siberian Water-milfoil
Myriophyllum spicatum L.	Eurasian or Spiked Water-milfoil
Najas L.	water-nymph
Nama aretioides (Hook. & Arn.) Brand	Purple Nama, Ground Nama
Nasturtium officinale W.T. Aiton [I]	Watercress
Navarretia Ruiz & Pav.	navarretia; pincushion-plant
Neokochia americana (S. Watson) G.L. Chu & S.C. Sand.	Green Molly
Nepeta cataria L. [I]	Catnip, Catmint
Nitella C. Agardh	stonewort
Nuphar polysepala Engelm.	Spatterdock, Indian Pond Lily, Wakas
Oenothera pallida Lindl.	Pale Evening-primrose
Onobrychis viciifolia Scop. [I]	Holy-clover, Sainfoin
Onopordum acanthium L. [I]	Scotch Thistle
Oplopanax horridus (Sm.) Miq.	Devil's Club
Opuntia Mill.	pricklypear cactus
Oreostemma alpigenum (Torr. & A. Gray) Greene	Alpine Aster
Orthotrichum pulchellum Brunt.	orthotrichum moss
Osmorhiza berteroi DC.	Sweet-cicely
Osmorhiza occidentalis (Nutt.) Torr.	Western Sweet-root
Osmorhiza Raf.	sweet-root; sweet-cicely
Oxytropis DC.	locoweed; oxytrope; crazyweed

Scientific name	Common name
Packera Á. Löve & D. Löve	butterweed; groundsel
Packera streptanthifolia (Greene) W.A. Weber & Á. Löve	Cleft-leaf Groundsel
Packera streptanthifolia (Greene) W.A. Weber & Á. Löve	Rocky Mountain Butterweed, Cleft-leaf Groundsel
Panicum virgatum L.	Switchgrass
Parnassia palustris L.	Northern Grass-of-Parnassus, Wideworld Grass-of-Parnassus
Paronychia sessiliflora Nutt.	Whitlow-wort
Paxistima myrsinites (Pursh) Raf.	Mountain-box, Mountain-lover, Myrtle Boxwood, Oregon Boxwood
Pectiantia pentandra (Hook.) Rydb.	Alpine Mitrewort, Five-stamened Mitrewort
Pedicularis groenlandica Retz.	Pink Elephants, Elephant's Head
Pedicularis racemosa Douglas ex Benth.	Leafy Lousewort, Sickletop Lousewort
Pediocactus simpsonii (Engelm.) Britton & Rose	Simpson's Ball Cactus
Penstemon acuminatus Douglas ex Lindl.	Sand Dune or Sharp-leaved Penstemon
Penstemon deustus Douglas	Hot-rock Penstemon
Penstemon fruticosus (Pursh) Greene	Shrubby or Bush Penstemon
Penstemon gairdneri Hook.	Gairdner's Penstemon
Penstemon globosus (Piper) Pennell & D.D. Keck	Globe Penstemon
Penstemon montanus Greene	Mountain Penstemon
Penstemon pumilus Nutt.	Dwarf Penstemon
Penstemon Schmidel	beardtongue; penstemon
Perideridia gairdneri (Hook. & Arn.) Mathias	Gairdner's Yampah
Perideridia Rchb.	yampah; false-caraway
Persicaria amphibia (L.) Delarbre	Water Smartweed
Persicaria Mill.	knotweed; smartweed; tearthumb
Petrophytum (Nutt.) Rydb.	rockmat
Petrophytum caespitosum (Nutt.) Rydb.	Tufted or Rocky Mountain Rockmat
Phacelia hastata Douglas ex Lehm.	Whiteleaf Phacelia, Silverleaf Phacelia
Phacelia lutea (Hook. & Arn.) J.T. Howell	Yellow Phacelia
Phalaris arundinacea L. [I]	Reed Canarygrass
Philadelphus lewisii Pursh	Lewis's Mock Orange
Phleum pratense L. [I]	Timothy
Phlox hoodii Richardson	Hood's Phlox, Carpet Phlox
Phlox hoodii subsp. *muscoides* (Nutt.) Wherry	Moss Phlox
Phlox idahonis Wherry	Clearwater Phlox
Phlox kelseyi subsp. *glandulosa* Wherry	Kelsey's Phlox
Phlox L.	phlox, wild sweet-william
Phlox longifolia Nutt.	Long-leaf Phlox
Phlox pulvinata (Wherry) Cronquist	Cushion Phlox, Compact Phlox
Phragmites australis (Cav.) Trin. ex Steud. [I]	Common Reed
Phyllodoce empetriformis (Sm.) D. Don	Red Mountain-heath, Pink Mountain-heath
Phyllodoce Salisb.	mountain-heath
Physocarpus (Cambess.) Raf.	ninebark
Physocarpus capitatus (Pursh) Kuntze	Pacific Ninebark
Physocarpus malvaceus (Greene) Kuntze	Mallow Ninebark
Picea engelmannii Parry ex Engelm.	Engelmann Spruce
Pinus albicaulis Engelm.	Whitebark Pine
Pinus contorta Douglas ex Loudon	Lodgepole Pine
Pinus flexilis E. James	Limberpine
Pinus monophylla Torr. & Frém.	Singleleaf Pinyon
Pinus monticola Douglas ex D. Don	Western White Pine
Pinus ponderosa Douglas ex C. Lawson	Ponderosa Pine
Plagiobothrys Fisch. & C.A. Mey.	popcorn-flower; plagiobothrys
Plantago eriopoda Torr.	Alkali Plantain, Saline Plantain
Plantago L.	plantain
Pleiacanthus (Nutt.) Rydb.	skeletonweed
Pleiacanthus spinosus (Nutt.) Rydb.	Thorny Skeletonweed
Poa alpina L.	Alpine Bluegrass
Poa bulbosa L. [I]	Bulbous Bluegrass
Poa compressa L. [I]	Canada Bluegrass
Poa glauca Vahl	Glaucous Bluegrass
Poa L.	bluegrass
Poa palustris L.	Fowl Bluegrass
Poa pratensis L. [I]	Kentucky Bluegrass

Scientific name	Common name
Poa secunda subsp. *juncifolia* (Scribn.) Soreng	Big, Alkali, or Nevada Bluegrass
Poa secunda subsp. *secunda*	Canby's, Pacific, Pine, Curly, Sandberg's, or Rough Bluegrass
Poa wheeleri Vasey	Wheeler's Bluegrass
Polemonium elusum J.J. Irwin & R.L. Hartm.	Elusive Polemonium
Polemonium pulcherrimum Hook.	Showy Polemonium
Polemonium viscosum Nutt.	Skunk Polemonium, Sticky Polemonium
Polygonum L.	doorweed; knotweed; smartweed
Polygonum polygaloides Meisn.	White-margined Knotweed
Polypogon Desf. [I]	polypogon; beard-grass
Polypogon monspeliensis (L.) Desf. [I]	Rabbitsfoot Grass, Annual Beard-grass
Polystichum munitum (Kaulf.) C.Presl	Western Sword-fern
Populus alba L. [I]	White Poplar
Populus angustifolia E. James	Narrow-leaved Cottonwood
Populus deltoides W. Bartram ex Marshall [I]	Eastern Cottonwood
Populus fremontii S. Watson [I]	Fremont Cottonwood
Populus L.	poplar; cottonwood; aspen
Populus tremuloides Michx.	Quaking Aspen
Populus tristis Fisch.	Black Cottonwood
Porterella carnosula (Hook. & Arn.) Torr.	Porterella
Portulaca oleracea L. [I]	Common Purslane
Potamogeton crispus L. [I]	Curled Pondweed
Potamogeton foliosus Raf.	Leafy or Close-leaved Pondweed
Potamogeton gramineus L.	Grass-leaved Pondweed
Potamogeton L.	pondweed
Potamogeton natans L.	Broad-leaf or Floating-leaf Pondweed
Potamogeton richardsonii (A. Benn.) Rydb.	Richardson's Pondweed
Potamogeton robbinsii Oakes	Robbin's Pondweed
Potentilla baileyi (S. Watson) Greene	Owyhee Ivesia
Potentilla glaucophylla Lehm.	Blueleaf or Vari-leaved Cinquefoil
Potentilla gordonii (Hook.) Greene	Gordon's Ivesia
Potentilla gracilis Douglas ex Hook.	Slender Cinquefoil
Potentilla L.	cinquefoil; five-finger
Primula alcalina Cholewa & D.M. Hend.	Alkaline Primrose
Primula jeffreyi (Van Houtte) A.R. Mast & Reveal	Jeffrey's or Tall Mountain Shooting Star
Prosartes D. Don	fairy-bell
Prunus armeniaca L.	Apricot
Prunus emarginata (Douglas ex Hook.) Eaton	Bitter Cherry
Prunus L.	plum; cherry; laurel
Prunus virginiana L.	Chokecherry
Pseudoroegneria (Nevski) Á. Löve	wheatgrass
Pseudoroegneria spicata (Pursh) Á. Löve	Bluebunch Wheatgrass
Pseudotsuga menziesii (Mirb.) Franco	Douglas Fir
Psilocarphus brevissimus Nutt.	Dwarf Woolly-heads
Pteridium aquilinum (L.) Kuhn	Bracken; Brake-fern
Ptilidium ciliare (L.) Hampe	liverwort
Puccinellia Parl.	alkaligrass
Purshia DC. ex Poir.	antelope-brush; bitter-brush
Purshia tridentata (Pursh) DC.	Antelope-brush, Bitter-brush
Pyrrocoma Hook.	goldenweed
Pyrus L. [I]	pear
Ranunculus alismifolius Geyer ex Benth.	Plantainleaved Buttercup
Ranunculus aquatilis L.	White Water-buttercup, Water Crowfoot
Ranunculus aristatus (B. Boivin) Christenh. & Byng	Sedge Mouse-tail, Bristly Mouse-tail
Ranunculus L.	buttercup; crowfoot; water-buttercup
Ranunculus minimus (L.) E.H.L. Krause	Tiny Mouse-tail, Common Mouse-tail
Ranunculus testiculatus Crantz [I]	Bur Buttercup, Hornseed Buttercup, Curveseed Butterwort
Rhamnus alnifolia L'Hér.	Alder Buckthorn
Rhododendron columbianum (Piper) Harmaja	Trapper's Tea, Smooth Labrador-tea
Rhododendron menziesii Craven	Fool's Huckleberry, Mock Azalea, Rusty Menziesia
Rhus glabra L.	Western or Smooth Sumac
Rhus trilobata Nutt.	Lemonade Sumac, Smooth Sumac, Skunkbush

Scientific name	Common name
Ribes aureum Pursh	Golden Currant
Ribes cereum Douglas	Wax Currant
Ribes hudsonianum Richardson	Stinking Currant, Northern Black Currant
Ribes inerme Rydb.	Whitestem Gooseberry
Ribes L.	currant; gooseberry
Ribes lacustre (Pers.) Poir.	Swamp Gooseberry, Swamp Black Gooseberry, Prickly Currant
Ribes montigenum McClatchie	Alpine Prickly Currant, Mountain Gooseberry
Ribes velutinum Greene	Desert Gooseberry
Riccia fluitans L.	Floating Crystalwort
Robinia pseudoacacia L. [I]	Black Locust
Rosa canina L. [I]	Dog Rose
Rosa gymnocarpa Nutt.	Baldhip or Little Wild Rose
Rosa L.	rose
Rosa rubiginosa L. [I]	Sweetbrier, Eglantine
Rosa woodsii Lindl.	Woods' Rose
Rubus bifrons Vest [I]	Himalayan or European Blackberry
Rubus idaeus L.	Red Raspberry
Rubus L.	bramble; blackberry; raspberry
Rubus nutkanus Moc. ex Ser.	Thimbleberry
Rudbeckia occidentalis Nutt.	Western Coneflower
Rumex acetosella L. [I]	Sheep, Horse, or Field Sorrel, Sour Weed
Rumex crispus L. [I]	Curly, Sour, or Yellow Dock
Rumex L.	dock; sorrel
Rumex salicifolius Weinm.	Willow Dock
Rumex venosus Pursh	Veiny or Winged Dock, Wild Begonia
Ruppia maritima L.	Beaked Ditch-grass, Widgeon-grass
Sagittaria Ruppius ex L.	arrowhead
Salicornia rubra A. Nelson	Red Glasswort
Salix ×fragilis L. [I]	crack willow
Salix alba L. [I]	White Willow
Salix amygdaloides Andersson	Peach-leaf Willow
Salix arctica Pall.	Arctic Willow
Salix bebbiana Sarg.	Bebb's Willow
Salix boothii Dorn	Booth's Willow
Salix drummondiana Barratt ex Hook.	Drummond's Willow
Salix eastwoodiae Cockerell ex A. Heller	Eastwood's Willow
Salix exigua Nutt.	Coyote Willow
Salix geyeriana Andersson	Geyer's Willow
Salix L.	willow
Salix lasiandra var. *caudata* (Nutt.) Sudw.	Whiplash Willow
Salix lasiolepis Benth.	Arroyo Willow
Salix lemmonii Bebb	Lemmon's Willow
Salix lutea Nutt.	Yellow Willow
Salix melanopsis Nutt.	Dusky Willow
Salix nivalis Hook.	Snow Willow
Salix planifolia Pursh	Diamondleaf Willow
Salix scouleriana Barratt ex Hook.	Scouler's Willow
Salix wolfii Bebb	Wolf's Willow
Salsola tragus L. [I]	Tumbleweed, Wind Witch
Salvia dorrii (Kellogg) Abrams	Gray Ball Sage
Sambucus cerulea Raf.	Blue Elderberry
Sambucus L.	elderberry; elder
Sanguisorba stipulata Raf.	Sitka Burnet
Sarcobatus vermiculatus (Hook.) Torr.	Black Greasewood
Saussurea americana Eaton	American Saw-wort
Saxifraga Tourn. ex L.	saxifrage
Schoenoplectus (Rchb.) Palla	bulrush; naked-stem bulrush; club-rush
Schoenoplectus acutus (Muhl. ex Bigelow) Á. Löve & D. Löve	Hardstem Bulrush, Tule
Schoenoplectus americanus (Pers.) Volkart	American or Olney's Three-square
Schoenoplectus pungens (Vahl) Palla	Common Three-square
Schoenoplectus subterminalis (Torr.) Soják	Water Bulrush
Schoenoplectus tabernaemontani (C.C. Gmel.) Palla	Softstem Bulrush, Tule
Scirpus cyperinus (L.) Kunth	Wool-grass
Scirpus microcarpus J. Presl & C. Presl	Small-fruit Bulrush

Scientific name	Common name
Scirpus Tourn. ex L.	bulrush
Scutellaria L.	skullcap
Secale cereale L. [I]	Cultivated Rye
Sedum L.	stonecrop
Sedum valens Björk	Idaho Stonecrop
Selaginella P. Beauv.	spike-moss; lesser-clubmoss
Senecio integerrimus Nutt.	Western Groundsel, One-stemmed Butterweed
Senecio L.	groundsel; ragwort; butterweed
Senecio serra Hook.	Butterweed Groundsel, Tall Butterweed
Senecio triangularis Hook.	Arrowleaf Groundsel
Shepherdia canadensis (L.) Nutt.	Canada Buffalo-berry, Russett Buffalo-berry, Soopolallie, Soapberry
Sibbaldia procumbens L.	Creeping Sibbaldia
Silene acaulis (L.) Jacq.	Moss Campion or Pink, Cushion Pink
Silene spaldingii S. Watson	Spalding's Catchfly, Spalding's Silene
Sisymbrium altissimum L. [I]	Tall Tumblemustard, Jim Hill Mustard
Solanum dulcamara L. [I]	Bittersweet, Climbing Nightshade, Felonwort, Blue Bindweed
Solidago L.	goldenrod
Solidago multiradiata Aiton	Northern Goldenrod
Solidago spectabilis (D.C. Eaton) A. Gray	Nevada Goldenrod
Sorbus L.	mountain-ash; service tree; whitebeam
Sparganium angustifolium Michx.	Narrowleaf or Floating Bur-reed
Sparganium L.	bur-reed
Sparganium natans L.	Small Bur-reed
Sphaeralcea A. St.-Hil.	globe-mallow
Sphaeralcea grossulariifolia (Hook. & Arn.) Rydb.	Gooseberry-leaved Globe-mallow
Sphaerocarpos hians Haynes	liverwort
Sphagnum L.	sphagnum
Spiraea douglasii Hook.	Douglas's Spirea
Spiraea L.	spirea; spiraea; meadowsweet
Spiraea lucida Douglas ex Greene	Shiny-leaf Spirea
Spiranthes diluvialis Sheviak	Ute Ladies-tresses
Spirodela polyrhiza (L.) Schleid.	Greater Duckweed
Sporobolus airoides (Torr.) Torr.	Alkali Sacaton, Hairgrass Dropseed
Sporobolus cryptandrus (Torr.) A. Gray	Sand Dropseed
Sporobolus hookerianus P.M. Peterson & Saarela	Alkali Cordgrass
Stachys L.	hedge-nettle; woundwort; betony
Stanleya Nutt.	stanleya; prince's plume
Stanleya pinnata (Pursh) Britton	Bushy Stanleya
Stanleya tomentosa var. *runcinata* (Rydb.) Rollins	Woolly Stanleya (var. *runcinata*)
Stenotus acaulis (Nutt.) Nutt.	Stemless Goldenweed, Cushion Stenotus
Streptopus amplexifolius (L.) DC.	Clasping-leaved Twisted-stalk, Cucumber-root
Stuckenia Börner	pondweed
Stuckenia pectinata (L.) Börner	Sago Pondweed
Suaeda calceoliformis (Hook.) Moq.	Pahute Weed
Subularia aquatica L.	Awlwort
Symphoricarpos albus (L.) S.F. Blake	Common Snowberry
Symphoricarpos Duhamel	snowberry
Symphoricarpos parishii Rydb.	Parish's Snowberry
Symphoricarpos rotundifolius A. Gray	Mountain Snowberry
Symphyotrichum foliaceum (Lindl. ex DC.) G.L. Nesom	Leafy or Leaf-bracted Aster
Symphyotrichum frondosum (Nutt.) G.L. Nesom	Short-rayed Aster, Alkali Aster
Symphyotrichum Nees	aster
Taeniatherum caput-medusae (L.) Nevski [I]	Medusahead
Tamarix L. [I]	tamarisk; saltcedar
Tanacetum vulgare L. [I]	Common Tansy
Taxus baccata L.	Common Yew, English Yew, Golden Irish Yew, Golden Yew, Irish Yew, Silver Yew, Yellow-berried Yew
Taxus canadensis Marshall	Canada Yew
Taxus chinensis (Pilg.) Rehder	Chinese Yew
Taxus cuspidata Siebold & Zucc.	Japanese Yew

Scientific name	Common name
Tetradymia DC.	horse-brush
Tetradymia glabrata Torr. & A. Gray	Little-leaf Horse-brush
Tetradymia spinosa Hook. & Arn.	Cottonhorn or Catclaw Horse-brush
Thalictrum alpinum L.	Dwarf or Alpine Meadowrue
Thalictrum fendleri Engelm. ex A. Gray	Fendler's Meadowrue
Thalictrum occidentale A. Gray	Western Meadowrue
Thalictrum Tourn. ex L.	meadowrue
Thinopyrum Á. Löve [I]	wheatgrass
Thinopyrum intermedium (Host) Barkworth & D.R. Dewey [I]	Intermediate Wheatgrass
Thinopyrum obtusiflorum (DC.) Banfi [I]	Tall Wheatgrass
Thlaspi arvense L. [I]	Field Pennycress, Fanweed, Stinkweed
Thuja plicata Donn ex D. Don	Western Red Cedar
Tiarella trifoliata L.	Trefoil Foamflower
Tiquilia nuttallii (Hook.) A.T. Richardson	Nuttall's Crinklemat
Townsendia florifera (Hook.) A. Gray	Showy Townsend Daisy
Toxicodendron rydbergii (Small ex Rydb.) Greene	Western Poison Ivy
Tragopogon dubius Scop. [I]	Yellow Salsify
Trautvetteria caroliniensis (Walter) Vail	False Bugbane
Triantha occidentalis (S. Watson) R.R. Gates	Western False-asphodel
Trichophorum cespitosum (L.) Hartm.	Northern Deergrass
Trichostema oblongum Benth.	Mountain Blue-curls
Trifolium macrocephalum (Pursh) Poir.	Big-head Clover
Trifolium parryi A. Gray	Parry's Clover
Trifolium Tourn. ex L.	clover; trefoil
Triglochin maritima L.	Seaside Arrow-grass
Triglochin Riv. ex L.	arrow-grass
Trillium ovatum Pursh	White Trillium, Western Wake-robin or Trillium
Tripleurospermum inodorum (L.) Sch. Bip.	Scentless or False Mayweed
Tsuga heterophylla (Raf.) Sarg.	Western Hemlock
Tsuga mertensiana (Bong.) Carrière	Mountain Hemlock
Typha angustifolia L. [I]	Narrow-leaved Cat-tail
Typha L.	cat-tail; reedmace
Typha latifolia L.	Common Cat-tail, Broad-leaved Cat-tail
Ulmus americana L. [I]	American Elm
Ulmus pumila L. [I]	Siberian Elm
Urtica dioica L.	Stinging Nettle
Utricularia macrorhiza Leconte	Common Bladderwort, Greater Bladderwort
Vaccinium cespitosum Michx.	Dwarf Bilberry or Huckleberry
Vaccinium L.	bilberry; blueberry; huckleberry; cranberry
Vaccinium membranaceum Douglas ex Torr.	Globe Huckleberry, Thin-leaved Huckleberry
Vaccinium scoparium Leiberg ex Coville	Grouseberry, Whortleberry
Vaccinium uliginosum L.	Bog Blueberry, Bog Bilberry
Valeriana L.	valerian
Valeriana occidentalis A. Heller	Western Valerian
Ventenata dubia (Leers) Coss. & Durieu [I]	North Africa Grass
Veratrum californicum Durand	California False Hellebore
Veratrum L.	false hellebore; corn-lily
Verbascum thapsus L. [I]	Common Mullein, Flannel Mullein
Veronica L.	speedwell
Veronica peregrina L.	Purslane Speedwell
Viola L.	violet
Viola orbiculata (A. Gray) Geyer ex B.D. Jacks.	Round-leaved or Darkwoods Violet
Wyethia amplexicaulis (Nutt.) Nutt.	Northern Mule's-ears or Wyethia
Wyethia sagittata (Pursh) Mabb.	Arrowleaf Balsamroot
Xanthoparmelia idahoensis Hale	Idaho Xanthoparmelia Lichen
Xanthoparmelia norchlorochroa Hale	xanthoparmelia lichen
Xerophyllum tenax (Pursh) Nutt.	Beargrass, Western Turkey-beard
Zannichellia palustris L.	Horned Pondweed
Zeltnera exaltata (Griseb.) G. Mans.	Western Centaury
Zizania L.	Indian rice; wild rice

Appendix 4: Complete list of SWAP habitats and community types organized hierarchically. Terrestrial vegetation types follow the United States National Vegetation Classification hierarchy (USNVC 2022) with colloquial name used in this plan in boldface type.

SWAP habitat

1 Forest & Woodland Class
- 1.B Temperate & Boreal Forest & Woodland Subclass
  - 1.B.2 Cool Temperate Forest & Woodland Formation
    - 1.B.2.Nb Rocky Mountain Forest & Woodland Division
      - M501 Central Rocky Mountain **Dry Lower Montane–Foothill Forest** Macrogroup
      - M500 Central Rocky Mountain **Mesic Lower Montane Forest** Macrogroup
      - M020 Rocky Mountain **Subalpine–High Montane Forest** Macrogroup
        - G222 Rocky Mountain Subalpine–Montane **Aspen Forest & Woodland** Group
        - G223 Northern Rocky Mountain Whitebark Pine - Subalpine Larch Woodland Group
          - A3368 **Whitebark Pine Forest & Woodland** Alliance
    - 1.B.2.Nc Western North American Pinyon - Juniper Woodland & Scrub Division
      - M896 Intermountain **Pinyon–Juniper Woodland** Macrogroup
  - 1.B.3 Temperate Flooded & Swamp Forest Formation
    - 1.B.3.Nc Rocky Mountain-Great Basin Montane Flooded & Swamp Forest Division
      - M034 Rocky Mountain-Great Basin **Montane Riparian & Swamp Forest** Macrogroup
        - G796 Northern Rocky Mountain **Lowland-Foothill Riparian Forest** Group
    - 1.B.3.Nd Western North American Interior Flooded Forest Division
      - M298 Interior West **Ruderal Flooded & Swamp Forest & Woodland** Macrogroup

2 Shrub & Herb Vegetation Class
- 2.B Temperate & Boreal Grassland & Shrubland Subclass
  - 2.B.2 Temperate Grassland & Shrubland Formation
    - 2.B.2.Nf Western North American Grassland & Shrubland Division
      - M048 Central Rocky Mountain **Montane–Foothill Grassland & Shrubland** Macrogroup
      - M168 Rocky Mountain-Vancouverian **Subalpine–High Montane Mesic Meadow** Macrogroup
      - M493 Western North American **Ruderal Grassland & Shrubland** Macrogroup
    - 2.B.2.Ng Western North American Interior Chaparral Division
      - M094 Cool Interior Chaparral Macrogroup
        - G282 Western North American Montane Sclerophyll Scrub Group
          - A3936 Snowbrush Ceanothus Shrubland Alliance AKA A3936 **Snowbrush Ceanothus Chaparral**
- 2.C Shrub & Herb Wetland Subclass
  - 2.C.2 Temperate to Polar Bog & Fen Formation
    - 2.C.2.Na North American **Bog & Fen** Division (D029)
  - 2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation
    - 2.C.4.Nb Western North American Temperate Freshwater Marsh, Wet Meadow & Shrubland Division
      - M888 Arid West Interior **Freshwater Marsh** Macrogroup

SWAP habitat

M074 Western North American **Vernal Pool** Macrogroup
M073 Vancouverian **Lowland Marsh, Wet Meadow & Shrubland** Macrogroup
M893 Western North American **Montane Marsh, Wet Meadow & Shrubland** Macrogroup
G526 Rocky Mountain-Great Basin **Lowland–Foothill Riparian Shrubland** Group
M301 Western North American **Ruderal Marsh, Wet Meadow & Shrubland** Macrogroup
2.C.5 Salt Marsh Formation
2.C.5.Nd North American Western Interior Brackish Marsh, Playa & Shrubland Division
M082 Warm & Cool Desert **Alkali-Saline Marsh, Playa & Shrubland** Macrogroup
3 Desert & Semi-Desert Class
3.B Cool Semi-Desert Scrub & Grassland Subclass
3.B.1 Cool Semi-Desert Scrub & Grassland Formation
3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division
M171 Great Basin-Intermountain **Dry Shrubland & Grassland** Macrogroup
G775 Intermountain **Sparsely Vegetated Dune Scrub & Grassland** Group
M170 Great Basin-Intermountain **Dwarf Sagebrush Steppe & Shrubland** Macrogroup
M169 Great Basin-Intermountain **Tall Sagebrush Steppe & Shrubland** Macrogroup
M093 Great Basin **Saltbush Scrub** Macrogroup
M118 Intermountain Basins **Cliff, Scree & Badland Sparse Vegetation** Macrogroup
M499 Western North American Cool **Semidesert Ruderal Scrub & Grassland** Macrogroup
4 Polar & High Montane Scrub, Grassland & Barrens Class
4.B Temperate to Polar Alpine & Tundra Vegetation Subclass
4.B.1 Temperate & Boreal Alpine Tundra Formation
4.B.1.Nb Western North American Alpine Tundra Division
M099 Rocky Mountain-Sierran **Alpine Tundra** Macrogroup
5 Aquatic Vegetation Class
5.B Freshwater Aquatic Vegetation Subclass
5.B.2 Temperate to Polar Freshwater Aquatic Vegetation Formation
5.B.2.Na North American Freshwater Aquatic Vegetation Division
M109 Western North American **Freshwater Aquatic Vegetation** Macrogroup
6 Open Rock Vegetation Class
6.B Temperate & Boreal Open Rock Vegetation Subclass
6.B.1 Temperate & Boreal Cliff, Scree & Other Rock Vegetation Formation
6.B.1.Nb Western North American Temperate Cliff, Scree & Rock Vegetation Division
M887 Western North American **Cliff, Scree & Rock Vegetation** Macrogroup
7 Agricultural [Habitat] & Developed Vegetation Cultural Class
7.B Herbaceous **Agricultural Vegetation** Cultural Subclass (CSC02)
7.C Herbaceous & Woody Developed Vegetation Cultural Subclass
7.C.1 Lawn, Garden & Recreational Vegetation Cultural Formation (CFO09)
Rivers (5th order and higher)
Large Streams (3rd, 4th order)
Small Streams (1st, 2nd order) – Intermittent
Small Streams (1st, 2nd order) – Perennial

SWAP habitat
Lakes, Ponds & Reservoirs
Springs
Caves & Subterranean Habitats

Appendix 5: Species of greatest conservation need (SGCN; *n* = 137) and species of greatest information need (SGIN[a]; *n* = 132) considered obligate (O), near-obligate (N), dependent (D), or associated (A) with one or more habitats[b].

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Fishes																																							
Pacific Lamprey																																	D	N					
White Sturgeon																																	O					D		
White Sturgeon (Kootenai River DPS)																																	O							
Lake Chub[a]																																						O		
Northern Leatherside Chub																																		D	D?	D	A		

[a] Species of greatest information need (SGIN) are denoted by superscript a.

[b] Obligate species are defined as having complete dependence on a specific habitat or associated plant community to meet one or more seasonal habitat requirements. If that habitat is lost, habitat functionality is lost for obligate species. Greater Sage-Grouse and Sagebrush Sparrow are examples of sagebrush-obligate species. Macfarlane's Four-o'clock is an example of a canyon grassland obligate species. Near-obligate species have their breeding distribution almost entirely within specific habitat communities and highest densities achieved within that habitat's communities. Pronghorn and Ferruginous Hawk are examples of sagebrush near-obligate species. Dependent species are defined as having seasonal distributions in a variety of habitats including a specific habitat, but there is a strong overlap with the distribution of that habitat. Where ranges overlap, the specific habitat provides an important seasonal habitat. Southern Idaho Ground Squirrel and Great Basin Spadefoot are examples of sagebrush-dependent species. Associated species are defined as those that occur in other communities but may also breed and forage or meet other habitat requirements in a specific habitat. Townsend's Big-eared Bat is an example of a sagebrush-associated species.

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Leopard Dace[a]																																	D?	D	D?	D	A		
Green Sucker[a]																																	D?	D	D?	D			
Yellowstone Cutthroat Trout																																	D	N	D?	D	A		
Bonneville Cutthroat Trout																																	D	N	D	D	A		
Steelhead (Snake River Basin DPS)																																	D	N	D?	D			
Sockeye Salmon (Snake River ESU)																																	D	D			O		
Chinook Salmon (Snake River fall-run ESU)																																	O	D					
Chinook Salmon (Snake River spring/summer-run ESU)																																	D	N	D?	D			
Bear Lake Whitefish																																					O		
Pygmy Whitefish[a]																																					O		
Bonneville Cisco																																					O		
Bonneville Whitefish																																					O		
Mountain Whitefish																																	N	D			A		
Bull Trout																																	D	D		N	D		

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Burbot																																N	D					
Slimy Sculpin[a]																																D?	D	D?	D	D		
Bear Lake Sculpin																																				O		
Shoshone Sculpin[a]																																			O		O	
Wood River Sculpin																																D	D	A?	D			
Cedar Sculpin[a]																																D	D	D?	D			
Amphibians																																						
Western Toad	A		A							A	A	A					A	A	A	A		A	A	A	A	A		A			A	A			A		A	A
Woodhouse's Toad										A		A					A		A	A		A		A	A	A		A			A				A			
Rocky Mountain Tailed Frog[a]		A	A				A			A	A																						D			D		
Northern Leopard Frog														D			D	D																		D		
Columbia Spotted Frog (Great Basin population)														A			A	A	A															A	A	A	D	D	
Great Basin Spadefoot[a]															A				D			A		D	D	A													
Idaho Giant Salamander[a]		D					A																												A	D	A	A	
Coeur d'Alene Salamander[a]							A	A									A																		A	D	A	D	

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Mammals																																						
Pygmy Rabbit						A																A		O	O	A		A										
American Pika					A						D																A		D	O								
Hoary Marmot[a]					A						D																		O	O								
Northern Idaho Ground Squirrel	A									O																												
Southern Idaho Ground Squirrel										D		A										D		D	D			A										
Merriam's Ground Squirrel[a]										A		A										A		A	A	A					A							
Wyoming Ground Squirrel (ssp. *nevadensis*)[a]																						A			N	N		A										
Dark Kangaroo Mouse[a]																					A	D		D	D	D	A	A										
Northern Bog Lemming[a]			?				A							N				A																				
Dwarf Shrew[a]	A		A	A		A				A	A											A					A		A	A								
Western Small-footed Myotis	A					A		A										A	A				A	A	A	A	D	A		A				A	A	A	A		A	D
Long-eared Myotis[a]	A	A	A		A	A	A	A											A				A	A	A	A	A			A	A	A		A	A	A	A	A	A	D

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Little Brown Myotis[c]	A	A	A	A			A	A	A			A			A			A	A				A				A			A	A	A		A	A	A	A	D
Fringed Myotis[a]	A	A	A			A	A	A											A				A	A	A	A	A							A	A	A	A	A	D
Long-legged Myotis[a]	A	A				A	A	A											A								A			A				A	A	A	A	A	D
Yuma Myotis[c]	A	A				A	A	A										A	A				A	A	A	A	A							D	D	D	D	D	A	D
Canyon Bat[a]						A		A															A	A	A	A	A									A	A		A	A
Pallid Bat[ac]	A					A		A											A				A	A	A	A	D							A	A	A	A		A	A
Hoary Bat	A	A	A	A		A	A	A										A	A			A							A		A	A					A		
Big Brown Bat[ac]	A	A	A	A		A	A	A																A	A				A	A	A	A		A	A	A	A	A	A
Silver-haired Bat	A	A	A	A		A	A	A	A									A	A								A		A		A	A		A	A	A	A	A	A
Townsend's Big-eared Bat[c]	A	A	A	A		A	A	A		A			A				A	A	A			A	A	A	A	A	A			A				A	A	A	A		A	D
Spotted Bat[a]	A					A	A	A			A						A	A					A	A	A	A	D			D	A			A	A	A	A			
Western Spotted Skunk[a]	A	A				A		A											A			A	A	A	A		A				A									
Wolverine		A	A		D						A																		D											
American Marten[a]		D	D		D		A	A																																
Fisher		D	D				D																																

[c] Buildings and other human-made structures provide vital habitat for Little Brown Myotis, Yuma Myotis, Pallid Bat, Big Brown Bat, and Townsend's Big-eared Bat, especially during the summer maternity season.

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Grizzly Bear (Greater Yellowstone Ecosystem population)		A	A	A	D		A				A		A																A	A									
Grizzly Bear (Selkirk–Cabinet population)		A	A		D		A	A			A		A	A															A	A									
Kit Fox[a]										A		A										A	A	A	A	A	A	A											
Canada Lynx (Purcell Mountains)		A	D		D						A		A																										
Pronghorn										A		A										A		N	N	A		A			A								
Rocky Mountain Goat			D		D						D																		N	N								
California Bighorn Sheep										D		A										D					O	A											
Rocky Mountain Bighorn Sheep										D	A	A										D						A		O									
Moose	A	A	A	A	A		A	A	A	D			D		A		A	A	A	A											A	A	D						
Caribou		D	O		O																																		
Reptiles																																							
Great Basin Collared Lizard																								A			D	A											
Northern Alligator Lizard[a]	A	A								A																				A								
Pygmy Short-horned Lizard[a]	A					A				A		A										A		D	D	A	A	A										

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Desert Horned Lizard[a]																						D			D	D														
Western Groundsnake[a]																						A				A	A	A												
Common Gartersnake	A	A					A	A	A	A		A					A	A	A	A											A	A								
Birds																																								
Trumpeter Swan								A							D		D	D													A		D	A				D		
Cinnamon Teal									A			A			D	A	D			A	D										A		D							
Northern Pintail												A			D	A	D			A	A										A		D	A				A		
Harlequin Duck							D																											A	D		D	A		
Mountain Quail	A									D									D			A			A							A								
Spruce Grouse[a]		N	A				N																																	
Greater Sage-Grouse																A	A		A		A	A		O	O	A		A			A					A	A	A	A	
Sharp-tailed Grouse				A						D		D	D									A			A			A			A							A	A	
Eared Grebe															O																		O							
Western Grebe															N																		O	N				O		
Clark's Grebe															N																		O	N				O		
Yellow-billed Cuckoo								O	A																															

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Common Nighthawk	A																		A					D	D													
Black Swift		O																											O						O			
Sandhill Crane														D		D	D		A	A										A		A				A	A	
Long-billed Curlew										A											D							D								D		
Migratory shorebird assemblage[ad]																	O																					
Franklin's Gull														O																N		O			N		
Ring-billed Gull														A																			A			O		
California Gull														A																			A			O		
Caspian Tern														A																			N			O		
Black Tern													A	O			A														A		O			O		
Common Loon																																	A			O		
American White Pelican[a]																																	O	A		O		
American Bittern														O																	A		O			N		
White-faced Ibis														O																	N		O			N		

[d] The migratory shorebird assemblage includes the following 16 species: American Golden-Plover, Semipalmated Plover, Marbled Godwit, Stilt Sandpiper, Sanderling, Dunlin, Baird's Sandpiper, Least Sandpiper, Pectoral Sandpiper, Semipalmated Sandpiper, Western Sandpiper, Long-billed Dowitcher, Solitary Sandpiper, Lesser Yellowlegs, Greater Yellowlegs, and Red-necked Phalarope.

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Golden Eagle	A					A																A		D	D				A									
Ferruginous Hawk						A																A		A	N						A								
Burrowing Owl												A										D		D	D	D					A								
Great Gray Owl		D	D	D			A				A			A				A																				
Short-eared Owl										A					D		D					N			N						A								
Boreal Owl[a]			O																																			
Lewis's Woodpecker	D							D																														
White-headed Woodpecker	N			A																																		
Olive-sided Flycatcher	D	N	A											A																					D			
Loggerhead Shrike																									D						D							
Canada Jay		N	N																																			
Pinyon Jay						O																																
Clark's Nutcracker	D	D	D	A	D	A																																
Sage Thrasher																									O													
American Pipit[a]											N																		O							O		
Evening Grosbeak[a]	N	A		A																																		

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Gray-crowned Rosy-Finch			A			A																			A				O	O									
Black Rosy-Finch			A			A																			A				O	O									
Cassin's Finch		D	D	D		A																																	
Cassia Crossbill			O	O																																			
Grasshopper Sparrow										D		A										N		A															
Brewer's Sparrow						A																			N														
Sagebrush Sparrow																									O														
Bobolink																															O								
Wilson's Warbler								A										N	A												A	A							
Invertebrates																																							
A cave obligate mite (*Flabellorhagidia pecki*)[a]																																							O
Harvestman genus *Acuclavella* species group[ae]																																						O	
A cave obligate harvestman (*Speleomaster lexi*)[a]																																							O

[e] The harvestman genus *Acuclavella* species group includes the following 5 species: *Acuclavella cosmetoides*, *A. shoshone*, *A. merickeli*, *A. quattuor*, and *A. sheari*.

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A cave obligate harvestman (*Speleomaster pecki*)[a]																																							O
Idaho Lava Tube Millipede[a]																																							O
Snake River Pilose Crayfish																																	D	D					
Pilose Crayfish																																	D	D					
Idaho Amphipod[a]																																			O				
Constricted Fairy Shrimp[a]															O																								
Raptor Fairy Shrimp																																				O			
Lolo Mayfly[a]																																			O				
A mayfly (*Paraleptophlebia jenseni*)[a]																																	N						
A mayfly (*Paraleptophlebia traverae*)[a]																																	?	?					
Columbia Primitive Minnow Mayfly[a]														?	?																						O			
A mayfly (*Ameletus tolae*)[a]																																			O				

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Idaho Point-headed Grasshopper																								D	D													
A grasshopper (*Argiacris amissuli*)[a]																									O?													
A grasshopper (*Argiacris keithi*)[a]																														O								
A grasshopper (*Argiacris militaris*)[a]																													O	O								
A grasshopper (*Barracris petraea*)[a]																														O								
Spur-throat grasshopper genus *Melanoplus* species group[af]																													O?	O?								
Tiny Forestfly[a]																																			N		N		
Idaho Forestfly[a]																																					N		N
Umatilla Willowfly[a]																																			N		N		
Straight Snowfly[a]																																					O		
Idaho Snowfly[a]																																			O		O		

[f] The spur-throat grasshopper genus *Melanoplus* species group includes the following 34 species: *Melanoplus aix*, *M. alector*, *M. artemisiae*, *M. baldi*, *M. cinereus*, *M. daemon*, *M. digitifer*, *M. idaho*, *M. illash*, *M. indigens*, *M. ixalus*, *M. latah*, *M. lemhiensis*, *M. lemurus*, *M. lolo*, *M. marshallii*, *M. militaris*, *M. obex*, *M. ohadi*, *M. papoosense*, *M. papyraedus*, *M. payettei*, *M. phobetico*, *M. pyro*, *M. salmonis*, *M. shoshoni*, *M. sol*, *M. stipes*, *M. tendoyense*, *M. tincupense*, *M. trigeminus*, *M. washingtonius*, *M. xenus*, and *M. zeus*.

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Duckhead Snowfly[a]																																		O	O			
Palouse Snowfly[a]																																		N	N			
Boise Snowfly[a]																																		N	N			
Cascades Needlefly[a]																																				O		
Clearwater Roachfly[a]																																			O			
Utah Sallfly[a]																																		O	O			
Lolo Sallfly[a]																																		O				
A yellow-masked bee (*Hylaeus lunicraterius*)[a]																								A?	O?														
Yellow Bumble Bee										A		A					A	A	A	A		A		A	A			A				A						
High Country Bumble Bee[a]						O																							O									
Morrison Bumble Bee																	D					D		D	D			D				D						
Western Bumble Bee	A	A	A				A	A	A		A						A	A		A						A	A				A	A						
Suckley Cuckoo Bumble Bee	A	A	A				A	A	A		A						A	A	A	A						A	A				A	A						
A miner bee (*Calliopsis barri*)[a]																							O															
A miner bee (*Perdita barri*)[a]																															A							

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
A miner bee (*Perdita wyomingensis sculleni*)[a]	A									A?												A?								A								
A leafcutting bee (*Ashmeadiella sculleni*)[a]	A									A																													
Rocky Mountain Parnassian[a]																												O											
Monarch Butterfly										A		A					A	A	A	A		A									A	A							
Gillette's Checkerspot		A									A							A	A																				
Beartooth Copper[a]																												O	O										
A moth (*Protogygia arena*)[a]																							O																
A flower moth (*Schinia edwardsii*)[a]																											O?			O?									
Wiest's Primrose Sphinx[a]																							O																
A caddisfly (*Glossosoma idaho*)[a]																																	O	O?					
A caddisfly (*Rhyacophila oreia*)[a]																																				O			
A caddisfly (*Rhyacophila robusta*)[a]																																				O			

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A caddisfly (*Goereilla baumanni*)[a]																																			O			
A caddisfly (*Manophylax annulatus*)[a]																																			O			
A caddisfly (*Apatania barri*)[a]																																				O		
A caddisfly (*Arctopora salmon*)[a]																																			O	O		
A caddisfly (*Homophylax auricularis*)[a]																																		O?		O?			
A caddisfly (*Limnephilus challisa*)[a]																																				O			
A caddisfly (*Philocasca banksi*)[a]																																				O?			
A caddisfly (*Psychoglypha smithi*)[a]																																		N?		N?			
An ant-like flower beetle (*Amblyderus owyhee*)[a]																							O																
A metallic wood-boring beetle (*Chrysobothris horningi*)[a]																											O												

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A metallic wood-boring beetle (*Chrysobothris idahoensis*)[a]																						A		A	A													
A click beetle (*Beckerus barri*)[a]														○																									
Lined June Beetle[a]																							○																
Blind Cave Leiodid Beetle[a]																																							○
Idaho Dunes Tiger Beetle																							○																
Columbia River Tiger Beetle																							○											○					
A tiger beetle (*Cicindela decemnotata montevolans*)[a]																									○														
Bruneau Dune Tiger Beetle																							○																
A skiff beetle (*Hydroscapha redfordi*)[a]																																						○	
Western Ridged Mussel																																		○					
Western Pearlshell																																		○	○				
Shortface Lanx																																		○	○				

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Banbury Springs Limpet																																					O	
Shortspire Pondsnail																																	O						
Snake River Physa																																	O						
Desert Valvata																																	O						
Salmon River Pebblesnail[a]																																	O						
Pixie Pebblesnail[a]																																						O?	
Unexpected Pebblesnail[a]																																	O						
Bliss Rapids Snail																																	N					N	
Bruneau Hot Springsnail																																	N					N	
Bear Lake Springsnail[a]																																						O	
Skade's Jumping-slug[a]		O																																				
Blue-gray Taildropper[a]		O																																				
Papillose Taildropper[a]		N					A																															
Rocky Mountain Axetail[a]		O																																				
Nimapuna Disc	A	A																																				

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Marbled Disc	D																										D											
Mountainsnail genus *Oreohelix* species group[ag]	A									A												A					N			N								
Selway Forestsnail[a]		O																																			
Salmon Oregonian[a]																						N					N											
Columbia Oregonian[a]	A	A																				A		A	A												A	
Mission Creek Oregonian								A											A								A										
Cottonwood Oregonian[a]																						N					N										
Giant Palouse Earthworm[a]	A									D												A															
Plants																																					
Idaho Xanthoparmelia Lichen																						A				A	N										
xanthoparmelia lichen																					A	A		A		A	A										

[g] The mountainsnail genus *Oreohelix* species group includes the following 12 species: Seven Devils Mountainsnail, Lyrate Mountainsnail, Whitepine Mountainsnail, Costate Mountainsnail, Deep Slide Mountainsnail, Boulder Pile Mountainsnail, Deseret Mountainsnail, Rocky Mountainsnail, Subalpine Mountainsnail, Thin-ribbed Mountainsnail, Whorled Mountainsnail, and Lava Rock Mountainsnail.

Group/Taxon	(*Xanthoparmelia norchlorochroa*)	liverwort (*Ptilidium ciliare*)[a]	liverwort (*Sphaerocarpos hians*)	orthotrichum moss (*Orthotrichum pulchellum*)[a]	Beautiful Bryum Moss[a]	dendroalsia moss (*Dendroalsia abietina*)[a]	Midget Quillwort[a]	Slender Moonwort[a]	Whitebark Pine	Idaho Stonecrop[a]	Packard's Milk-vetch	Bodin's Milk-vetch[a]	Least Bladdery Milk-vetch[a]
Dry Lower Montane–Foothill Forest		A	A							N			A
Mesic Lower Montane Forest		A	A	A		N		A				A	
Subalpine–High Montane Forest									A				
Aspen Forest & Woodland									N				
Whitebark Pine Forest & Woodland													
Pinyon–Juniper Woodland													
Montane Riparian & Swamp Forest													
Lowland–Foothill Riparian Forest			A	A									
Ruderal Flooded & Swamp Forest & Woodland										A			A
Montane–Foothill Grassland & Shrubland							A					A	
Subalpine–High Montane Mesic Meadow													
Ruderal Grassland & Shrubland													
Snowbrush Ceanothus Chaparral													
Bog & Fen													
Freshwater Marsh													
Vernal Pool													
Lowland Marsh, Wet Meadow & Shrubland					A		A					A	
Montane Marsh, Wet Meadow & Shrubland			A										A
Lowland–Foothill Riparian Shrubland													
Ruderal Marsh, Wet Meadow & Shrubland													
Alkali–Saline Marsh, Playa & Shrubland													
Dry Shrubland & Grassland											A		
Sparsely Vegetated Dune Scrub & Grassland													
Dwarf Sagebrush Steppe & Shrubland													
Tall Sagebrush Steppe & Shrubland													
Saltbush Scrub													
Cliff, Scree & Badland Sparse Vegetation											N		
Semi-Desert Ruderal Scrub & Grassland											A		
Alpine Tundra										N			
Cliff, Scree & Rock Vegetation		A			A			A	A				
Agricultural Vegetation													
Lawn, Garden & Recreational Vegetation													
Aquatic Vegetation													
Rivers (5th order and higher)													
Large Streams (3rd, 4th order)													
Small Streams (1st, 2nd order) – Intermittent			A										
Small Streams (1st, 2nd order) – Perennial													
Lakes, Ponds & Reservoirs													
Springs					A								
Caves & Subterranean Habitats													

Group/Taxon	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Forest	Aspen Forest & Woodland	Whitebark Pine Forest & Woodland	Pinyon–Juniper Woodland	Montane Riparian & Swamp Forest	Lowland–Foothill Riparian Forest	Ruderal Flooded & Swamp Forest & Woodland	Montane–Foothill Grassland & Shrubland	Subalpine–High Montane Mesic Meadow	Ruderal Grassland & Shrubland	Snowbrush Ceanothus Chaparral	Bog & Fen	Freshwater Marsh	Vernal Pool	Lowland Marsh, Wet Meadow & Shrubland	Montane Marsh, Wet Meadow & Shrubland	Lowland–Foothill Riparian Shrubland	Ruderal Marsh, Wet Meadow & Shrubland	Alkali–Saline Marsh, Playa & Shrubland	Dry Shrubland & Grassland	Sparsely Vegetated Dune Scrub & Grassland	Dwarf Sagebrush Steppe & Shrubland	Tall Sagebrush Steppe & Shrubland	Saltbush Scrub	Cliff, Scree & Badland Sparse Vegetation	Semi-Desert Ruderal Scrub & Grassland	Alpine Tundra	Cliff, Scree & Rock Vegetation	Agricultural Vegetation	Lawn, Garden & Recreational Vegetation	Aquatic Vegetation	Rivers (5th order and higher)	Large Streams (3rd, 4th order)	Small Streams (1st, 2nd order) – Intermittent	Small Streams (1st, 2nd order) – Perennial	Lakes, Ponds & Reservoirs	Springs	Caves & Subterranean Habitats
Asotin Milk-vetch																						O																
Piper's Milk-vetch										N												A																
Christ's Elk-Season Lupine[a]		A	A																										A								
Northwestern Yellow Hard Flax[a]																A?	A?																				
Hillman's Stinkweed[a]																						A				A	A										
rockcress (*Boechera rollinsiorum*)			A																										N								
Slickspot Peppergrass																									N			A									
Woolly Stanleya (var. *runcinata*)[a]																								A	A												
Robinson's Starwort		N																																			
Spalding's Catchfly										N												A															
Pahove Sandverbena																						N			N												
Macfarlane's Four-o'clock										A												N						A									
Clearwater Phlox		A																N		A																
Kelsey's Phlox (subsp. *glandulosa*)[a]																					A																
Elusive Polemonium	N					A				A								A							A				A								

Group/Taxon	Bloom Peak Douglasia	Leslie Gulch Monardella	Mountain Blue-curls[a]	Disappearing Monkey-flower[a]	Nez Perce Monkey-flower[a]	Christ's Paintbrush	Water Howellia	Winward's Goldenbrush	Katie's Daisy[a]	Spokane False Goldenaster[a]	Nevada Goldenrod[a]	Swinger's Biscuit-root[a]	Brunsfeld's Biscuit-root[a]	Ute Ladies-tresses	Indian Valley Sedge
Dry Lower Montane–Foothill Forest			A		A A							A	A		
Mesic Lower Montane Forest													A		
Subalpine–High Montane Forest															
Aspen Forest & Woodland															
Whitebark Pine Forest & Woodland															
Pinyon–Juniper Woodland															
Montane Riparian & Swamp Forest															
Lowland–Foothill Riparian Forest							A							A	A
Ruderal Flooded & Swamp Forest & Woodland										A?		N	A		
Montane–Foothill Grassland & Shrubland					N	N									
Subalpine–High Montane Mesic Meadow															
Ruderal Grassland & Shrubland															
Snowbrush Ceanothus Chaparral															
Bog & Fen							A								
Freshwater Marsh							A N							A	A
Vernal Pool			A												
Lowland Marsh, Wet Meadow & Shrubland			A	A			A				A			A	A
Montane Marsh, Wet Meadow & Shrubland				A						A?				A	A
Lowland–Foothill Riparian Shrubland														A	A
Ruderal Marsh, Wet Meadow & Shrubland											A			A	A
Alkali–Saline Marsh, Playa & Shrubland															
Dry Shrubland & Grassland		A						A	A						
Sparsely Vegetated Dune Scrub & Grassland								A							
Dwarf Sagebrush Steppe & Shrubland						N			A						
Tall Sagebrush Steppe & Shrubland															
Saltbush Scrub															
Cliff, Scree & Badland Sparse Vegetation		N			N			N							
Semi-Desert Ruderal Scrub & Grassland									A						
Alpine Tundra															
Cliff, Scree & Rock Vegetation	O												A		
Agricultural Vegetation															
Lawn, Garden & Recreational Vegetation															
Aquatic Vegetation															
Rivers (5th order and higher)															
Large Streams (3rd, 4th order)															
Small Streams (1st, 2nd order) – Intermittent															
Small Streams (1st, 2nd order) – Perennial															
Lakes, Ponds & Reservoirs															
Springs											A				
Caves & Subterranean Habitats															

Appendix 6: Target Stakeholders for Idaho State Wildlife Action Plan Coordination with Federal, State/Provincial, and Local Agencies and American Indian Tribes (Element 7)

Stakeholder type/Stakeholder
Federal agency
USDA Farm Service Agency, Idaho State Office
USDA Forest Service, Intermountain Region (R4)
USDA Forest Service, Northern Region (R1)
USDA Forest Service, Rocky Mountain Research Station
USDA Natural Resources Conservation Service
US Department of Energy, Idaho National Laboratory
US Department of Energy–Idaho Operations Office
Bureau of Indian Affairs, Northwest Region Regional Office
Bureau of Land Management Idaho
Bureau of Reclamation, Columbia–Pacific Northwest Region
US Fish and Wildlife Service, Idaho Fish and Wildlife Office
US Fish and Wildlife Service, Interior Regions 9 & 12, Science Applications
US Fish and Wildlife Service, Legacy Region 6, Science Applications
US Fish and Wildlife Service, Pacific Region, Science Applications
US Fish and Wildlife Service, Pacific Region, Wildlife and Sport Fish Restoration
National Park Service, City of Rocks National Reserve
National Park Service, Craters of the Moon National Monument and Preserve
National Park Service, Yellowstone National Park
USGS Forest and Rangeland Ecosystem Science Center
USGS Idaho Cooperative Fish and Wildlife Research Unit
USGS National Wildlife Health Center
Federal Highway Administration
National Interagency Fire Center
National Oceanic and Atmospheric Administration
Northwest Power and Conservation Council, Idaho Office
US Army Corps of Engineers, Walla Walla District, Natural Resource Management
US Environmental Protection Agency
Federal agency–public
USGS, Northwest Climate Adaptation Science Center
Idaho state agency
Idaho Army National Guard
Idaho Department of Commerce
Idaho Department of Environmental Quality
Idaho Department of Fish and Game
Idaho Department of Health and Welfare
Idaho Department of Health and Welfare, Division of Public Health, Idaho Bureau of Laboratories (IBL)

Stakeholder type/Stakeholder
Idaho Department of Lands
Idaho Department of Parks and Recreation
Idaho Department of Water Resources
Idaho Geological Survey
Idaho Governor's Office of Energy and Mineral Resources
Idaho Governor's Office of Species Conservation
Idaho Office of Emergency Management
Idaho Oil and Gas Conservation Commission
Idaho Rural Partnership
Idaho Soil and Water Conservation Commission
Idaho State Department of Agriculture
Idaho Transportation Department
Local government
Idaho Association of Counties (on behalf of Idaho's 44 counties)
Adams Soil & Water Conservation District
Idaho Association of Soil Conservation Districts (on behalf of Idaho's 50 local Soil & Water Conservation Districts)
Idaho Soil & Water Conservation District
Latah Soil & Water Conservation District
Nez Perce Soil & Water Conservation District
Cross-boundary state/provincial agency
British Columbia Ministry of Environment and Climate Change Strategy
Montana Fish, Wildlife & Parks
Nevada Department of Wildlife
Oregon Department of Fish and Wildlife
Utah Department of Natural Resources
Utah Division of Wildlife Resources
Washington Department of Fish and Wildlife
Wyoming Game and Fish Department
American Indian tribe
Coeur d'Alene Tribe (Schitsu'umsh)
Kalispel Tribe of Indians
Kootenai Tribe of Idaho
Nez Perce Tribe (Nimiipuu)
Shoshone–Bannock Tribes of the Fort Hall Reservation
Shoshone–Paiute Tribes of the Duck Valley Reservation, Nevada

Appendix 7: Target Stakeholders for Idaho State Wildlife Action Plan Public Participation (Element 8)

Stakeholder
American Heritage Wildlife Foundation (AHWF)
Animals In Distress Association (AIDA)
Association of Idaho Cities (AIC)
Backcountry Hunters & Anglers (BHA)
Bat Conservation International (BCI)
Bennett Lumber Products
Bird Conservancy of the Rockies
Birds of Prey NCA Partnership
Blaine County Land, Water and Wildlife Program (LWWP)
Boise River Enhancement Network (BREN)
Boise State University (BSU)
Boise State University, Intermountain Bird Observatory
Boulder–White Clouds Council (BWCC)
Brigham Young University—Idaho
Center for Large Landscape Conservation (CLLC)
Central Idaho Rangelands Network (CIRN)
Clearwater Basin Collaborative (CBC)
Clearwater Resource Conservation and Development (RC&D) Council
Coeur d'Alene Audubon Society
Coeur d'Alene Lake Advisory Committee
College of Eastern Idaho (CEI)
College of Southern Idaho (CSI)
College of Western Idaho (CWI)
Conservation Voters for Idaho
Defenders of Wildlife
Ducks Unlimited (DU)
EcoAdapt™
Forest Stewardship Council (FSC)
Friends of Scotchman Peaks Wilderness (FSPW)
Friends of the Clearwater
Friends of the Teton River (FTR)
Gem State Grotto
Global Transboundary Conservation Network
Golden Eagle Audubon Society (GEAS)
Good Neighbor Authority (GNA)
Greater Yellowstone Coalition
Greater Yellowstone Coordinating Committee (GYCC)
Greater Yellowstone Ecosystem (GYE) Common Loon Working Group
Heart of the Rockies Initiative

Stakeholder
Henrys Fork Chapter Idaho Master Naturalists
Henrys Fork Foundation
Henrys Fork Wildlife Alliance
High Country Resource Conservation and Development (RC&D) Council
High Divide Collaborative
Hispanic Cultural Center Of Idaho
Idaho Association of Commerce and Industry (IACI)
Idaho Association of Highway Districts (IAHD)
Idaho Association of Noxious Weed Control Superintendents (IANWCS)
Idaho Bat Working Group
Idaho Beef Council (IBC)
Idaho Bird Conservation Partnership
Idaho Cattle Association (ICA)
Idaho Chamber Alliance (ICA)
Idaho Chapter of the American Fisheries Society (ICAFS)
Idaho Chapter of The Wildlife Society (ICTWS)
Idaho Chapter Sierra Club
Idaho Coalition of Land Trusts (ICOLT)
Idaho Commission on Hispanic Affairs
Idaho Conservation League (ICL)
Idaho Dairy Products Commission
Idaho Farm Bureau Federation
Idaho Firewise, Inc.
Idaho Fish and Wildlife Foundation (IFWF)
Idaho Forest Group (IFG)
Idaho Forest Owners Association (IFOA)
Idaho Forest Products Commission (IFPC)
Idaho Foundation for Parks and Lands
Idaho Grain Producers Association (IGPA)
Idaho Ground Water Association (IGWA)
Idaho Herpetological Society, Inc.
Idaho Land Conservation Assistance Network
Idaho Master Naturalist High Desert Chapter
Idaho Master Naturalist—Pend Oreille Chapter
Idaho Master Naturalists
Idaho Mining Association
Idaho Native Plant Society (INPS)
Idaho Outfitters and Guides Association (IOGA)
Idaho Outfitters and Guides Licensing Board (OGLB)
Idaho Partners in Amphibian and Reptile Conservation
Idaho Pheasants Forever
Idaho Potato Commission

Stakeholder
Idaho Power Company
Idaho Public Health Districts (PHDs)
Idaho Public Utilities Commission
Idaho Rangeland Conservation Partnership (IRCP)
Idaho Rangeland Resources Commission (IRRC)
Idaho Real Estate Commission
Idaho Resource Conservation & Development Association (Idaho RC&D Association)
Idaho Rivers United
Idaho Sportsmen
Idaho State Chapter of the National Wild Turkey Federation
Idaho State University (ISU)
Idaho Steelhead & Salmon Unlimited (ISSU)
Idaho Trappers Association (ITA)
Idaho Water Resource Board (IWRB)
Idaho Water Users Association (IWUA)
Idaho Wheat Commission (IWC)
Idaho Wild Sheep Foundation
Idaho Wildlife Federation
Idaho Wool Growers Association (IWGA)
iNaturalist
Inland Northwest Land Conservancy
Interagency Grizzly Bear Committee (IGBC)
Intermountain Forest Association
Intermountain West Joint Venture (IWJV)
International Wildlife Coexistence Network
Intertribal Timber Council (ITC)
Invertebrate Ecology Inc. (IE)
J.R. Simplot Company
Kaniksu Land Trust (KLT)
Kootenai Environmental Alliance
Lake Pend Oreille Waterkeeper
Land Trust Alliance
Land Trust of the Treasure Valley
Lava Lake Institute for Science and Conservation
Lemhi Forest Restoration Group (LFRG)
Lemhi Regional Land Trust (LRLT)
Lewis–Clark State College (LCSC)
Manulife Investment Management Timberland and Agriculture Inc.
Molpus Woodlands Group
Monarch Joint Venture (MJV)
Mule Deer Foundation (MDF)
National Wildlife Control Operators Association (NWCOA)

Stakeholder
NatureServe
Nez Perce National Historical Park
North Idaho College (NIC)
North Side Canal Company (NSCC)
Northern Rocky Mountain Grotto
Northwest Nazarene University (NNU)
Owyhee Cattlemen's Association
Owyhee Initiative (OI)
PacifiCorp—Renewable Resources
Palouse Audubon Society (PAS)
Palouse Land Trust
Palouse Prairie Foundation
Palouse–Clearwater Environmental Institute (PCEI)
Partners in Amphibian and Reptile Conservation (PARC)
Payette Forest Coalition (PFC)
Payette Land Trust
Pheasants Forever
Portneuf Valley Audubon Society (PVAS)
PotlatchDeltic
POWER Engineers
Prairie Falcon Audubon Society
Public Lands Council (PLC)
Quail Forever
Rocky Mountain Elk Foundation (RMEF)
Rocky Mountain Power
Sagebrush Steppe Land Trust (SSLT)
Salmon Valley Stewardship
Salt Lake Grotto
Sawtooth Interpretive and Historical Association (SIHA)
Sawtooth Society
Selkirk Conservation Alliance (SCA)
Selway–Bitterroot Frank Church Foundation (SBFC)
Silver Sage Grotto
Snake River Alliance
Snake River Audubon Society
Soulen Livestock Company
Southern Idaho Land Trust
Southern Wings
Southwest Idaho Resource Conservation and Development (RC&D) Council (SWIDRCD)
Stimson Lumber Company
Sustainable Forestry Initiative (SFI) Idaho SFI Implementation Committee (SIC)
Teton Regional Land Trust (TRLT)

Stakeholder
The Nature Conservancy (TNC) in Idaho
The Peregrine Fund
The Ricketts Conservation Foundation
The Trumpeter Swan Society (TTSS)
The Xerces Society for Invertebrate Conservation
Theodore Roosevelt Conservation Partnership (TRCP)
Trout Unlimited (TU)
University of Idaho (UI)
University of Idaho (UI) Extension
University of Idaho (UI), Rangeland Center
University of Washington, School of Environmental and Forest Sciences, Landscape Ecology and Conservation Lab
Upper Columbia United Tribes (UCUT)
Vital Ground Foundation
West Central Highlands Resource Conservation and Development Council
Western Association of Fish and Wildlife Agencies (WAFWA)
Western Governors' Association (WGA)
Western Rivers Conservancy
Western Working Group (WWG) of Partners in Flight
White-Nose Syndrome Response Team (US)
Wild Sheep Foundation (WSF)
Wildlife Conservation Society (WCS) North America Program
Wildlife Management Institute (WMI)
Wood River Land Trust
Wood River Wolf Project
Yellowstone to Yukon Conservation Initiative (Y2Y)

List of Abbreviations & Acronyms

ACEP	Agricultural Conservation Easement Program
AFSIC	USDA Alternative Farming Systems Information Center
AFWA	Association of Fish & Wildlife Agencies
aka	also known as
AM	adaptive management
AOS	American Ornithological Society
APLIC	Avian Power Line Interaction Committee
ARS	US Department of Agriculture, Agricultural Research Service
ASM	American Society of Mammalogists
BBS	North American Breeding Bird Survey
BCI	Bat Conservation International
Bd	*Batrachochytrium dendrobatidis*, the chytrid fungus that causes amphibian chytridiomycosis
BDA	beaver dam analogue
BEA	US Department of Commerce, Bureau of Economic Analysis
BLM	Bureau of Land Management
BMP	best management practice
BURP	Beneficial Use Reconnaissance Program (DEQ)
CASC	Climate Adaptation Science Center
CCAA	Candidate Conservation Agreements with Assurances
CLLC	Center for Large Landscape Conservation
CMP	Conservation Measures Partnership
CRMO	Craters of the Moon National Monument and Preserve
CWA	Clean Water Act, 33 U.S.C. §1251 et seq. (1972)
dbh	diameter at breast height
DEQ	Idaho Department of Environmental Quality
DNA	deoxyribonucleic acid
DOD	US Department of Defense
DPS	distinct population segment
e.g.	for example
eDNA	environmental DNA
EO	Element Occurrence
EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act of 1973, as amended
FAO	Food and Agriculture Organization of the United Nations
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration

FOS	Foundations of Success
FRPP	Farm and Ranch Lands Protection Program
FS	USDA Forest Service
FWS	US Fish and Wildlife Service
GYE	Greater Yellowstone Ecosystem
i.e.	that is
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDOL	Idaho Department of Labor
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
IFWIS	IDFG Idaho Fish and Wildlife Information System
IISC	Idaho Invasive Species Council
INL	US Department of Energy, Idaho National Laboratory
INPS	Idaho Native Plant Society
INRMP	Integrated Natural Resources Management Plan
IPDES	Idaho Pollutant Discharge Elimination System
ISCPA	Idaho Stream Channel Protection Act
ISDA	Idaho State Department of Agriculture
ITD	Idaho Transportation Department
M&E	monitoring and evaluation
NABat	North American Bat Monitoring Program
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NIFC	National Interagency Fire Center
NLCD	National Land Cover Database
NMFS	NOAA Fisheries/National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPT	Nez Perce Tribe (Nimiipuu)
NRCS	USDA Natural Resources Conservation Service
NW CASC	USGS Northwest Climate Adaptation Science Center
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
OEMR	Idaho Governor's Office of Energy and Mineral Resources
OHV	off-highway vehicle
OSC	Idaho Governor's Office of Species Conservation
Pd	*Pseudogymnoascus destructans*
PODs	Points of Diversion
RCPP	Regional Conservation Partnership Program
SGCN	species of greatest conservation need
SGIN	species of greatest information need

ssp.	subspecies
STWG	State and Tribal Wildlife Grants Program
subsp.	subspecies
SWAP	State Wildlife Action Plan
US	United States
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USGS	US Geological Survey
var.	variety
WAFWA	Western Association of Fish and Wildlife Agencies
WCRP	Wildlife Conservation and Restoration Program
WGA	Western Governors' Association
WHA	Idaho Department of Fish and Game Wildlife Habitat Area
WMA	Idaho Department of Fish and Game Wildlife Management Area
WNS	bat white-nose syndrome
Wrangle	World Rangeland Learning Experience
WRE	Wetland Reserve Easement
WUI	wildland urban interface

Glossary

adaptive management: A structured, iterative process of robust decision-making in the face of uncertainty, with an aim to reducing uncertainty over time via system monitoring.

animal assemblage: Those species, such as shorebirds, whose populations concentrate at particular areas during migration, and species occurring in multiple species assemblages at migration "funnels" or hot spots. Such species may be collectively treated within "Animal Assemblage" elements, for which conservation status assignment would be appropriate. Examples of such assemblages are shorebird, waterfowl, landbird, and raptor migratory concentration areas. Species considered within assemblage elements differ from the more common situation during migration, whereby most long-distance migrants are tied to particular places and habitats during their breeding season, as well as during the nonbreeding (e.g., wintering) season when they are not in transit. For these species, conservation of both types of places is important to minimize their risk of extinction.

aquaculture: Breeding, raising, and harvesting fish, shellfish, and aquatic plants.

aquifer recharge: Water that moves from the land surface or unsaturated zone into the saturated zone; artificial processes or natural processes enhanced by humans, which convey water underground.

baseflow: That part of the stream discharge that is not attributable to direct runoff from precipitation or melting snow; it is usually sustained by groundwater discharge.

beneficial uses: Beneficial uses are the desired uses that waterbodies should support, including water supply (e.g., domestic, agricultural, and industrial), recreation (e.g., swimming, boating, and fishing), and aquatic life. Each beneficial use has a unique set of water quality criteria that must be met to support each use. Most waterbodies have multiple beneficial uses. A water body is considered impaired when it does not meet the water quality criteria needed to support one or more of its beneficial uses. Designated beneficial uses for which the surface waters of the state of Idaho are to be protected include aquatic life, recreation, water supply, wildlife habitats, and aesthetics (IDAPA 58.01.02 § 100).

best management practices (BMPs): Methods that have been determined to be the most effective and practical means of preventing or reducing effects of various threats to help achieve goals.

biosecurity: Procedures intended to protect humans or animals against disease or harmful biological agents.

bunchgrass: Any of several grasses chiefly of the western US, which grow in tufts (such as *Sporobolus airoides*, *Leymus condensatus*, *Schizachyrium scoparium*, and various grasses of the genus *Achnatherum*).

caliche: An area of calcium carbonate formed in the soils of semiarid regions.

climate-change refugia: Areas relatively buffered from contemporary climate change over time that enable persistence of valued physical, ecological, and sociocultural resources. More broadly, climate refugia are habitats that components of biodiversity retreat to, persist in, and can potentially expand from under changing environmental conditions.

compensatory mitigation: Replacing (through restoration or creation) project-induced loss of critical areas for the purposes of offsetting unavoidable adverse impacts.

confident: The species was reported and confirmed in Idaho by a reliable source.

conservation: The use of methods and procedures necessary or desirable to sustain healthy populations of wildlife, including all activities associated with scientific resources management such as research, census, monitoring of populations, acquisition, improvement and management of habitat, live trapping and transplantation, wildlife damage management, and periodic or total protection of a species or population as well as the taking of individuals within wildlife stock or population if permitted by applicable state and federal law.

conservation grazing: The use of grazing livestock to maintain and increase the biodiversity of natural or seminatural habitats.

conservation tillage (or minimum tillage): A broadly defined practice that includes techniques such as no-till, strip till, ridge till, and mulch till systems to maintain plant residues on at least 30% of the soil surface after tillage activities.

conveyance (e.g., water conveyance): The legal process of transferring property from one owner to another.

cover cropping: Planting crops to cover the soil rather than for the purpose of being harvested. Cover crops manage soil erosion, soil fertility, soil quality, water, weeds, pests, diseases, biodiversity, and wildlife in an ecological system managed and shaped by humans.

Critically Endangered (CR): A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V IUCN 2012), and it is therefore considered to be facing an extremely high risk of extinction in the wild.

current presence: Species is known to be currently extant in Idaho.

deciduous: A tree or shrub that sheds its leaves annually.

decommission: To withdraw from service. Decommissioning unneeded roads, or storage of roads that do not have an immediate need, helps facilitate vegetation regrowth, reduce

landslide potential, reduce erosion, restore aquatic and terrestrial habitat, reduce disturbance, and reduce maintenance costs.

designated roads and trails: Specific roads and trails identified by the agencies where some type of motorized vehicle use is appropriate and allowed either seasonally or yearlong.

dispersed camping: Dispersed camping is the term used for camping OUTSIDE of a designated campground. Typically, it refers to roadside car camping, but also refers to backpacking in undeveloped sites. Dispersed camping means there are no services like trash removal, and amenities such as toilets, tables, and fire pits are not usually available.

distinct population segment: A vertebrate population or group of populations that are distinct from other populations of the species and significant to the entire species. Under the ESA, species, subspecies, or distinct population segments of vertebrate species are eligible for listing. NOAA Fisheries and the US Fish and Wildlife Service have a joint policy defining the criteria for identifying a population as a DPS (61 FR 4722; February 7, 1996).

DNA: The hereditary material in humans and almost all other organisms.

ecological threshold (or regulatory threshold): The point at which there is an abrupt change in the structure, quality, or functioning of an ecosystem, or where external changes produce a large and persistent response.

eDNA: Nuclear or mitochondrial DNA that is released from an organism into the environment.

Element: A biodiversity unit of conservation attention and action for which a conservation status rank is assigned. Elements may be recognized at any taxonomic level (although typically are only recognized at the species level and below for organisms, and the ecological system, alliance, and association levels for communities). Elements may also be recognized for biodiversity units for which there is no systematic hierarchy (e.g., animal assemblages, community complexes).

Element Occurrence (EO): An area of land and/or water in which a species or natural community is, or was, present. An EO should have practical conservation value for the Element as evidenced by potential continued (or historical) presence and/or regular recurrence at a given location. For species Elements, the EO often corresponds with the local population, but when appropriate may be a portion of a population (e.g., long-distance dispersers) or a group of nearby populations (e.g., metapopulation). For community Elements, the EO may represent a stand or patch of a natural community, or a cluster of stands or patches of a natural community.

elite tree (resistant seed source): A seed or plus tree confirmed through resistance screening to have heritable (genetic) resistance (or reduced susceptibility) to blister rust. The level of resistance provided to progeny is yet undefined and may be in relation to other screened trees to date within the stand or geographic area.

Endangered (EN): A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V IUCN 2012), and it is therefore considered to be facing a very high risk of extinction in the wild.

endemic: Species existing in that region (e.g., Idaho) and nowhere else—significant from a planning point of view because if these species are not conserved adequately in the region, global biodiversity will be irretrievably diminished; in many cases, also distinctive species and sources of regional pride and identification with nature—valuable qualities for a conservation feature.

evapotranspiration: Loss of water from soil by evaporation from the soil surface and by transpiration from the leaves of plants.

extirpation: The local extinction of an organism or species such that it ceases to exist in a particular area but continues to exist elsewhere.

forest land: Federal, state, and private land growing forest tree species which are, or could be at maturity, capable of furnishing raw material used in the manufacture of lumber or other forest products. The term includes federal, state and private land from which forest tree species have been removed but have not yet been restocked, but it does not include land affirmatively converted to uses other than the growing of forest tree species.

G1. Critically Imperiled: At very high risk of extinction or elimination due to very restricted range, very few populations or occurrences, very steep declines, very severe threats, or other factors.

G2. Imperiled: At high risk of extinction or elimination due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

G3. Vulnerable: At moderate risk of extinction or elimination due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

G4. Apparently Secure: At fairly low risk of extinction or elimination due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

G5. Secure: At very low risk or extinction or elimination due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats.

gene: A unit of heredity that is transferred from a parent to offspring and is held to determine some characteristic of the offspring. Genes are made up of DNA.

genetic diversity: The range of different inherited traits within a population or a species, low levels of which can affect fitness and the ability to adapt to changing environmental conditions.

graminoid: Of or relating to grasses.

gross domestic product: The total value of goods produced and services provided in a country or state during 1 year.

groundwater: Groundwater is water that is located beneath the ground surface in soil pore spaces and in the fractures of lithologic formations. A unit of rock or an unconsolidated deposit is called an aquifer when it can yield a usable quantity of water. Groundwater is recharged from, and eventually flows to, the surface naturally; natural discharge often occurs at springs and seeps, and can form oases or wetlands. Groundwater is also often withdrawn for agricultural, municipal, and industrial use by constructing and operating extraction wells. The study of the distribution and movement of groundwater is hydrogeology (or groundwater hydrology). See Idaho Code §42-230.

herbicide: A substance that is toxic to plants, used to destroy unwanted vegetation.

hydroperiod: The number of days per year that an area of land is wet or the length of time that there is standing water at a location.

identification: Identification is the assignment of an unknown specimen to a previously recognized taxonomic group, often at the species level.

insecticide: A substance used for killing insects.

Integrated Pest Management: A sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks.

interspecific: Existing between species.

intraspecific: Existing within a single species.

invasive species: A nonnative species whose introduction does or is likely to cause economic or environmental harm or harm to human, animal, or plant health.

lacustrine: Pertaining to lakes or lake shores.

larval host plant: Plants that meet the specific dietary requirements of species dependent on them, such as milkweed required for Monarch Butterfly caterpillars.

lichen: Any of numerous complex plantlike organisms made up of an alga or cyanobacterium and a fungus growing in symbiotic association on a solid surface (such as a rock or the bark of trees).

limnetic: Of, relating to, or inhabiting the open water of a body of fresh water.

lithology: The general physical characteristics of a rock or the rocks in a particular area.

mesic: Having or characterized by a moderate amount of moisture: neither hydric nor xeric.

mitigation hierarchy: First attempting to avoid negative effects, next to minimize unavoidable negative effects, and lastly to compensate for remaining negative effects not avoided or adequately minimized (WGA Policy Resolution 2022-06).

native: The species is present in Idaho without direct or indirect human intervention, and is present within its native range and natural dispersal potential.

nomenclature: Nomenclature is the naming of organisms and the establishment, interpretation, and application of regulations governing the system of naming.

occupancy: The proportion of sites where a species is found, may vary along spatial and temporal scales. Changes in occupancy are typically driven by changes in abundance.

open range: All unenclosed lands outside of cities, villages, and herd districts, upon which cattle, by custom, license, lease, or permit, are grazed or permitted to roam.

parasite: An organism that lives in or on another organism (its host) and gets food or protection from it.

participatory science: The collection and analysis of data relating to the natural world by members of the public, typically as part of a collaborative project with professional scientists.

pasture: (1) Grazing lands composed of introduced or domesticated native forage species that are used primarily for the production of livestock. They receive periodic renovation or cultural treatments such as tillage, fertilization, mowing, weed control, and may be irrigated. They are not in rotation with crops. (2) A grazing area enclosed and separated from other areas by fencing or other barriers; the management unit for grazing land. (3) Forage plants used as food for grazing animals. (4) Any area devoted to the production of forage, native or introduced, and harvested by grazing.

pathogen: A biological agent that causes disease.

permanent pasture and rangeland, other than cropland and woodland pastured: This land use category encompasses grazeable land that does not qualify as woodland pasture or cropland pasture. It may be irrigated or dry land. In some areas, it can be a high quality pasture

that could not be cropped without improvements. In other areas, it is barely able to be grazed and is only marginally better than wasteland.

phylogeny: The origin of groups. Phylogenetic trees are diagrams that depict the origin and evolution of groups of organisms.

population: A group of organisms of the same species occupying a particular space at a particular time, with the potential to breed with each other. For the purpose of determining practical conservation value, we interpret "group" to mean two or more individuals.

rangeland: Land on which the indigenous vegetation (climax or natural potential) is predominantly grasses, grass-like plants, forbs, or shrubs and is managed as a natural ecosystem. If plants are introduced, they are managed similarly. Rangeland includes natural grasslands, savannas, shrublands, many deserts, tundra, alpine communities, marshes, and meadows.

recruitment: The increase in a natural population as offspring grow and immigrants arrive.

regional endemic: Species endemic to a particular geographic region (e.g., Pacific Northwest, Great Basin, Columbia Plateau, Rocky Mountains), but not restricted to Idaho. For our purposes, this includes species whose distribution includes Idaho and at least one other adjoining state or Canadian province.

regularly occurring: Occurrence of the species is consistent in Idaho (e.g., it may migrate in and out of the state, but it returns on at least an annual basis), i.e., occurs regularly within Idaho at a manageable level.

relict: A persistent remnant of an otherwise extinct flora or fauna or kind of organism. A relict (or relic) is an organism that at an earlier time was abundant in a large area but now occurs at only one or a few small areas.

ruderal: Vegetation found on human-disturbed sites, with no apparent recent historical natural analogs, and whose current composition and structure is not a function of continuous cultivation by humans and includes a broadly distinctive characteristic species combination, whether tree, shrub, or herb dominated. The vegetation is often dominated by nonnative and/or generalist native species that have expanded in extent and abundance due to the human disturbances (Faber-Langendoen et al. 2014). Ruderal ecosystems are generally not priorities for conservation for their own sake, though they may support rare species or function as important landscape connectors or matrices in reserves.

S1. Critically Imperiled: At very high risk of extirpation in the jurisdiction due to very restricted range, very few populations or occurrences, very steep declines, severe threats, or other factors.

S2. Imperiled: At high risk of extirpation in the jurisdiction due to restricted range, few populations or occurrences, steep declines, severe threats, or other factors.

S3. Vulnerable: At moderate risk of extirpation in the jurisdiction due to a fairly restricted range, relatively few populations or occurrences, recent and widespread declines, threats, or other factors.

S4: Apparently Secure: At a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors.

S5: Secure: At very low or no risk of extirpation in the jurisdiction due to a very extensive range, abundant populations or occurrences, with little to no concern from declines or threats.

sclerophyllous: A type of vegetation that is adapted to long periods of dryness and heat.

setback: A restriction area or minimum distance used to limit the effects of stressors on environmentally sensitive areas or critical wildlife habitat areas.

SH. Possibly Extirpated: Known from only historical records but still some hope of rediscovery. There is evidence that the species or ecosystem may no longer be present in the jurisdiction, but not enough to state this with certainty. Examples of such evidence include (1) that a species has not been documented in approximately 20 to 40 years despite some searching and/or some evidence of significant habitat loss or degradation; (2) that a species or ecosystem has been searched for unsuccessfully, but not thoroughly enough to presume that it is no longer present in the jurisdiction.

species: Includes taxonomic species as well as selected subspecies, populations, evolutionarily significant units (ESU), distinct population segments (DPS), or other entities below the species level (hereafter species); for some taxa, multiple species assemblages may be identified for consideration rather than individual species.

spillover event: Occurs when a reservoir population with a high pathogen prevalence comes into contact with a novel host population, the pathogen is transmitted from the reservoir population into the novel population.

stakeholders: Those individuals, groups, or institutions that have a vested interest in or can influence the natural resources of Idaho and/or that potentially will be affected by SWAP activities and have something to gain or lose if conditions change or stay the same. Stakeholders are all those who need to be considered in achieving SWAP revision goals and whose participation and support are crucial to its success.

stream order: Stream order in hydrography deals with the hierarchy of streams from the source (or headwaters) downstream.

subterranean: Existing, occurring, or done under the earth's surface.

SX: Presumed Extirpated: Species or ecosystem is believed to be extirpated from the jurisdiction (i.e., nation, or state/province). Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered. Equivalent to "Regionally Extinct" in IUCN Red List terminology.

sylvatic plague: A bacterial disease transmitted by fleas that afflicts many mammalian species, including humans.

T#: Infraspecific Taxon (trinomial)—The status of infraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank. Rules for assigning T-ranks follow the same principles as global conservation status ranks (see G1 through G5 above). For example, the global rank of a critically imperiled subspecies of an otherwise widespread and common species would be G5T1. A T subrank cannot imply the subspecies or variety is more abundant than the species, for example, a G1T2 subrank should not occur. A vertebrate animal population (e.g., listed under the US Endangered Species Act or assigned candidate status) may be tracked as an infraspecific taxon and given a T-rank; in such cases a Q is used after the T-rank to denote the taxon's informal taxonomic status.

taxonomy: Taxonomy is the study of classification. It includes rules, theories, principles, and procedures. Data on variation in organisms are used to arrange those organisms in a system of classification. Some workers regard systematics and taxonomy as essentially synonymous, whereas others consider systematics a broader term that includes taxonomy, identification, and nomenclature.

thermal: Warm water.

Vulnerable (VU): A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V IUCN 2012), and it is therefore considered to be facing a high risk of extinction in the wild.

water reuse: Reclaims water from a variety of sources then treats and reuses it for beneficial purposes, also known as water recycling or water reclamation.

wildlife: "Wildlife" means any form of animal life, native or exotic, generally living in a state of nature provided that domestic Cervidae as defined in section 25-3701, Idaho Code, shall not be classified as wildlife (section 36-202, Idaho Code).

wildlife-associated recreation: Fishing, hunting, and wildlife-watching (observing, photographing, and feeding fish or wildlife) activities.

xeric: Having little moisture, tolerant of or adapted to dry conditions.

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The bibliography is divided into 2 sections: Works Cited in Text (includes all works specifically cited in the text) and Data Sources.

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Data Sources

Species Conservation Status Assessments

Accurate portrayal of species distributions requires extensive compilation of species occurrences. To support our species ranking assessments, data were compiled from numerous external data sources including:

- Aquila Environmental
- Boise State University
- Brigham Young University – Idaho
- Bureau of Land Management (BLM) Idaho
- Coeur d'Alene Tribe (Schitsu'umsh)
- College of Idaho
- College of Western Idaho
- Cornell Lab of Ornithology, Birds of the World
- ERO Resources
- Idaho Department of Environmental Quality, Beneficial Use Reconnaissance Program (BURP)
- Idaho Department of Fish and Game internal data (e.g., Greater Sage-Grouse Lek Survey ArcGIS Portal, Sharp-tailed Grouse lek data Excel spreadsheet, Lakes and Streams database, telemetry data, remote camera data)
- Idaho Department of Lands
- Idaho Power Company
- Idaho State University
- Idaho Transportation Department
- Illinois Natural History Survey
- iNaturalist
- Integrated Digitized Biocollections (iDigBio)
- Intermountain Bird Observatory
- International Union for Conservation of Nature (IUCN)
- JBR Environmental Consultants, Inc.
- Kalispel Tribe of Indians
- Kootenai Tribe of Idaho
- Maxim Technologies
- Montana State University

National Museum of Natural History
National Oceanic and Atmospheric Administration (NOAA)
National Park Service (US) (NPS)
NatureServe
Nez Perce Tribe (Nimiipuu)
Odonata Central
Pacific Northwest Moths Database
PotlatchDeltic
Red Willow Research, Inc.
Science Applications International Corporation, Environmental Programs Division
Shoshone–Bannock Tribes of the Fort Hall Reservation
Shoshone–Paiute Tribes of the Duck Valley Reservation, Nevada
Sigler JW, Zaroban DW. 2018. Fishes of Idaho: a natural history survey. 1st ed. Caldwell (ID): Caxton Press.
StreamNet
Symbiota Collections of Arthropods Network (SCAN)
Tetra Tech
The Biota of North America Program (BONAP)
The Nature Conservancy in Idaho
The Xerces Society for Invertebrate Conservation
Trec, Inc.
University of California at Berkeley, Essig Museum of Entomology
University of Idaho
University of Montana
US Department of Agriculture (USDA)
US Fish and Wildlife Service (FWS)
US Geological Survey (USGS)
US Geological Survey, Gap Analysis Program (GAP)
US Geological Survey, North American Bat Monitoring Program (NABat)
US Geological Survey, North American Breeding Bird Survey (BBS)
US Geological Survey, Northwest Regional Gap Analysis Project (NWGAP)
USDA Forest Service (FS)
USDA Forest Service Natural Resource Information System (NRIS)
Utah State University
Wallace RL, Zaroban DW. 2013. Native fishes of Idaho. Bethesda (MD): American Fisheries Society.
Western EcoSystems Technology, Inc. (WEST)

Species Distribution (%) by Ecological Province

Data sources for species' ranges (including those used to calculate the proportion of each species' distribution within each ecological province) included:

Idaho Department of Fish and Game Species Diversity Database (IDFG 2023c)

Idaho Native Plant Society (INPS 2023)

The Biota of North America Program (BONAP) North American Vascular Flora (Kartesz and BONAP 2015)

Birds of the World Range maps (Birds of the World 2022)

eBird Status and Trends range maps, Data Version: 2021 (Fink et al. 2022)

US Fish and Wildlife Service ECOS Environmental Conservation Online System (FWS 2023a)

Northwest Gap Analysis Project (NWGAP) (Beauvais et al. 2013)

Fishes of Idaho: A Natural History Survey (Sigler and Zaroban 2018)

Native Fishes of Idaho (Wallace and Zaroban 2013)

Management Plan for the Rocky Mountain Population of Trumpeter Swans (Pacific Flyway Council 2017)

2020 Sage-grouse Population Triggers Analysis (IDFG 2020a)

Habitat Specialists as Conservation Umbrellas: Do Areas Managed for Greater Sage-grouse Protect Pygmy Rabbits? (Smith 2019)

Distribution of the Yellowstone Grizzly Bear (2006–2020) (IGBST 2021)

Planning Team & Process

We identified a core group of individuals responsible for the overall design and implementation of the plan to serve as the SWAP Revision Team. In addition, an internal IDFG SWAP Steering Committee was formed at the request of the Director to guide the comprehensive review and revision. Central to the success of the SWAP revision was to recognize and make use of existing skills and experience and identify gaps to ensure that the project moved forward with the best available knowledge.

Core Team

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and additional adviser **Jim Fredericks**, Deputy Director of Programs

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