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About This Document

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 2022 revision. Designed to span 10 years, the Idaho SWAP is statewide in scope and targets the conservation of both "species of greatest conservation need" and "species of greatest information need" as determined by IDFG (collectively "SWAP species"). Because populations of migratory species can be limited by factors throughout their annual cycle, we identify strategies across their annual life cycle in what is known as "full-life-cycle conservation." The plan also identifies knowledge gaps to help focus future efforts to improve understanding and planning; however, we do not allow a lack of information to inappropriately limit necessary near-term application of the best available science and good judgment in decision–making. The plan uses a framework of the 5 major geographic and ecological regions of Idaho to provide context for the location of SWAP species and habitats and to support large-scale conservation. The extent and condition of 39 wildlife habitats and community types essential to the conservation of SWAP species are also described. The plan describes a monitoring and evaluation program intended to provide for reasoned judgment in the face of uncertainties. In addition, the plan includes a narrative on coordination with federal, state, and local agencies and American Indian tribes as well as how IDFG provided for broad public participation in the process of revising and implementing the SWAP. Finally, the plan is written in a manner intended to respect the diverse social and cultural values of local communities and the natural resource-based economies that Idaho is largely built on. Ultimately the SWAP represents a strategic program for conserving wildlife that can be used by all conservation stakeholders and partners.

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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 2022 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) as determined by 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. First authorized in the Wildlife Conservation and Restoration Program (WCRP) enacting legislation (H.R. 5548 . . . 2000), the elements were subsequently adopted for use in the State and Tribal Wildlife Grants Program (STWG). 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; 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 continue to remain eligible for 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 large-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. 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. 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). SGIN fall into at least one of the following 3 categories of knowledge uncertainty: (1) taxonomic uncertainty, which occurs with incomplete taxonomic description; (2) distributional uncertainty, which occurs when few or no species inventory data are available; and (3) ecological uncertainty, which occurs with a lack of understanding of habitat requirements, community dynamics, response to disturbance, key interactions with other species, or ecosystem functions (Molina and Marcot 2007). The resulting list includes 133 SGCN and 133 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 is integral to the successful functioning of a variety of groups across jurisdictional boundaries. Using such a classification likewise facilitates interagency cooperation on vegetation management issues that transcend jurisdictional boundaries, and encourages conservation partners to use and contribute to a common system.

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 as well as learn and 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 2022 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 user of the SWAP, 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) 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, 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 (H.R. 5548 . . . 2000). This plan represents IDFG's comprehensive review and revision of the 2015 SWAP (IDFG 2017). 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 (H.R. 5548 . . . 2000), the elements were subsequently adopted for use in the STWG Program. 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;

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 eight of the following elements must be adequately addressed.

1. Uses such 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 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. A state shall provide an opportunity for public participation in the development, revision, and implementation of the comprehensive plan

Purpose

Wildlife belongs to the people of Idaho—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 2022 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 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 (final version expected fall 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. 1.1), 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 4).

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 with regard to (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), 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 a list of common plant species associated with this habitat.

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.

There are multiple ways 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 ecological province they work in 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 (under 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 as well as learn and 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 revision of the 2022 SWAP. We also describe IDFG’s efforts to involve the public in the SWAP revision. Finally, we describe how IDFG plans to revise the plan 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 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 citizen 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 (Appendix 2), a complete list of habitats and community types referenced in this plan (Appendix 3), and SWAP species by taxonomic group and habitat association (Appendix 4). 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 5 and 6, 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

Understanding the nature and cause of change in the objectives or conservation features (e.g., species, habitats, ecological processes, and human well-being) of a plan is foundational to any conservation planning exercise. This information can be used to help frame conservation planning problems as well as to lay the groundwork for developing feasible strategies and actions. Typically called a "situation analysis," the ideal result is an explicit articulation of how socioeconomic, political, institutional, and ecological factors drive change in the systems we work in—in this case, both the natural and human-influenced lands and waters of Idaho. These changes may pose problems or impact the things we value as well as create opportunities for intervention (see Groves and Game 2016; CMP 2020).

Idaho has a rich history with diverse natural areas and resources. The 11th largest US state by area—with a land area of 82,623 square miles and water area of 923 square miles—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, large-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 such as 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 nongovernmental organizations (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. A 2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (US Department of the Interior and US Department of Commerce 2011) found that 838 thousand Idaho residents and nonresidents 16 years old and older fished, hunted, or wildlife watched in Idaho, which includes observing, feeding, and photographing wildlife. The sum of anglers, hunters, and wildlife watchers exceeded the total number of participants in wildlife-related recreation because many of the individuals engaged in more than one wildlife-related activity. 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 strong wildlife populations, 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 *Working Lands, Working Communities Initiative* (https://westgov.org). 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 being to develop 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-use based livelihoods.

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.

Ecological Framework

To orient the user to the geographic and ecological regions of Idaho, we provide a map (Fig. 1.1) and descriptions for each of the 5 FS ECOMAP provinces (Cleland et al. 2007; McNab et al. 2007; [FS] USDA Forest Service ECOMAP Team 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. For example, when considering Quaking Aspen, we might want to highlight that aspen stands in the Middle Rockies, Southern Rockies, and Intermountain Semidesert grow differently in terms of patch size and abundance, are limited by different factors, and respond differently to key drivers of change, such as fire suppression, intense herbivory, insect/disease outbreaks, conifer expansion, or persistent drought. Thus conservation actions necessary to reduce competition and herbivory in the Middle Rockies may do little to conserve snowdrift-dependent aspen patches in the Owyhees.

Province descriptions were adapted in part from (Bailey 1995) and McNab et al. (2007).

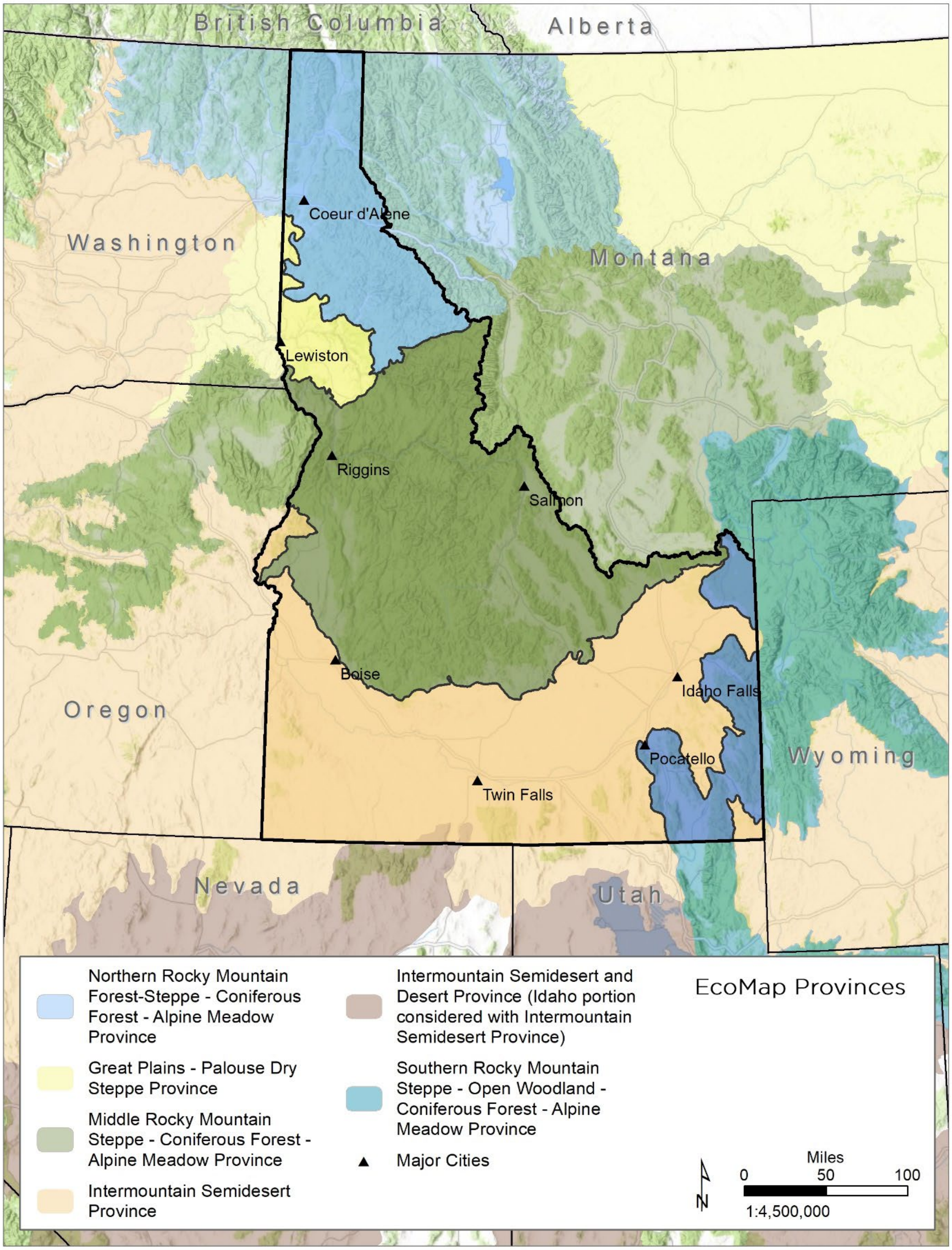

Fig. 1.1 Map of FS ECOMAP province boundaries in Idaho and adjacent states.

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. Small glaciers 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 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 Dwarf-primrose 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 uses include mining, logging, farming, residential development, roads, and hydroelectricity. With grassland and farmland as predominant habitat types in 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 agriculture lands at lower elevations. Timber harvest and the wood products industry is an important land use. Local agriculture including the production of hops for the beer industry and cattle ranching, and mining 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 6 federally recognized American Indian tribes in Idaho are located in this area: the Coeur d'Alene Tribe (Schitsu'umsh) in Plummer and the Kootenai Tribe of Idaho in Bonners Ferry.

Fire management over the past several years has attempted to simulate and reestablish the vegetative composition of regular fire patterns. Past fire suppression has resulted in the encroachment of shade-tolerant species and 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, 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.

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 are also being heavily impacted in this province by climate change. Continued monitoring of microclimates along with co-occurrence of cool air dependent species will provide baseline information for determining best management practices. 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. 2018c). 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 slightly maritime-influenced continental steppe, semiarid climate with hot, dry summers and cool, 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 and 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, forbs, 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, Woodyroot Milkvetch, bumble bees, and other native pollinators vital to crop production.

Palouse Prairie grassland remnant on Gormsen Butte, southwestern Latah County, Idaho, with surrounding cropland 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 Redcedar dominate mesic areas. Wetlands and riparian habitats are much more limited in extent, comprising 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 Potlach river systems provide important instream habitat for resident and anadromous fish, freshwater mussels, stream invertebrate, 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 private and corporate timber companies responsible for most of the logging operations. This province is home to the Nez Perce Tribe, 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 province has a maritime-influenced temperate climate with warm, dry summers and cool to cold, moist winters. Most precipitation occurs during autumn, winter, and spring as snow. Dominant landforms are mountains of moderate elevations. Vegetation is mainly evergreen needleleaf forest that varies in composition with altitude, although lower slopes and plains are dominated by shrubland and herbaceous cover.

Middle Fork Brownlee Creek, Cecil D Andrus Wildlife Management Area, Washington County, Idaho

Fisher, Wolverine, Mountain Goat, Rocky Mountain Bighorn Sheep, Harlequin Duck, and Clark's Nutcracker are all examples of SGCN in this region. High mountain lakes are a stronghold of 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. Finally, the Elusive Jacob's-ladder, 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 back country 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.

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 has declined due to altered fire regimes and a keystone tree species, Whitebark Pine, has declined dramatically. 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 sixfold increase of area burned by wildfire with each 1.8 °F (1 °C) of temperature increase relative to the median annual area burned during 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, 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 to shrub–steppe obligate species. 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 habitat tend to have the highest vegetation productivity within the landscape and are key habitat types for foraging herbivores (invertebrates to large ungulates).

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 nearly level 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-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 Indian Paintbrush is endemic to this province. Because only a small portion of the Intermountain Semidesert and Desert Province extends into Idaho, and these provinces in Idaho are similar, 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 good water and forage production to make a living on their limited allotments of 160 acres. Instream and riparian habitat are usually intrinsically linked in terms of their condition and value as fish and wildlife habitats. 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 populations 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.

Aged basaltic canyons, Gooding, Idaho

The aridity of this region requires water management programs, including water storage, delivery, and regulation for agriculture, 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.

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 private, state, and federal lands. Mining occurs in isolated locations throughout the province. Phosphate mining is the most important economic activity in southeast Idaho, centered around the town of Soda Springs. In addition to private land ownership, the province includes several national wildlife refuges (NWR) 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 in some areas leads to the increased frequency and severity of wildfires and drought (Halofsky et al. 2018b, Adler 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.

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 altitude where much occurs as snow. Topography is high mountains of steep, little-weathered slopes. Vegetation is mainly evergreen needleleaf forest that varies in composition with altitude 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) and 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 Whitestem Goldenbush.

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. This province provides outdoor recreational opportunities for hunting, angling, trail-riding, hiking, wildlife viewing, kayaking, and river rafting.

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

Chapter 2 Species & Habitats

Species of Greatest Conservation & Information Need

In the early legislation describing State and Tribal Wildlife Grants, 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 State Wildlife Action Plan, 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). These latter species fall into at least one of the following 3 categories of knowledge uncertainty: (1) taxonomic uncertainty, which occurs with incomplete taxonomic description; (2) distributional uncertainty, which occurs when few or no species inventory data are available; and (3) ecological uncertainty, which occurs with a lack of understanding of habitat requirements, community dynamics, response to disturbance, key interactions with other species, or ecosystem functions (Molina and Marcot 2007). 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 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: amphibians, birds, mammals, reptiles, fishes, invertebrates, and plants. 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. We also conducted a range review to ensure that range extent reflected the most current information for species. We then 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, 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[1]	Vertebrates	Invertebrates	Plants
Status under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.)	endangered, threatened, or candidate, *or* under review in the candidate or petition process, *or* a delisted taxon, recovered, being monitored first 5 years		
IUCN Red List category	Critically Endangered (CR), Endangered (EN), or Vulnerable (VU)		
Idaho state rank	SX (if restoration is intended) 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	species is endemic to Idaho or the region (i.e., Idaho and 1 or more adjacent states or provinces)	

	the edge of its distribution in Idaho	
Rangewide declines	if widespread, species is known to be declining (>10%) or at-risk over much or all of its range	
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

[1] Not all criteria were applied equally to all taxonomic groups in an attempt 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.

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: (1) taxonomic uncertainty (species needs taxonomic revision), (2) distributional uncertainty (lack of basic inventory data on species presence, abundance, 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). 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.

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 133 SGCN (Table 2.1) and 133 SGIN (Table 2.2). Broken down by major taxonomic group, SGCN include 4 amphibians, 44 birds, 21 mammals, 1 reptile, 18 fishes, 25 invertebrates, and 20 plants. SGIN include 4 amphibians, 7 birds, 15 mammals, 5 reptiles, 7 fishes, 73 invertebrates, and 22 plants. The list of SGIN includes 4 species groups or assemblages: migratory shorebird assemblage (16 species)[a], spur-throat grasshopper genus *Melanoplus* species group (34 species)[b], mountainsnail genus *Oreohelix* species group (12 species)[c], and harvestman genus *Acuclavella* species group (5 species)[d].

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Amphibians								
Western Toad	G4, S3		U	14	4	39	36	7
Woodhouse's Toad	G5, S2		U	0	2	5	90	3
Northern Leopard Frog	G5, S2		U	0	0	8	72	20
Columbia Spotted Frog (Great Basin population)	G4, T2T4Q, S2		U	0	0	0	100	0
Birds								
Northern Pintail	G5, S3B, S3N		E	14B, 14N	4B, 4N	38B, 38N	38B, 38N	7B, 7N

[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 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*.
[c] 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.
[d] The harvestman genus *Acuclavella* species group includes the following 5 species: *Acuclavella cosmetoides*, *A. shoshone*, *A. merickeli*, *A. quattuor*, and *A. sheari*.
[e] Percent distribution of species within Idaho portion of each ecological province.
[f] Combination global (G; rangewide) and subnational (S; state, i.e., Idaho) conservation status rank.
[g] Endangered Species Act (ESA) status codes: E—listed as endangered under ESA; T—listed as threatened under ESA; C—candidate taxon, ready for proposal; UR—under review in the candidate or petition process; DM—delisted taxon, recovered, being monitored first 5 years.
[h] 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.
[i] NRM = Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province.
[j] GPP = Great Plains–Palouse Dry Steppe Province.
[k] MRM = Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province.
[l] ISP = Intermountain Semidesert Province.
[m] 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* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Cinnamon Teal	G5, S3B		E	12	4	32	45	8
Trumpeter Swan	G4, S1B, S4N		B	0B, 15N	0B, 5N	8B, 21N	54B, 48N	38B, 11N
Harlequin Duck	G4, S1B		B	44	1	54	0	1
Common Nighthawk	G5, S3B		G	13	4	36	40	7
Black Tern	G4G5, S1B		B	27	1	9	49	15
Caspian Tern	G5, S1B		B	0	0	7	83	10
California Gull	G5, S2B, S5N		F	0B, 11N	0B, 6N	7B, 17N	77B, 57N	16B, 9N
Ring-billed Gull	G5, S3B, S5N		E	0B, 13N	0B, 5N	14B, 21N	70B, 51N	16B, 10N
Franklin’s Gull	G5, S2B		F	0	0	4	71	25
Long-billed Curlew	G5, S2B		E	<1	2	17	76	5
American Bittern	G5, S1B		E	2	2	6	89	1
White-faced Ibis	G5, S3B		F	0	0	5	74	21
Yellow-billed Cuckoo	G5, S1B	T	A	0	0	0	85	15
Golden Eagle	G5, S3		D	11	4	38	40	6
Ferruginous Hawk	G4, S3B		C	0	2	14	77	7
Mountain Quail	G5, S2		U	5	19	59	17	0
Greater Sage-Grouse	G3G4, S2		F	0	0	26	71	2
Sharp-tailed Grouse	G5, S3		F	0	0	9	68	23
Common Loon	G5, S1B, S2N		A	100B, 15N	0B, 4N	0B, 23N	0B, 47N	0B, 11N
Sandhill Crane	G5, S3B		D	5	3	42	42	8
Pinyon Jay	G3, S2	UR	D	0	0	0	75	25
Clark’s Nutcracker	G5, S3		F	18	1	57	14	10
Canada Jay	G5, S3		F	27	2	59	3	9
Grasshopper Sparrow	G5, S3B		G	1	7	14	70	8
Sagebrush Sparrow	G5, S2B		F	0	<1	22	72	6
Brewer’s Sparrow	G5, S3B		H	<1	4	40	47	9
Cassin’s Finch	G5, S3		G	14	4	38	38	7
Black Rosy-Finch	G4, S2		E	0	0	60	25	15
Gray-crowned Rosy-Finch	G5, S3		E	11	3	52	28	6

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Cassia Crossbill	G1, S1		E	0	0	0	100	0
Bobolink	G5, S2B		E	7	2	8	78	6
Loggerhead Shrike	G4, S3		F	<1	2	16	76	5
Sage Thrasher	G4, S3B		G	0	0	24	68	8
Wilson's Warbler	G5, S3B		G	19	5	50	17	9
Olive-sided Flycatcher	G4, S3B		F	22	2	56	10	9
Lewis's Woodpecker	G4, S3B		E	10	3	46	34	7
White-headed Woodpecker	G4, S2		C	<1	7	90	3	0
Clark's Grebe	G5, S2B		C	0	0	9	86	5
Western Grebe	G5, S2B		E	24	3	12	54	7
Eared Grebe	G5, S3B, S3N		D	0B,9N	0B,7N	7B,17N	79B,60N	14B,8N
Short-eared Owl	G5, S3		E	1	5	17	71	5
Burrowing Owl	G4, S2B		E	0	0	7	91	2
Great Gray Owl	G5, S3		U	17	5	48	21	9
Mammals								
Pronghorn	G5, S3		F	0	0	30	68	2
Mountain Goat	G5, S3		D	16	<1	81	0	2
California Bighorn Sheep	G4, T2, S1		C	0	0	0	100	0
Rocky Mountain Bighorn Sheep	G4, T4, S2		E	0	3	93	1	2
Moose	G5, T5, S3		E	18	3	46	23	9
Caribou	G5, SX	E	Z	100	0	0	0	0
Canada Lynx (Purcell Mountains)	G5, S1	T	U	100	0	0	0	0
Wolverine	G4, S1	UR	B	19	<1	70	2	9
Fisher	G5, S3		U	53	3	44	0	0
Grizzly Bear (Greater Yellowstone Ecosystem population)	G4, TNRQ, S3	T	B	0	0	13	26	61
Grizzly Bear (Selkirk–Cabinet population)	G4, TNRQ, S3	T	B	100	0	0	0	0

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Western Small-footed Myotis	G5, S3		U	7	4	27	52	10
Little Brown Myotis	G3, S3	UR	U	14	4	38	38	7
Yuma Myotis	G5, S3		F	14	4	38	38	7
Hoary Bat	G3G4, S3		U	14	4	38	38	7
Silver-haired Bat	G3G4, S3		U	14	4	38	38	7
Townsend's Big-eared Bat	G4, S3		E	14	4	38	38	7
Pygmy Rabbit	G4, S3		G	0	0	24	71	5
American Pika	G5, S3		F	19	3	55	14	8
Northern Idaho Ground Squirrel	G2, S2	T	E	0	0	86	14	0
Southern Idaho Ground Squirrel	G2, S2		E	0	0	55	45	0
Reptiles								
Common Gartersnake	G5, S3		U	14	4	39	36	7
Fishes								
Mountain Whitefish	G5, S3		H	15	4	38	36	7
Wood River Sculpin	G2, S2		H	0	0	45	55	0
White Sturgeon	G4, S1		E	7	1	55	37	0
Bonneville Cisco	G3, S2		H	0	0	0	100	0
Burbot	G5, S1		F	100	0	0	0	0
Bonneville Whitefish	G3, S2		G	0	0	0	100	0
Pacific Lamprey	G4, S1		B	10	14	75	0	0
Bear Lake Whitefish	G1, S1		G	0	0	0	100	0
Bull Trout	G5, S3	T	F	25	5	61	9	0
Bear Lake Sculpin	G3, S2		H	0	0	0	100	0
Northern Leatherside Chub	G3, S2		U	0	0	6	85	9
Sockeye Salmon (Snake River ESU)	G5, T1Q, S1	E	A	0	2	98	0	0
Steelhead (Snake River Basin DPS)	G5, T2T3Q, S2	T	F	4	12	85	0	0

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Chinook Salmon (Snake River spring/summer-run ESU)	G5, T1Q, S1	T	E	4	12	85	0	0
Yellowstone Cutthroat Trout	G5, T4, S3		F	0	0	7	70	23
Bonneville Cutthroat Trout	G5, T4, S3		F	0	0	0	33	67
Chinook Salmon (Snake River fall-run ESU)	G5, T1Q, S1	T	E	1	42	57	0	0
White Sturgeon (Kootenai River DPS)	G4, T1Q, S1	E	D	100	0	0	0	0
Invertebrates								
Idaho Point-headed Grasshopper	G2, S1S2		NA	0	0	85	15	0
Nimapuna Disc	G1, S1S3		NA	14	17	69	0	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
Raptor Fairy Shrimp	G1, S1		NA	0	0	0	100	0
Idaho Dune 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
Mission Creek Oregonian	G1, S1		NA	10	32	57	0	0
Monarch Butterfly	G4, S2	C	NA	11	4	39	39	7
Marbled Disc	G1, S1		NA	0	0	100	0	0
Gillette’s Checkerspot	G3, S2S3		NA	27	8	39	22	4
Shortface Lanx	G2, S2		NA	0	5	39	56	0
Western Ridged Mussel	G3, S3		NA	1	6	35	58	<1

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Banbury Springs Limpet	G1, S1	E	E	0	0	0	100	0
Shortspire Pondsnail	G1, S1		NA	0	6	94	0	0
Western Pearlshell	G5, S2		NA	18	3	43	27	8
Snake River Pilose Crayfish	G3G4, S2		F	0	0	0	98	2
Pilose Crayfish	G4G5, S2		F	0	0	0	65	35
Snake River Physa	G1, S1	E	NA	0	0	0	100	0
Bruneau Hot Springsnail	G1, S1	E	NA	0	0	0	100	0
Bliss Rapids Snail	G1, S1	T	NA	0	0	0	100	0
Desert Valvata	G2, S2		NA	0	0	0	88	12
Plants								
Packard's Milkvetch	G1, S1		U	0	0	8	92	0
Woodyroot Milkvetch	G1G2, S1		B	28	64	8	0	0
A rockcress (*Boechera rollinsiorum*)	G1, S1		U	0	0	55	45	0
Indian Valley Sedge	G1, S1		D	0	0	57	43	0
Christ's Indian Paintbrush	G1, S1		U	0	0	0	100	0
Bloom Peak Dwarf-primrose	G1, S1		U	100	0	0	0	0
Winward's Whitestem Goldenbush	G1, S1		E	0	0	0	33	67
Water Howellia	G3, S1	DM	DE	76	24	<1	0	0
Idaho Pepperweed	G2, S2	T	U	0	0	19	71	10
MacFarlane's Four O'clock	G2, S1	T	E	6	8	86	0	0
Leslie Gulch Monardella	G1, S1		CD	0	0	0	100	0
Clearwater Phlox	G1, S1		F	23	10	66	0	0
Whitebark Pine	G3G4, S3	C	U	20	3	54	18	6
Elusive Jacob's-ladder	G1, S1		U	0	0	100	0	0

Table 2.1 Status, distribution, and abundance of Idaho species of greatest conservation need (SGCN; *n* = 133) by taxonomic group (see Appendixes 1 and 2 for scientific names)

				Species distribution (%) by ecological province[e]				
Group/taxon	**Conservation status rank[f]**	**ESA status[g]**	**Pop size[h]**	**NRM[i]**	**GPP[j]**	**MRM[k]**	**ISP[l]**	**SRM[m]**
Spalding's Silene	G2, S1S2	T	E	9	19	71	1	0
A liverwort (*Sphaerocarpos hians*)	G1, S1		U	12	88	0	0	0
Ute Lady's Tresses	G2G3, S1	T	E	0	0	1	61	38
Robinson's Starwort	G1G2, SNR		U	95	5	0	0	0
Idaho Xanthoparmelia Lichen	G1, S1		U	0	0	100	0	0
Xanthoparmelia Lichen	G1G2, S2		U	0	0	53	47	<1

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 133) 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				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
Amphibians								
Rocky Mountain Tailed Frog (E)	G4, S3		F	37	2	59	2	0
Great Basin Spadefoot (E)	G5, S3		U	<1	3	21	74	3
Idaho Giant Salamander (E)	G3G4, S3		F	45	4	51	0	0
Coeur d'Alene Salamander (E)	G4, S3		U	77	5	18	0	0
Birds								
Black Swift (E)	G4, S2B		D	80	<1	19	0	0
Spruce Grouse (E)	G5, S3		F	24	5	64	5	2
Migratory shorebird assemblage (E)[v]	GNR, SNR[18]		U	12	6	24	52	6
American White Pelican (E)	G4, S3B		E	6	2	5	78	9
Evening Grosbeak (E)	G5, S4		G	16	4	42	30	8
American Pipit (E)	G5, S3B		E	32	<1	62	3	2
Boreal Owl (E)	G5, S1		A	20	5	56	9	10
Mammals								

[n] Combination global (G; rangewide) and subnational (S; state, i.e., Idaho) conservation status rank.
[o] Endangered Species Act (ESA) status codes: E—listed as endangered under ESA; T—listed as threatened under ESA; C—candidate taxon, ready for proposal; UR—under review in the candidate or petition process; DM—delisted taxon, recovered, being monitored first 5 years.
[p] 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.
[q] NRM = Northern Rocky Mountain Forest–Steppe - Coniferous Forest - Alpine Meadow Province.
[r] GPP = Great Plains–Palouse Dry Steppe Province.
[s] MRM = Middle Rocky Mountain Steppe - Coniferous Forest - Alpine Meadow Province.
[t] ISP = Intermountain Semidesert Province.
[u] SRM = Southern Rocky Mountain Steppe - Open Woodland - Coniferous Forest - Alpine Meadow Province.
[18] 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.
[v] 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.

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 133) 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				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
Kit Fox (D)	G4, S2		C	0	<1	18	71	11
American Marten (E)	G5, S3		E	100	0	0	0	0
Long-eared Myotis (E)	G5, S3		U	14	4	38	38	7
Fringed Myotis (D)	G4, S3		U	21	6	45	25	2
Long-legged Myotis (E)	G4G5, S3		U	14	4	38	38	7
Canyon Bat (E)	G5, S3		U	6	6	19	65	4
Pallid Bat (E)	G4, S3		U	9	7	16	64	4
Big Brown Bat (E)	G5, S3		U	14	4	38	38	7
Spotted Bat (E)	G4, S3		U	0	<1	26	73	1
Northern Bog Lemming (D)	G5, S2	UR	DF	100	0	0	0	0
Dark Kangaroo Mouse (D)	G4, S1		U	0	0	0	100	0
Hoary Marmot (E)	G5, S1		U	54	2	44	<1	0
Merriam's Ground Squirrel (E)	G4, S1		AC	0	0	0	100	0
Wyoming Ground Squirrel (ssp. *nevadensis*) (E)	G5, T4, S2		U	0	0	0	100	0
Dwarf Shrew (D)	G4, S2		U	0	0	75	12	13
Reptiles								
Northern Alligator Lizard (D)	G5, S3		U	71	7	22	0	0
Western Groundsnake (D)	G5, S3		U	3	0	10	87	0
Great Basin Collared Lizard (E)	G5, S1		U	0	0	1	99	0
Pygmy Short-horned Lizard (E)	G5, S3		U	2	2	21	74	1
Desert Horned Lizard (E)	G5, S3		U	0	0	2	98	0
Fishes								
Pygmy Whitefish (E)	G5, S3		G	100	0	0	0	0

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 133) 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				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
Slimy Sculpin (E)	G5, S3		U	87	0	13	0	0
Shoshone Sculpin (D)	G2, S2		F	0	0	0	100	0
Green Sucker (E)	G4, S3		E	0	0	1	66	33
Lake Chub (D)	G5, S3		U	100	0	0	0	0
Leopard Dace (E)	G4, S3		F	0	1	63	36	0
Cedar Sculpin (E)	GNR, S3		F	98	2	0	0	0
Invertebrates								
Harvestman genus *Acuclavella* species group (D)	GNR, SNR[18]		NA	53	6	41	0	0
Selway Forestsnail (D)	G1G2, S1S2		NA	6	6	88	0	0
An ant-like flower beetle (*Amblyderus owyhee*) (D)	GNR, SH		NA	0	0	0	85	15
A mayfly (*Ameletus tolae*) (D)	G1G2, SH		NA	100	0	0	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 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 leafcutting bee (*Ashmeadiella sculleni*) (D)	GNR, S1?		NA	0	0	0	100	0
A grasshopper (*Barracris petraea*) (D)	G3?, SH		NA	0	0	100	0	0

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				Species distribution (%) by ecological province				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
A click beetle (*Beckerus barri*) (D)	GNR, SH		NA	21	0	79	0	0
High Country Bumble Bee (D)	G3G5, S2		NA	0	0	100	0	0
Constricted Fairy Shrimp (D)	G1, S1		NA	0	0	7	93	0
A miner bee (*Calliopsis barri*) (D)	GNR, S1		NA	0	0	<1	99	1
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
Lolo Mayfly (E)	G3, S1?		NA	14	<1	86	0	0
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 tiger beetle (*Cicindela decemnotata montevolans*) (D)	G4G5, TNR, S1S2		NA	0	0	0	27	73
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
Giant Palouse Earthworm (D)	G1, S1		NA	14	86	0	0	0
Wiest's Primrose Sphinx (D)	G3, SH		NA	0	0	0	100	0
A cave obligate mite (*Flabellorhagidia pecki*) (D)	G1G2, S1		NA	0	0	35	65	0

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				Species distribution (%) by ecological province				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
Nez Perce Pebblesnail (D)	G2G3, S1S2		NA	0	51	49	0	0
Pixie Pebblesnail (D)	GH, SH		NA	0	0	100	0	0
Utah Sallfly (D)	G3, SH		NA	0	0	0	24	76
Blind Cave Leiodid Beetle (E)	G1G3, S1		NA	0	0	4	95	1
A caddisfly (*Glossosoma idaho*) (D)	G2G3, SH		NA	0	0	0	77	23
A caddisfly (*Goereilla baumanni*) (D)	G1, SH		NA	59	0	41	0	0
Skade's Jumping-slug (D)	GNR, S1		NA	100	0	0	0	0
A caddisfly (*Homophylax auricularis*) (D)	G1G3, SH		NA	0	0	66	34	0
A skiff beetle (*Hydroscapha redfordi*) (E)	GNR, S1		NA	13	0	87	0	0
A yellow-masked bee (*Hylaeus lunicraterius*) (D)	GNR, SH		NA	0	0	12	88	0
Idaho Lava Tube Millipede (D)	G1G2, S1		NA	0	0	9	91	0
Palouse Snowfly (D)	G3, SH		NA	52	48	0	0	0
A caddisfly (*Limnephilus challisa*) (D)	G1G2, SH		NA	0	0	100	0	0
Beartooth Copper (E)	G5,T3T5, S1		NA	0	0	94	6	0
Tiny Forestfly (D)	G3, S1S2		NA	0	6	34	60	0
A caddisfly (*Manophylax annulatus*) (D)	G1G3, SH		NA	16	0	84	0	0
Cascades Needlefly (D)	G3, SH		NA	61	25	14	0	0
Spur-throat grasshopper	GNR, SNR[18]		NA	23	2	47	27	2

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				Species distribution (%) by ecological province				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
genus *Melanoplus* species group (E)								
Mountainsnail genus *Oreohelix* species group (T)	GNR, SNR[18]		NA	4	7	58	16	16
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
Columbia Primitive Minnow Mayfly (D)	G2, SH		NA	43	20	16	15	6
Rocky Mountain Parnassian (E)	G5, S2S3		NA	16	5	46	25	9
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 caddisfly (*Philocasca banksi*) (D)	G1G3, SH		NA	100	0	0	0	0
Lined June Beetle (D)	GNR, S1S2		NA	0	0	18	82	0
Blue-gray Taildropper (D)	G3G4, S1		NA	92	8	0	0	0
Papillose Taildropper (D)	G4, S1		NA	100	0	0	0	0
A moth (*Protogygia arena*) (D)	GNR, S1		NA	0	0	0	100	0
A caddisfly (*Psychoglypha smithi*) (D)	G1G3, SH		NA	0	0	100	0	0
Bear Lake Springsnail (E)	G2, S1		NA	0	0	0	33	67
A caddisfly (*Rhyacophila oreia*) (D)	G2, S1S2		NA	5	6	87	1	1

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 133) 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				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
A caddisfly (*Rhyacophila robusta*) (D)	G2G3, SH		NA	50	0	50	0	0
A flower moth (*Schinia edwardsii*) (D)	GNR, S1		NA	0	0	100	0	0
Rocky Mountain Axetail (D)	GNR, S1		NA	90	10	0	0	0
Clearwater Roachfly (D)	G2, S1		NA	100	0	0	0	0
Idaho Forestfly (D)	G2, S1		NA	43	25	32	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 Amphipod (D)	G1, S1		NA	0	0	100	0	0
Lolo Sallfly (D)	G2, SH		NA	0	0	99	1	0
Umatilla Willowfly (D)	G3, S1		NA	28	72	0	0	0
A mud snail (*Taylorconcha insperata*) (D)	G1, S1		NA	0	0	6	94	0
Boise Snowfly (D)	G3, S1		NA	0	0	17	83	0
Plants								
Bodin's Milkvetch (D)	G4, SH		U	0	0	100	0	0
Dwarf Milkvetch (D)	G5, SH		U	97	3	<1	0	<1
Narrowleaf Grapefern (D)	G2?, SH		Z	100	0	0	0	0
Bryum Moss (D)	G3, SH		U	0	0	100	0	0
Hillman's Stinkweed (D)	G4G5, T1, SNR		DE	0	0	100	0	0
Dendroalsia Moss (D)	G4, SH		U	100	0	0	0	0

Table 2.2 Status, distribution, and abundance of Idaho species of greatest information need (SGIN; *n* = 133) 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				
Group/Taxon	**Conservation status rank[n]**	**ESA status[o]**	**Pop size[p]**	**NRM[q]**	**GPP[r]**	**MRM[s]**	**ISP[t]**	**SRM[u]**
Katie's Fleabane (D)	G1G2, S1		U	0	0	0	83	17
Spokane False Goldenaster (T)	G1?, SH		Z	93	7	0	0	0
Midget Quillwort (D)	G1G2, S1		B	<1	<1	73	27	0
Brunsfeld's Desertparsley (D)	G1, S1		U	33	10	56	1	0
Swinger's Biscuitroot (D)	G1, S1		U	6	8	86	0	0
Dwarf Mountain Lupine (T)	G5T1?, SNR		U	82	18	0	0	0
Nez Perce Monkeyflower (T)	G1, S1		U	54	41	5	0	0
Disappearing Monkeyflower (D)	G3, SH		U	0	0	14	86	0
Orthotrichum Moss (D)	G4, SH		U	6	8	86	0	0
Marsh Phlox (T)	G4, T1T3Q, SNR		U	0	0	0	46	54
A liverwort (*Ptilidium ciliare*), Northern Naugahyde Liverwort (D)	G5, SH		U	74	26	0	0	0
Northwestern Yellowflax (D)	G5, SH		U	57	36	7	0	0
Idaho Stonecrop (D)	G1G2, S1S2		U	4	6	90	0	0
Nevada Goldenrod (D)	G4, SH		U	0	0	0	100	0
Woolly Princesplume (T)	G4, T1, S1		U	0	0	100	0	0
Oblong Bluecurls, Mountain Blue-curls (D)	G5, SH		U	74	26	0	0	0

Habitats

In this section, we provide descriptions for 39 wildlife habitats and community types (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. 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 4). 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.

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."

Forest & Woodland

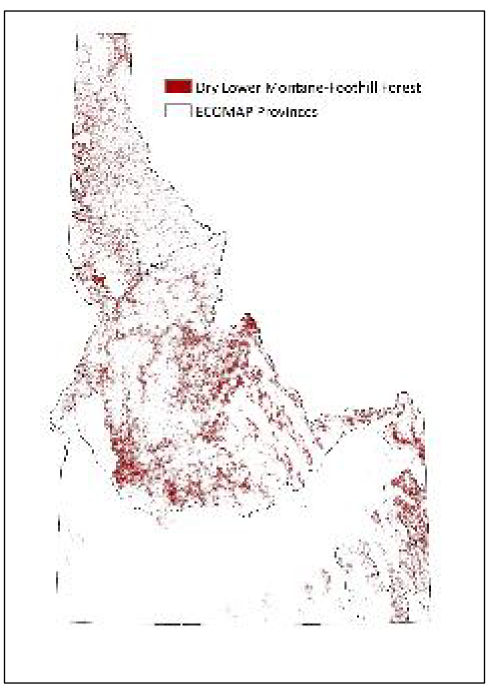
These habitats are dominated by broadleaf deciduous and needleleaf coniferous trees having at least 10% canopy cover. Canopy height and cover varies with the tree age, disturbance history (e.g., fire, flooding), and local environmental conditions (e.g., elevation, soils, temperature, precipitation, snow 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 Limber Pine 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.



Understory vegetation reflects fire history, topography, and soils. Tall understory shrubs, such as Rocky Mountain Maple, Saskatoon Serviceberry, and Curl-leaf Mountain Mahogany, are patchy, while mid-height Big Sagebrush, Antelope Bitterbrush, Mallow Ninebark, White Spirea, snowberry, or Snowbrush Ceanothus are more widespread. Low shrubs, such as Kinnikinnick, Creeping Barberry, Oregon Boxleaf, 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, needlegrass (*Achnatherum*), Wheeler's Bluegrass, and Cheatgrass. Forbs can be conspicuous, including Arrowleaf Balsamroot, buckwheats, Heartleaf Arnica, Sweetcicely, Nevada Pea, Spreading Dogbane, Timber Milkvetch, and others.

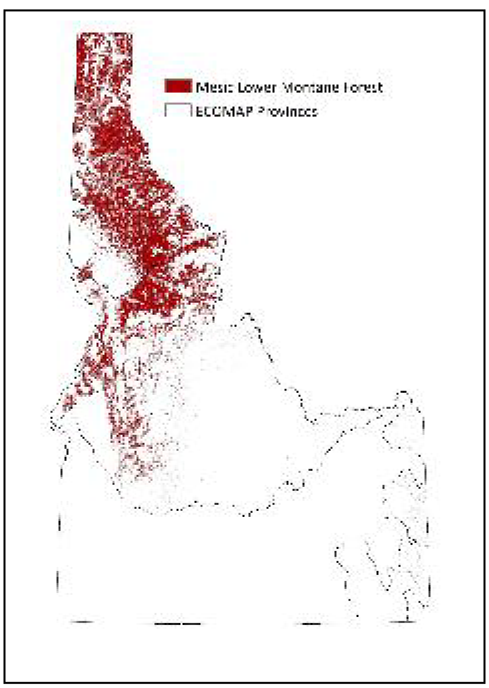
Mesic Lower Montane Forest

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.

Upper Priest River, Idaho 2007
Chris Murphy/IDFG

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.

Grand Fir, Douglas-fir, Western Redcedar, 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, Saskatoon Serviceberry, Pacific Yew, and Oceanspray; mid-height Rusty Menziesia, Thinleaf Huckleberry, White Spirea, Common Snowberry, and Dwarf Rose; and low-growing Oregon Boxleaf, Dwarf Bilberry, and Twinflower. Common forbs include Wild Sarsaparilla, Bride's Bonnet, British Columbia Wildginger, Threeleaf Foamflower, violets, Idaho Goldthread, Common Beargrass, Arrowleaf Ragwort, fairybells, Starry False Lily of the Valley, and Pacific Trillium. Ferns are also important including Maidenhair Fern, Western Oakfern, Woodfern, Common Ladyfern, and Western Swordfern. Graminoids are uncommon.

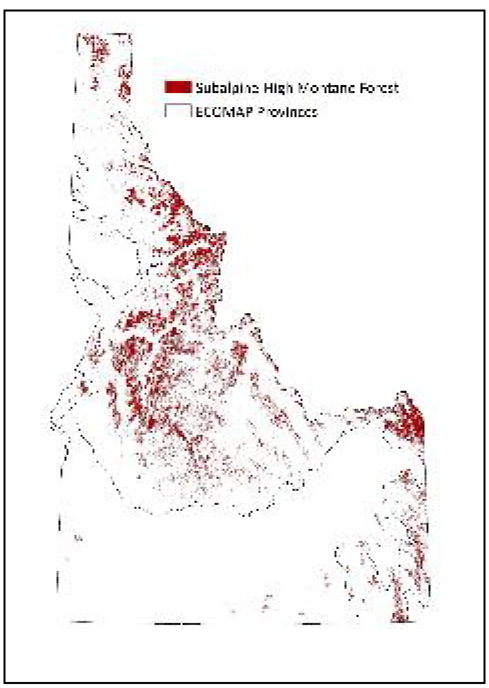


Subalpine–High Montane Forest

Brundage Mountain, Idaho 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.



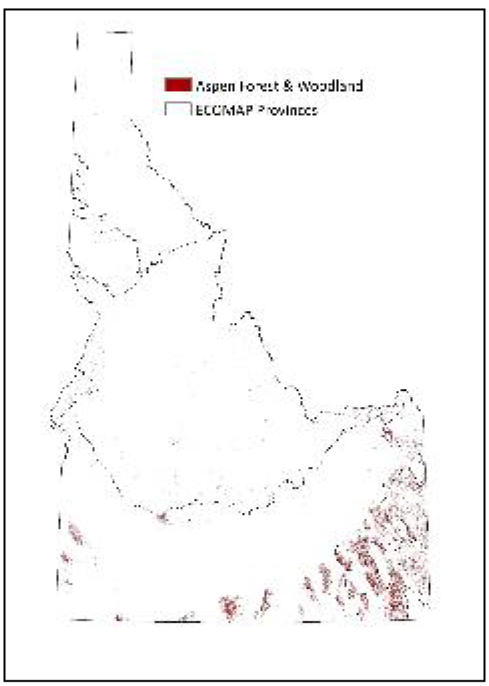
Characteristic trees, often forming large stands across glacial carved terrain, are Subalpine Fir, Engelmann Spruce, Lodgepole Pine, Mountain Hemlock (maritime climate influenced areas), and Quaking Aspen. Subalpine Larch, Subalpine Fir, Whitebark Pine, and Limber Pine form clumped to open stands closer to timberline. The variable understory is a mix of species adapted to dry, cool summers and cold, snowy winters. Heath-family shrubs, such as Western Labrador Tea, Thinleaf Huckleberry, Rusty Menziesia, Grouse Whortleberry, Pink Mountainheath, 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, Gooseberry Currant, Russet Buffaloberry, Mountain Snowberry, White Spirea, and Bunchberry Dogwood, can also occur. Open stands support abundant graminoids, namely Hitchcock's Smooth Woodrush, Idaho Fescue, Geyer's Sedge, rushes (*Juncus* spp.), and Pinegrass, with Bluejoint and Softleaf Sedge where moist. Forbs are diverse and range from Common Beargrass, Jacob's-ladder, Sickletop Lousewort, Timber Milkvetch, Prickly Sandwort, Poke Knotweed, and arnica on drier sites, to White Marsh Marigold, Red Baneberry, licorice-root, Claspleaf Twistedstalk, meadow-rue, Bride's Bonnet, Idaho Goldthread, miterwort, Carolina Bugbane, and Fragrant Bedstraw, on mesic soils.

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.



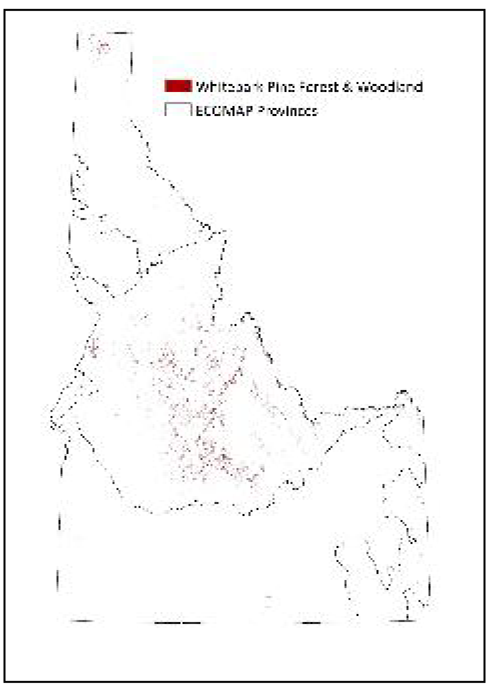
Understories are often lush, structurally complex, and diverse, but vary depending on moisture and disturbance. Tall deciduous shrubs, namely Saskatoon Serviceberry, Chokecherry, and Scouler's Willow, can be common, along with shorter Mountain Snowberry, Woods' Rose, Oregon Boxleaf, Common Juniper, Mountain Big Sagebrush, or Creeping Barberry. Typical graminoids are Slender Wheatgrass, Mountain Brome, Blue Wildrye, needlegrass (*Achnatherum*), Wheeler's Bluegrass, Pinegrass, and upland sedges (Hood's, Geyer's). Forbs are conspicuous, especially tall species such as Fendler's Meadow-rue, Sticky Purple Geranium, sweetroot, Silvery Lupine, Nettleleaf Giant Hyssop, Western Valerian, Manyflower Stickseed, Tall Ragwort, Western Coneflower, Engelmann's Aster, and California False Hellebore. Shorter forbs include Starry False Lily of the Valley, yarrow (*Achillea*), Woodland Strawberry, Northern Bedstraw, Mule-ears, and annuals.

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 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 Limber Pine, Subalpine Larch, Mountain Hemlock, and Engelmann Spruce. Whitebark Pine is a seral species, establishing after a disturbance such as wildfire or avalanche. Although high intensity fires kill Whitebark Pine, it tolerates low-intensity surface fires. Fire intervals vary from 30 to 300 years.

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.



The shrub understory is typically patchy, characterized by Common Juniper, Gooseberry Currant, Russet Buffaloberry, Mountain Snowberry, or Grouse Whortleberry. The herbaceous layer ranges from sparse to a moderately dense cover of graminoids, including Spike Fescue, Idaho Fescue, Geyer's Sedge, Ross' Sedge, or Wheeler's Bluegrass. Forbs indicative of droughty, poorly-developed soil are scattered, such as arnica, lupine, Rocky Mountain Goldenrod, Common Beargrass, yarrow (*Achillea*), Littleleaf Pussytoes, and Varileaf Cinquefoil. Birds and mammals (e.g., Grizzly Bear and rodents) eat and cache Whitebark Pine seeds, effectively dispersing the species. Clark's Nutcrackers transport the large, wingless seeds long distances, caching them across open subalpine habitat. In suitable sites, Whitebark Pine regenerates in clusters from forgotten caches.

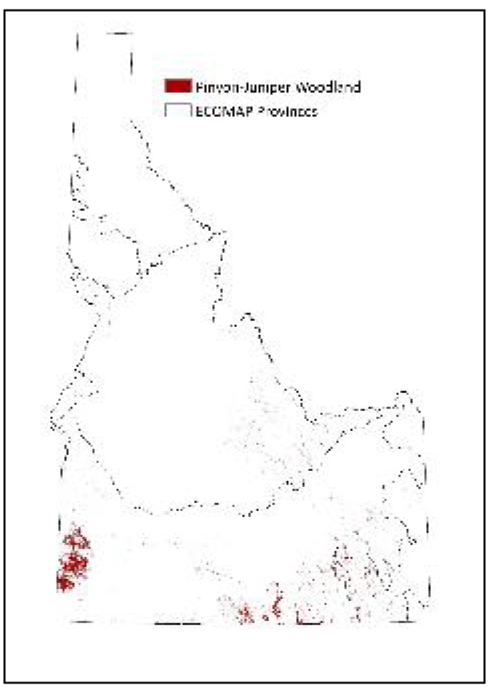
Pinyon–Juniper Woodland

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 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.

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 Bitterbrush, rabbitbrush, Little Sagebrush, Black Sagebrush, horsebrush, or Slender Buckwheat, with Rockspirea (*Holodiscus dumosus*), goldenbush, or Spiny Greasebush on rocks. Mesic sites may have Creeping Barberry and deciduous shrubs such as Mountain Snowberry, Wax Currant, serviceberry, or cherry. Herbaceous species reflect soil (depth, texture, moisture) and environmental conditions (slope, aspect, lithology, shade, disturbance). Common grasses include Bluebunch Wheatgrass, Idaho Fescue, Basin Wildrye, Sandberg Bluegrass, Indian Ricegrass, Needle and Thread, Saline Wildrye, needlegrass (*Achnatherum*), or Spike Fescue. Forbs can be diverse but typically have low cover and are commonly represented by Arrowleaf Balsamroot, buckwheat (Parsnipflower, Matted), Silvery Lupine, Oneflower Helianthella, phlox (Longleaf, Spiny), desertparsley, Tapertip Hawksbeard, pricklypear, Lambstongue Ragwort, cryptantha, or Tapertip Onion.

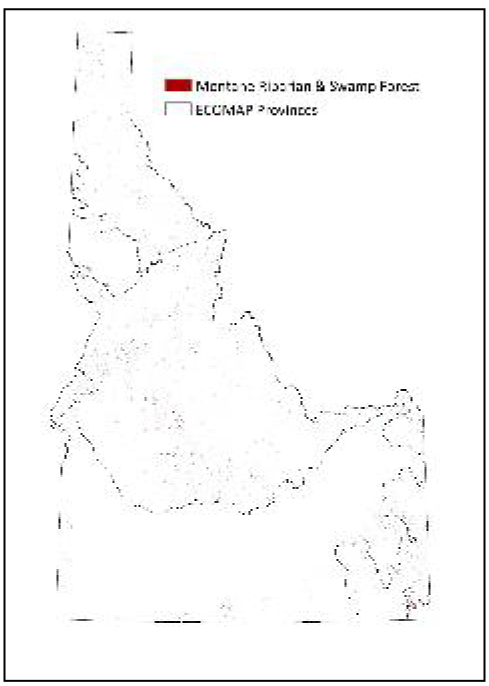


Montane Riparian & Swamp Forest

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. Narrowleaf 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.



Understory composition varies, depending on environmental setting. At higher elevations, heath family shrubs, such as Western Labrador Tea, Bog Blueberry, Grouse Whortleberry, and Pink Mountainheath, are common. An array of tall deciduous shrubs is often present, especially on sunnier streambanks, including Sitka Alder, Gray Alder, Redosier Dogwood, willow (Drummond's, Dusky), Rusty Menziesia, Thinleaf Huckleberry, Rocky Mountain Maple, Saskatoon Serviceberry, Black Hawthorn, currant (Prickly, Northern Black Currant), Alderleaf Buckthorn, Thimbleberry, Common Snowberry, and Rose Spirea. Herbaceous layers can be diverse. Characteristic graminoids are Bluejoint, sedges (Mountain, Northwest Territory, Water, Softleaf), Blue Wildrye, and Columbia Brome. Along with ladyfern, robust forbs are important, such as Arrowleaf Ragwort, Claspleaf Twistedstalk, Canby's Licorice-root, Starry False Lily of the Valley, Alpine Leafybract Aster, Common Cowparsnip, False Hellebore, Canadian Burnet, and Western Meadow-rue. Low-growing forbs are common, including White Marsh Marigold and Sierra Shootingstar at high elevations, and Field Horsetail, Carolina Bugbane, Fivestamen Miterwort, Fragrant Bedstraw, Small Enchanter's Nightshade, Virginia Strawberry, and Darkwoods Violet at lower elevations.

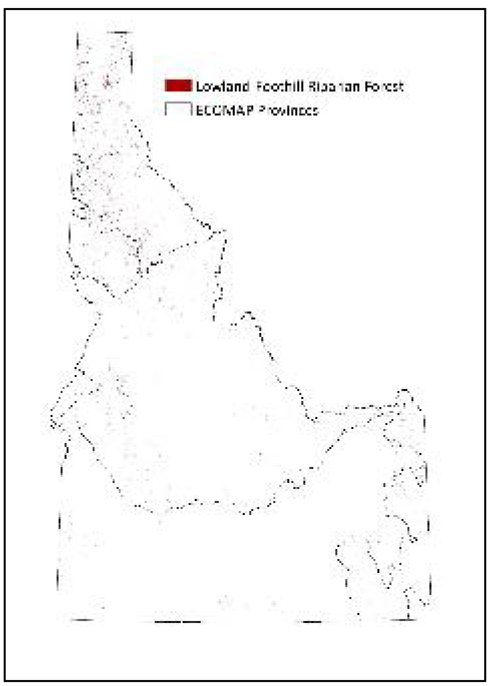
Lowland–Foothill Riparian Forest

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 rivers. In other locations, the condition, function, and viability of floodplain forests may be limited due to floodplain constraints, changing hydrologic regimes, or other stressors.

Black Cottonwood is typically ubiquitous; however, it is replaced by Narrowleaf Cottonwood in eastern Idaho. White Alder, Peachleaf Willow, juniper, Boxelder, and Bigtooth Maple also locally occur. Along with cottonwood, Douglas-fir, Ponderosa Pine, Grand Fir, and Quaking Aspen characterize lower montane areas, while Red Alder, Paper Birch, Western Redcedar, 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, Saskatoon Serviceberry, Chokecherry, hawthorn, Redosier Dogwood, Gray Alder, willow, Blue Elderberry, Lewis' Mock Orange, Western White Clematis, Golden Currant, snowberry, Woods' Rose, Skunkbush Sumac, Rose Spirea, Western Poison Ivy, *Rubus* spp., Alderleaf Buckthorn, ninebark, and Devilsclub (north Idaho). The herb layer varies in response to sunlight and disturbance. Common native graminoids include Woolly Sedge and Blue Wildrye; introduced species are locally abundant. Tall native forbs include Starry False Lily of the Valley, goldenrod, Stinging Nettle, horsetail, Sweetcicely, American Licorice, Common Ladyfern, aster, buttercup, Western Hemlock, Common Cowparsnip, Western Meadow-rue, White Sagebrush, and American Skunkcabbage. Springbeauty, bedstraw, and Small Enchanter's Nightshade are common low-growing species.

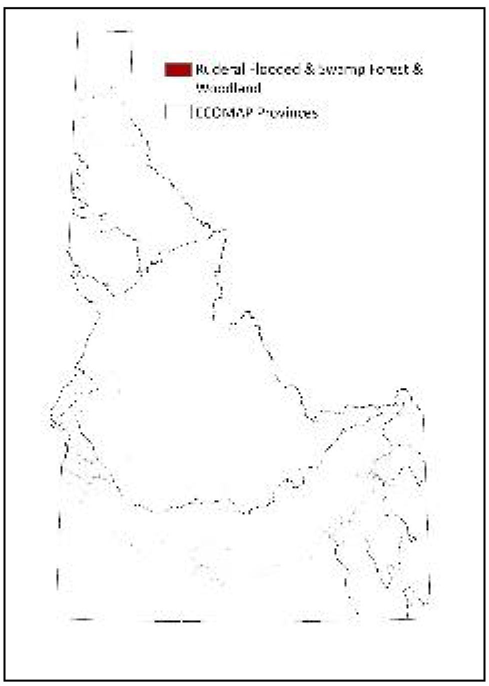


Ruderal Flooded & Swamp Forest & Woodland

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

This type is dominated by introduced invasive tree species. Abundant trees include Russian Olive, tamarisk, Silver Maple, Boxelder, Green Ash, cottonwood (Plains, Fremont), White Poplar, willow (White, Crack), elm (Siberian, American), Black Locust, Northern Catalpa, White Mulberry, and fruit trees (e.g., cherry, apple, pear, Apricot). Invasive shrubs can be common, especially false indigo, rose, and Himalayan Blackberry. Invasive plant species are also abundant in the understory such as the vine-like White Bryony and Climbing Nightshade, grasses (Reed Canarygrass, Quackgrass, Smooth Brome, Meadow Foxtail, Creeping Bentgrass, Canada Bluegrass, Cheatgrass, Mouse Barley), and noxious weeds (Canada Thistle, Poison Hemlock, Broadleaved Pepperweed, Purple Loosestrife, Paleyellow Iris, Leafy Spurge, Hound's Tongue). Other introduced ruderal species are common including Spear Saltbush, German-madwort, Curly Dock, Lambsquarters, Prickly Lettuce, Sweetclover, and seeded Tall Wheatgrass. Relict or recovering native woody species, including Peachleaf Willow, Yellow Willow, Narrowleaf Willow, Golden Currant, Gray Alder, Redosier Dogwood, and Woods' Rose, are frequently intermixed but not dominant. Common native herbs, such as Woolly Sedge, Field Horsetail, Indianhemp, goldenrod, and ruderal marsh species (e.g., Broadleaf Cattail, Hardstem Bulrush, Common Rush, Common Duckweed), also occur.



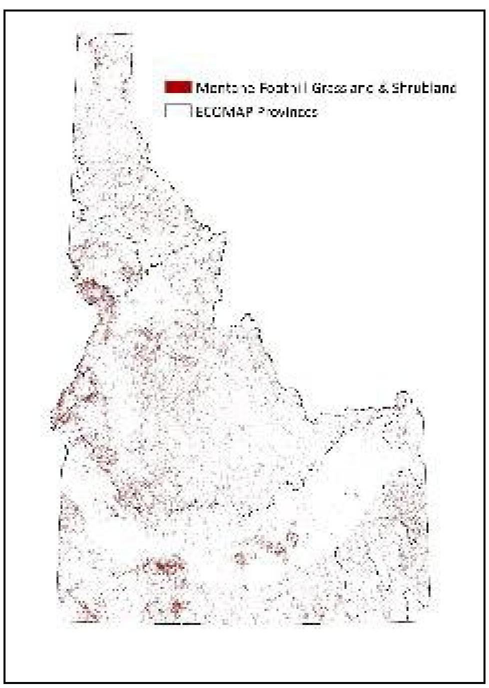
Temperate & Boreal Grassland & Shrubland

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 crust.

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 treeline 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) and borders of talus.

Lower Salmon River, Idaho 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.

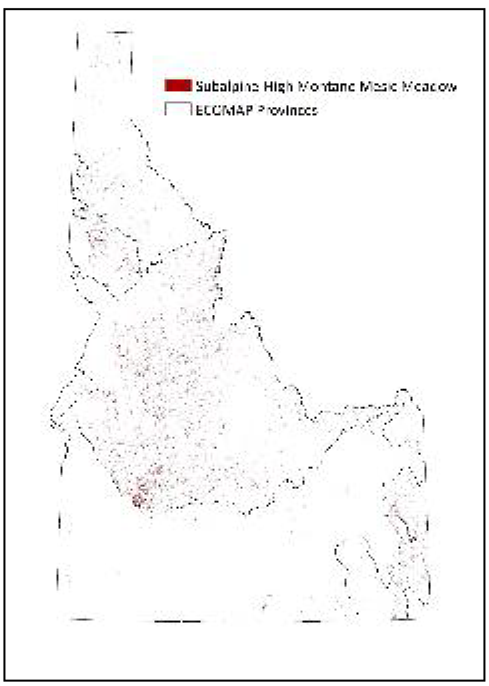
Canyon, Palouse Prairie, and foothill grasslands are dominated by Bluebunch Wheatgrass, Idaho Fescue, Rough Fescue, Basin Wildrye, Prairie Junegrass, Needle and Thread, and Sandberg Bluegrass. Others include Purple Threeawn, Sand Dropseed, wheatgrass (e.g., *Elymus*, *Pascopyrum*, *Thinopyrum*), and invasive annual grasses. Oatgrass, needlegrass (*Achnatherum*), sedges, and Spike Fescue are more abundant at high elevations. Spikemoss, moss, and lichen can cover soil between bunchgrasses. Low elevation shrub patches are dominated by serviceberry (Saskatoon, Utah), Netleaf Hackberry, hawthorn, Mallow Ninebark, Common Snowberry, rose, Smooth Sumac, Blue Elderberry, and Oceanspray. Rocky Mountain Maple, Mountain Snowberry, Bitter Cherry, Chokecherry, and Redstem Ceanothus become prominent in the lower montane. Forbs are conspicuous such as Arrowleaf Balsamroot, Blanketflower, lupine, buckwheat, desertparsley, Little Sunflower, beardtongue, geranium, Houndstongue Hawkweed, cinquefoil, arnica, aster, phlox, fleabane, Old Man's Whiskers, stoneseed, yarrow (*Achillea*), milkvetch, goldenrod, Indian paintbrush (*Castilleja*), and pussytoes. Montane shrubs occur with mesic herbs. They include Sitka Alder, mountain ash, Rusty Menziesia, Scouler's Willow, Thinleaf Huckleberry, elderberry, Snowbrush Ceanothus, currant, spirea, Thimbleberry, and American Red Raspberry.

Subalpine–High Montane Mesic Meadow

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. Although some areas are susceptible to the effects of increased conifer encroachment, invasive plants, and reduced snow cover and snow melt.

Hidden Lake, Grass Mountains
2009 Chris Murphy/IDFG

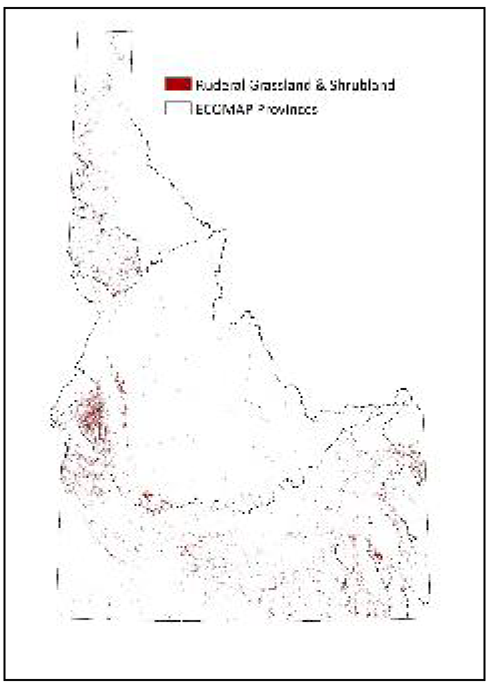


Some mesic meadows support patches of Shrubby Cinquefoil, Silver Sagebrush, or Wolf's Willow on fringes. More typically, there is an open to dense, diverse, and often forb-rich herb community. Burrowing mammals can increase forb diversity. Important forbs include Engelmann's Aster, fleabane (*Erigeron*), licorice-root (*Ligusticum*), Western Sweetroot, stickseed (*Hackelia*), bluebells (*Mertensia*), American Saw-wort, Fireweed, Common Cowparsnip, angelica (*Angelica*), meadow-rue (*Thalictrum*), valerian (*Valeriana*), ragwort (e.g., *Packera, Senecio*), false hellebore (*Veratrum*), Poke Knotweed, Western Coneflower, Small Camas, Globe Penstemon, Mule-ears, cinquefoil (*Potentilla*), goldenrod (*Solidago*), Western Pearly Everlasting, Indian paintbrush (*Castilleja*), Mountain Deathcamas, Common Beargrass, phlox (*Phlox*), yarrow (*Achillea*), onion (*Allium*), bellflower (*Campanula*), pussytoes (*Antennaria*), gentian (*Gentiana*), and Rocky Mountain Iris. Many meadows have dense stands of native graminoids, the most abundant being Baltic Rush, oatgrass (e.g., Timber Oatgrass, California Oatgrass), Tufted Hairgrass, Western Wheatgrass, Blue Wildrye, Bluejoint, muhly (*Muhlenbergia* spp), Idaho Fescue, and a number of sedges (e.g., Clustered Field Sedge, Meadow Sedge, Smallwing Sedge, Widefruit Sedge, Slenderbeak Sedge, Brown Sedge, Hood's Sedge, Raynolds' Sedge, Parry's Sedge).

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 2009 Janice Hill/IDFG

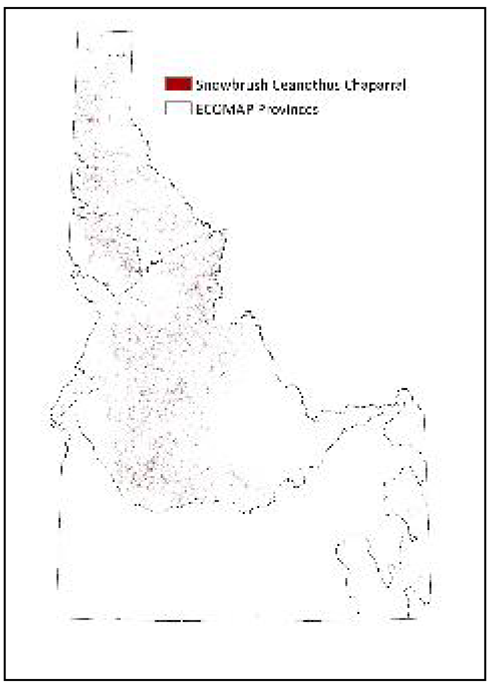


Dominant and diagnostic species include naturalized forage grasses such as Smooth Brome, Kentucky Bluegrass, bentgrass (*Agrostis*), fescue (*Festuca*), ryegrass (*Lolium*), Orchardgrass, Intermediate Wheatgrass, Quackgrass, Timothy, Common Velvetgrass, and others. Nonnative annuals may be present, including brome (*Bromus*), North Africa Grass, or Sweet Vernalgrass. Introduced annual forbs, such as Prickly Lettuce, Field Pennycress, Herb Sophia, and Yellow Salsify, are frequent. Seeded perennial forbs including Alfalfa, sainfoin (*Onobrychis*), Chickpea Milkvetch, Blue Flax, or native species are locally common. Invasive shrubs are occasional, with some areas dominated by rose (*Rosa*), Scotch 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.

Snowbrush Ceanothus Chaparral

Camas Peak, Soldier Mountains, Idaho 2004
Jennifer Miller/IDFG

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.



Many stands are located in relatively remote mountainous areas and 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.

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, Saskatoon Serviceberry, Scouler's Willow, or others may codominate, with less common species being Mountain Big Sagebrush, bitterbrush (*Purshia*), and Creeping Barberry. Gaps in the shrub layer support native bunchgrasses, such as Slender Wheatgrass, Bluebunch Wheatgrass, Idaho Fescue, Columbia Needlegrass, Basin Wildrye, Prairie Junegrass, and Sandberg Bluegrass. Pinegrass or Geyer's Sedge can be locally common. Medium to tall forbs often occur, including Silvery Lupine, giant hyssop (*Agastache*), Western Sweetroot, buckwheat (*Eriogonum*), and Spreading Dogbane. Various annual forbs can be prominent on bare soil, especially where snow lingers in the late spring.

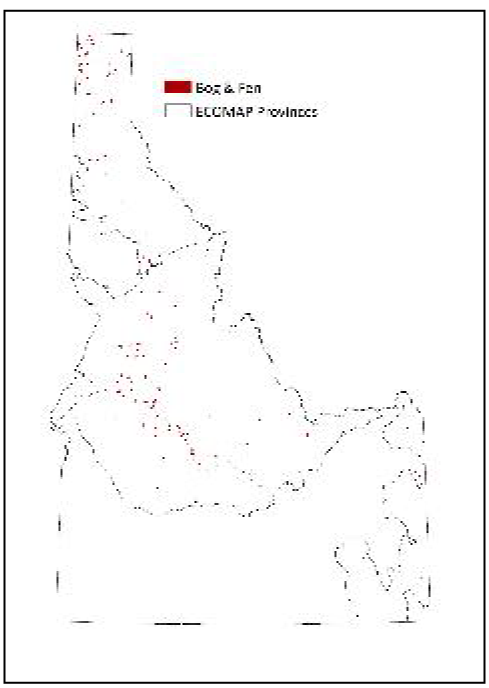
Shrub & Herb Wetland

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 >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 2004 Lisa Harloe/IDFG



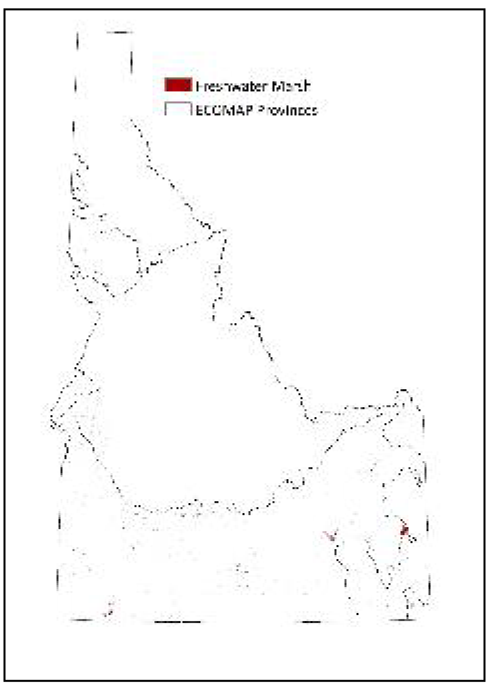
Nearly pristine fens can be found in remote high-elevation headwater mountain valleys. At lower elevations, the extent and condition of some fens have decreased due to several stressors affecting surface and subsurface hydrology and the sensitive plant communities.

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 (*Sphagnum*) moss ground layer. Lodgepole Pine and Engelmann Spruce trees are scattered. Heath family (Ericaceae) shrubs, primarily Bog Blueberry, Alpine Laurel, and Western Labrador Tea, are abundant. Bog Birch, short willows (e.g., Wolf's Willow, Diamondleaf Willow), and Rose Spirea can be common. Dominant graminoids include Fewflower Spikerush, sedges (e.g., Northwest Territory Sedge, Water Sedge, Mountain Sedge, Woollyfruit Sedge, Cusick's Sedge, Mud Sedge, Buxbaum's Sedge, Bristlystalked Sedge), Tall Cottongrass, and Tufted Bulrush. Forbs are abundant and include Buckbean, Purple Marshlocks, Buek's Groundsel, 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 willow (*Salix*) are locally dominant. Fewflower Spikerush is important, along with caespitose bulrushes (e.g., Tufted Bulrush), sedges (e.g., Analogue Sedge, Livid Sedge), rushes (*Juncus* spp.), arrowgrass (*Triglochin*), and Simple Bog Sedge. Forbs include Alpine Meadow-rue and Marsh Grass of Parnassus. Fens support boreal plants that are rare in Idaho.

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. Some marshes in Idaho have been lost due to various stressors including stable hydrology, lack of disturbance, excavation, pollution, invasive plants, and drought.

Vegetation is often characterized by tall emergent graminoids over 2 m tall, Broadleaf Cattail or bulrush (Hardstem Bulrush, Softstem Bulrush, Chairmaker's Bulrush). 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 spikerush (Common Spikerush, Beaked Spikerush), rush (Baltic Rush, Common Rush, Torrey's Rush), bulrushes (e.g., Common Threesquare, Cosmopolitan Bulrush, Panicled Bulrush, Small-fruit Bulrush), sedges (*Carex* spp.), American Mannagrass, wildrice (*Zizania*), Rice Cutgrass, Seaside Arrowgrass, Switchgrass, and Foxtail Barley. Common forbs include Stinging Nettle, milkweed (*Asclepias*), water hemlock (*Cicuta*), hedgenettle (*Stachys*), goldenrod (*Solidago*), Water Knotweed, Common Mare's-tail, Northern Water Plantain, arrowhead (*Sagittaria*), waterhorehound (*Lycopus*), and Fringed Willowherb. Annuals such as beggarticks (*Bidens*), smartweed (*Polygonum*), dock (*Rumex*), flatsedge

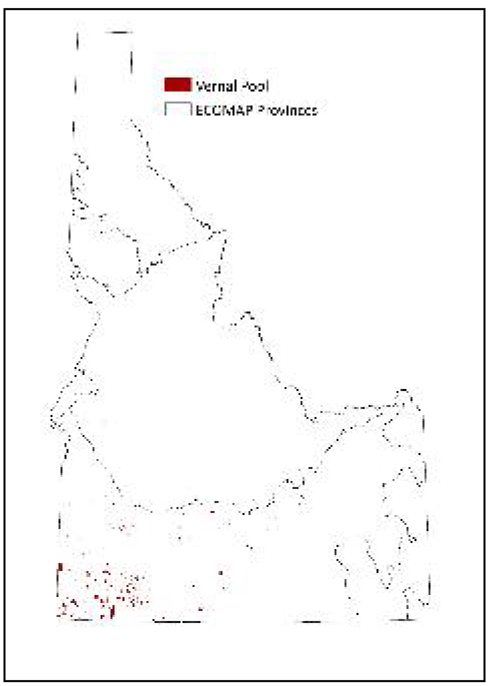
(*Cyperus*), Barnyardgrass, and rabbitsfoot grass (*Polypogon*) germinate after water drawdown. Aquatic species such as pondweed (*Potamogeton, Stuckenia*), Coon's Tail, Common Bladderwort, duckweed (*Lemna*) occur in open water between emergent patches.

Vernal Pool

Shallow, ephemerally flooded precipitation and snowmelt-filled closed depressions ranging from small to lake-like. 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 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.

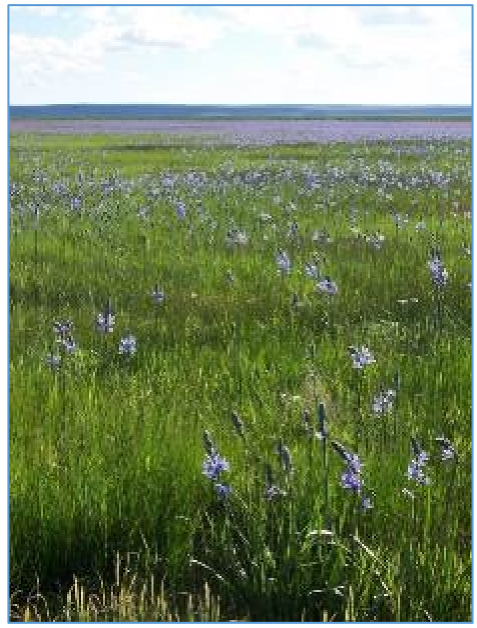


Vernal pools have relatively high diversity of plants and invertebrates adapted to shallow ephemeral flooding. Communities can form distinct zones or concentric rings of plants with similar moisture tolerances. Some vernal pools are dominated by perennial species, namely Silver Sagebrush, which dominate the entire pool or form a ring around wetter herbaceous communities. Common Spikerush and Mat Muhly are frequently dominant perennials in pools with longer inundation, co-occurring with Nevada Rush, Hairy Waterclover, California Damsonium, Small Camas, and Willow Dock, with Owyhee Sage, Squirreltail, Sandberg Bluegrass, and Wasatch Desertparsley on margins. Annuals frequently occur and are diverse, the most important being Needle Spikerush, Annual Hairgrass, popcornflower (*Plagiobothrys*), pincushionplant (*Navarretia*), Milkwort Knotweed, Smooth Spike-primrose, Fleshy Porterella, mousetail (*Myosurus*), Carolina Foxtail, Short Woollyheads, calicoflower (*Downingia*), and Neckweed. 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 endemic Davis' Pepperweed, with claypan-adapted forbs such as springparsley

(*Cymopterus*). Due to the isolation and unique ecology of vernal pools, many endemic or specialized plants and invertebrates (e.g., fairy shrimp, tadpole shrimp) occur.

Lowland Marsh, Wet Meadow & Shrubland

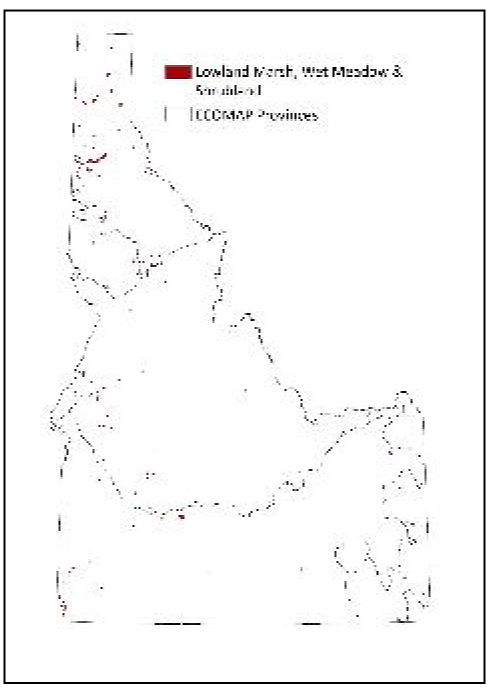
Low elevation, seasonally wet riparian shrublands, meadows, marshes, and mudflats in valleys, plains, and basins. This habitat occurs on flats, floodplains (bars, channels, oxbows, backwaters, depressions, terraces), pond and lake margins, sloped seeps and springs, drainages, and swales. Mudflats occur in drawdown zones of shallow water bodies. 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.



Duck Valley, Idaho 2005 Chris Murphy/IDFG

Many of Idaho's most productive and diverse low-elevation marshes and meadows occur on WMAs such as the Coeur d'Alene River, McArthur Lake, and Camas Prairie–Centennial Marsh. Examples of culturally important camas meadows also occur at Weippe Prairie and Duck Valley. Many other low-elevation seasonal wetlands are often altered by human land uses, lack of disturbance, and climate changes.

Dominant shrubs include Gray Alder, Rose Spirea, Black Hawthorn, Redosier Dogwood, rose, willows (Sitka, Bebb, Geyer, Drummond's, Shining, and Mackenzie's willows), snowberry (*Symphoricarpos*), and Pacific Ninebark. The herb layer includes Bluejoint, sedges (*Carex* spp.), Fowl Mannagrass, Drooping Woodreed, Panicled Bulrush, cowparsnip (*Heracleum*), Stinging Nettle, Arrowleaf Ragwort, Columbian Monkshood, Paleyellow Touch-me-not, ladyfern (*Athyrium*), bedstraw (*Galium*), violet (*Viola*), and skunkcabbage (*Lysichiton*). Graminoids dominate marshes, primarily bur-reeds (*Sparganium* spp.), sedges (Northwest Territory Sedge, Woollyfruit Sedge, Blister Sedge, Cusick's Sedge), rushes (*Juncus* spp.), spikerush (*Eleocharis*), bulrushes (Hardstem Bulrush, Woolgrass), wildrice (*Zizania*), grasses (Rough Bentgrass, mannagrass [*Glyceria*], Shortawn Foxtail), Broadleaf Cattail, and Sweetflag. Forbs are common, such as Water Horsetail, Purple Marshlocks, Buckbean, beggarticks (*Bidens*), waterhorehound, arrowhead (*Sagittaria*), Northern Water Plantain, Common Mare's-tail, loosestrife (*Lythrum*), skullcap (*Scutellaria*), and speedwell (*Veronica*). Exposed mudflats support mats of native



and introduced annuals. Graminoids include Foxtail Pricklegrass, flatsedge (*Cyperus*), lovegrass (*Eragrostis*), and spikerush. Forbs include Chaffweed, pygmyweed (*Crassula*), mudwort (*Limosella*), hedgehyssop (*Gratiola*), false pimpernel (*Lindernia*), rotala (*Rotala*), primrose-willow (*Ludwigia*), Little Hogweed, carpetweed (*Mollugo*), goosefoot (*Chenopodium*), cocklebur (*Xanthium*), dock (*Rumex*), and yellowcress. The composition of plant species in meadows varies. California Oatgrass, Tufted Hairgrass, spikerush, rushes (Baltic, Sierra, and Colorado rushes), sedges (Nebraska, Clustered Field, and Slenderbeak), Meadow Barley, Nevada Bluegrass, wildrye, wheatgrass, Mat Muhly, and Common Threesquare are diagnostic graminoids. Forbs can codominate, namely Small Camas, Mule-ears, ragwort (*Senecio*), Slender Cinquefoil, Rocky Mountain Iris, White Sagebrush, clover (*Trifolium*), dock, aster, yampah (*Perideridia*), beardtongue (*Penstemon*), yarrow (*Achillea*), Indian paintbrush (*Castilleja*), and Oregon Checkerbloom. Annuals are abundant (e.g., Popcornflower, Annual Hairgrass, willowherb [*Epilobium*], Milkwort Knotweed, pincushionplant [*Navarretia*]). Silver Sagebrush and Owyhee Sage are locally abundant shrubs.

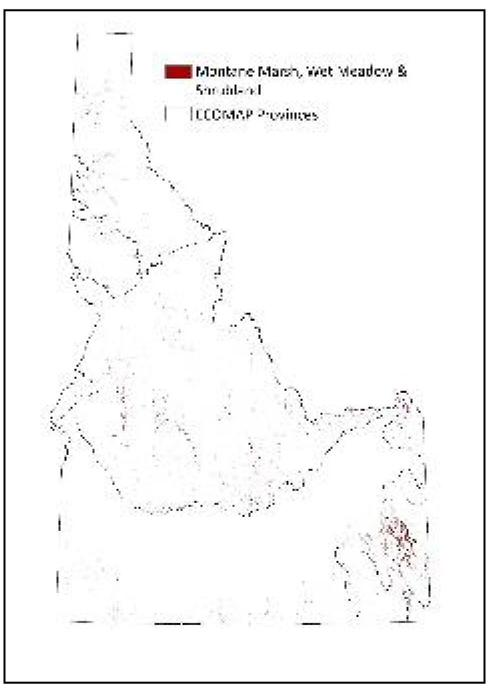
Montane Marsh, Wet Meadow & Shrubland

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

Crane Meadow, Elk Creek, Idaho Chris Murphy/IDFG

Diverse and productive native wet meadows, riparian shrublands, and marshes commonly occur throughout minimally-developed 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.

Shrubs range from dwarf (0.5 m) to >5 m tall, reflecting hydrology and elevation. Willows (Booth's, Drummond's, Geyer's, Bebb's, Lemmon's, Dusky), alder (Gray, Sitka), Redosier Dogwood, currants (Northern Black, Whitestem, Prickly), Alderleaf Buckthorn, Black Hawthorn, Rose Spirea, Rocky Mountain Maple, Western Labrador Tea, Twinberry Honeysuckle, and Thimbleberry are characteristic. Meadows support short-statured Bog Birch, willows (Wolf's, Diamondleaf, Eastwood's), Shrubby Cinquefoil, Sweetberry Honeysuckle, and heath (Pink Mountainheath, blueberries). Herbs vary depending on shrub density, hydrology, and soils. Dominant graminoids are sedges (Water, Northwest Territory, Mountain, Analogue, Woodrush, Nebraska, Woolly), Tufted Hairgrass, Bluejoint, Baltic Rush, Fewflower Spikerush, Pullup Muhly, Smallfruit Bulrush, Blue Wildrye, Wolf's Trisetum, and Mannagrass. High elevations have sedges (Alpine, Sheep), Woodrush, and rushes (*Juncus* spp.). Forbs can be conspicuous and include Sierra Shooting Star, Globe Penstemon, Elephanthead, Licoriceroot, Bistort, Marsh Marigold, camas, Plantainleaf Buttercup, groundsel (Cleftleaf,



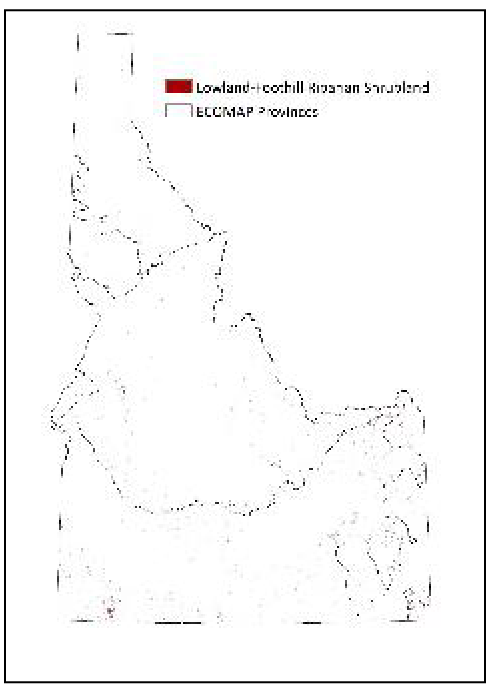
Arrowleaf), cinquefoil, aster (Giant Mountain, Leafybract), Flat-Top Pussytoes, False Hellebore, Lyall's Angelica, Cow Parsnip, Subalpine Fleabane, Indian paintbrush (*Castilleja*), Stinging Nettle, Monkshood, Starry False Lily Of The Valley, Lady Fern, Horsetail, Fringed Grass Of Parnassus, American Globeflower, Tinker's Penny, Springbeauty, Largeleaf Avens, bedstraw (*Galium*), and Enchanter's Nightshade. Marshes, flooded more deeply and persistently, form around beaver ponds, subalpine lakes, and depressions. Spikerush, sedges (Sierra Hare, Lakeshore, Blister), and Bur-Reed are common.

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

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.



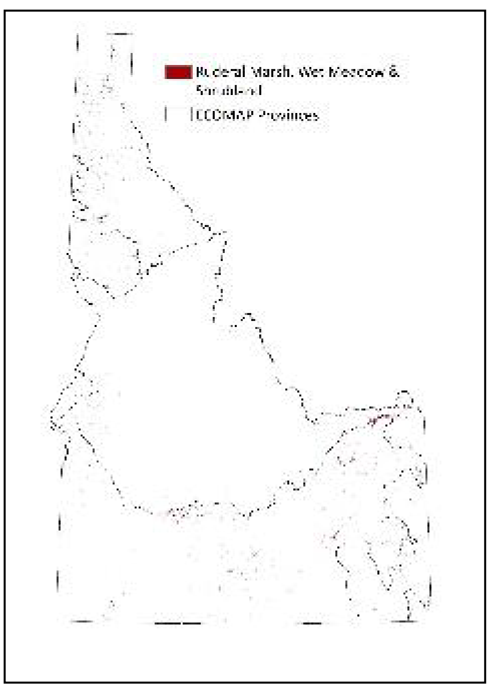
There is a diverse mix of shrubs (0.5 to > 5 m tall). Frequent dominant species are willows (Narrowleaf, Arroyo, Yellow, Greenleaf, Dusky), Water Birch, Gray Alder, hawthorn (Black, River), Woods' Rose, Lewis' Mock Orange, Chokecherry, Common Snowberry, Golden Currant, Redosier Dogwood, Rocky Mountain Maple, Skunkbush Sumac, Western Poison Ivy, Hairy False Goldenaster, sagebrush, and introduced False Indigo. Herbs vary depending on shrub density and flood disturbance. The most abundant species are Blue Wildrye, Fowl Mannagrass, Common Spikerush, sedges (Lakeshore, Woolly, Dewey's, Nebraska, Sheldon's), rushes (*Juncus* spp.), bulrush (Smallfruit, Threesquare), California Oatgrass, Stinging Nettle, Goldenrod, Wild Mint, Horsetail, Common Ladyfern, Starry False Lily Of The Valley, Sweetcicely, Western Columbine, aster, Common Cowparsnip, White Sagebrush, Fringed Willowherb, Largeleaf Avens, and bedstraw (*Galium*). Less common grasses include Basin Wildrye, Fowl Bluegrass, and wheatgrasses. Presence of Black Cottonwood indicates succession toward riparian forest.

Ruderal Marsh, Wet Meadow & Shrubland

Wet meadows, marshes, and shrublands dominated by introduced weedy species, 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. Past or current disturbances include haying, altered hydrology, infrastructure development, severe grazing, land clearing, and filling or draining.

Clark Fork River delta

Introduced False Indigo, roses (Dog, Sweetbriar), Himalayan Blackberry, Shrubby Cherry, or Saltcedar dominate shrub patches. If present, introduced or native trees are not dominant. Relic or recovering native shrubs, such as willows (*Salix* spp.), hawthorn (*Crataegus* spp.), Wood's Rose, Rose Spirea, or Western Poison Ivy, may be intermixed. Reed Canarygrass frequently dominates shrub understories and meadows. Other abundant or dominant introduced grasses include Creeping Meadow Foxtail, Bentgrass, Quackgrass, Smooth Brome, and Kentucky Bluegrass. Other forage grasses, such as fescue (*Festuca*), Timothy, Orchardgrass, and Intermediate Wheatgrass, are common. Noxious and highly invasive weeds, including Common Reed, Canada Thistle, Broadleafed Pepperweed, Poison Hemlock, Paleyellow Iris, Oxeye Daisy, Purple Loosestrife, Narrowleaf Cattail, Common Tansy, Fuller's 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, Annual Rabbitsfoot Grass, Curly Dock, Watercress, smartweed (*Polygonum*), Sweetclover, Catnip, clover, Field Pennycress, False Mayweed, Plantain, Sheep Sorrel, Herb Sophia, Pepperweed, Blue Mustard, Tall Tumblemustard, Prickly Lettuce, Yellow Salsify, Kochia, Spear Saltbush, Little Hogweed, and Speedwell. Native recovering, seeded, and disturbance-tolerant herbs are intermixed but not dominant. They include Broadleaf Cattail, bulrushes, rushes (*Juncus* spp.), sedges *(Carex* spp.), Spikerush, Barley, bluegrasses, wheatgrasses, Stinging Nettle, goldenrods, horsetails, milkweed, dock, smartweed (*Polygonum*), Willowherbs, Wild Mint, Povertyweed, White Sagebrush, Brackenfern, asters, cinquefoil, and annuals. Although dominated by



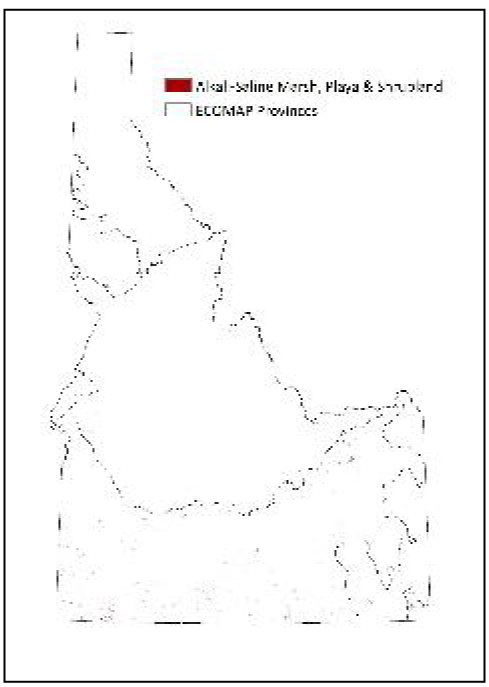
introduced species, these wetlands provide important ecosystem services (e.g., nutrient and sediment retention, habitat).

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 soil 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 very 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
2012 Chris Murphy/IDFG

Although 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 NWR). The extent and condition of some alkaline–saline wetlands have decreased due to decreased groundwater availability, pollution, and invasive plants.



Dense to open shrublands occupying sites with deeper groundwater are dominated by Greasewood, mixed with rabbitbrush (*Chrysothamnus* spp.), Green Molly, saltbush (*Atriplex* spp.), Shrubby Cinquefoil (east Idaho), willows (*Salix* spp.), and rarely Iodinebush. Trees, such as Russian Olive or Limber Pine, are marginal. The herbaceous understory and adjacent mesic meadows are characterized by Saltgrass, Alkali Sacaton, sedge (Clustered Field, Parry's), Baltic Rush, Western Wheatgrass, Beardless Wildrye, Basin Wildrye, Alkali Bluegrass, Slimstem Reedgrass, Barley, or seeded Tall Wheatgrass. Forbs are not abundant in greasewood and include Showy Milkweed, yarrow (*Achillea*), Alkali Mallow, and Povertyweed. Seasonally flooded or saturated marshes and wet meadows are dominated by a mix of bulrushes (Chairmaker's Bulrush, Common Threesquare, Cosmopolitan, Nevada), Beaked Spikerush, Saltgrass, Alkaligrass, Alkali Muhly, Alkali Cordgrass, Analogue Sedge, Seaside Arrowgrass, Torrey's Rush, and Annual Rabbitsfoot Grass. Important forbs are Pursh Seepweed, Sea Milkwort, Silverweed Cinquefoil, Alkali Aster, Swamp Milkweed, Cutleaf Waterparsnip, Desert Centaury, and occasionally Red Glasswort and Redwool Plantain. Eastern Idaho calcareous seep-fed meadows host a suite of uncommon forbs, including globally rare Bluedome Primrose and Meadow Milkvetch.

Desert & Semidesert

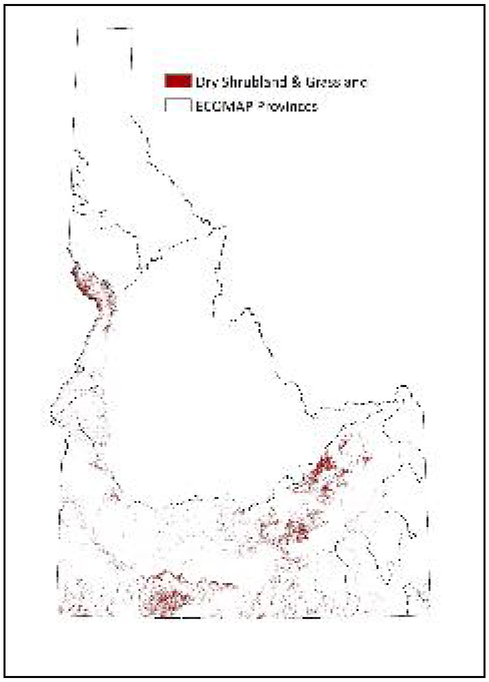
These habitats occur in areas with a semiarid climate, or where moisture availability is limited by topography (slope, aspect, windy ridges), landform, or soil type (coarse, thin, well-drained, erosion prone, alkaline). These habitats range from hot and dry low-elevation canyons and plains, to foothill, 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 (<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 crust may occur between plants.

Dry Shrubland & Grassland

Boise Foothills

Low elevation shrublands and grasslands composed of highly drought-resistant plants found in semiarid to arid settings. Stands occur on plateaus, benches, bluffs, breaklands, foothill slopes (often south to west aspects), and alluvial fans and flats, including in bottoms of hot and dry river canyons. 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 sagebrush or grasslands in areas of higher soil moisture or precipitation (e.g., higher elevations, north to east aspects). Soils in this habitat have relatively low cover of perennial vegetation and microbiotic crust, making them vulnerable to severe erosion if disturbed.

Intact dry shrublands and grasslands dominated by native vegetation occur along major river canyons (e.g., Hells Canyon, Salmon River) and on scattered foothills of central Idaho. Elsewhere, this habitat has been affected by various human land uses, invasive plants, and wildfire.



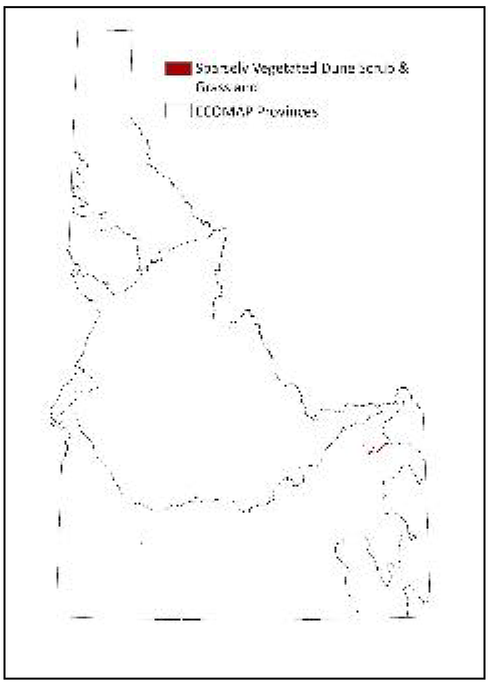
Vegetation is a mix of shrubs or dwarf-shrubs, or grass-dominated with a sparse shrub layer, but total cover is low (10% to 30%). Frequent shrubs are rabbitbrush (Yellow, Rubber, Truckee), horsebrush (Littleleaf, Shortspine), Spiny Hopsage, saltbush (Fourwing, Shadscale), Winterfat, Purple Sage, Granite Prickly Phlox, Slender Buckwheat, Bud Sagebrush, and Broom Snakeweed. Big Sagebrush, Low or Black Sagebrush, Bitterbrush, Greasewood, or juniper co-occur, but rarely have >5% cover. Periodic fire prevents shrub invasion in grasslands. Important grasses include Needle and Thread, Indian Ricegrass, Purple Threeawn, Sand Dropseed, Saline Wildrye, Bluebunch Wheatgrass, Sandberg Bluegrass, Squirreltail, and Cheatgrass. Forbs can be diverse but have low cover. Characteristic native forbs include Pricklypear Cactus, Arrowleaf Balsamroot, Shaggy Fleabane, Milkvetch, Northwestern Indian Paintbrush, Douglas' Dustymaiden, Nakedstem Sunray, Thorn Skeletonweed, Hoary Tansyaster, Pale Evening-Primrose, Sharpleaf Penstemon, and Desert Princesplume. Favorable precipitation can result in a flush of annuals, such as Suncup, Cushion Cryptantha, Great Basin Langloisia, Desert Dandelion, Whitestem Blazingstar, Carveseed, and Indian Wheat.

Sparsely Vegetated Dune Scrub & Grassland

Bruneau Dunes State Park, Bruneau, Idaho 2007 IDFG

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.

The large dune complexes at Bruneau Dunes State Park and remote regions of St. Anthony Sand Dunes are intact and healthy. In some localized areas, vegetation loss has resulted from unauthorized OHV use. In other areas, dune stabilization and increased invasive plants, which promote further dune stabilization, have reduced suitable habitat for dune obligate native species.



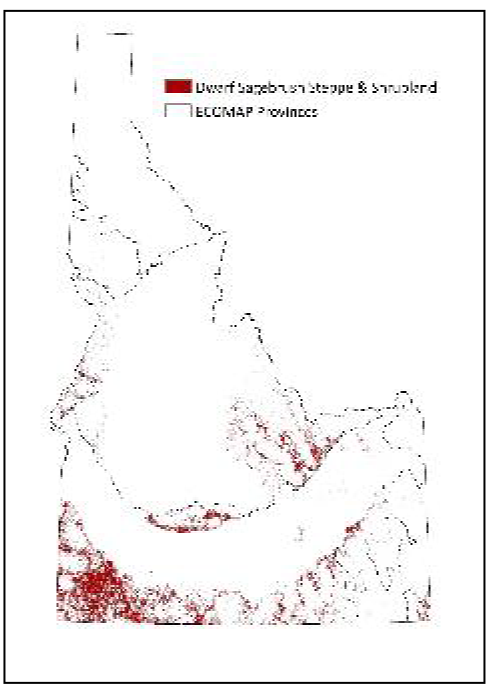
Yellow Wildrye, Indian Ricegrass, Needle and Thread, and Lemon Scurfpea are characteristic. Shrubs are patchy to scattered and commonly include Basin Big Sagebrush, Rabbitbrush, Bitterbrush, Chokecherry, Granite Pricklyphlox, and Fourwing Saltbush. Rocky Mountain Juniper is sometimes present. Other perennial forbs with low cover include Franklin's Sandwort, White Sand Verbena, Veiny Dock, Common Starlily, Evening Primrose (Booth's, Pale), Blue Mountain Prairieclover, Silverleaf Phacelia, and Nakedstem Sunray. If precipitation and microsites are favorable, annuals may be abundant, including Flatspine Burr Ragweed, Geyer's Milkvetch, Cryptantha, Suncup, annual buckwheats, annual lupines, Smooth Desert Dandelion, Whitestem Blazingstar, Ground Nama, Nuttall's Crinklemat, and Gilia.

Dwarf Sagebrush Steppe & Shrubland

Donkey Hills, Dry Creek, Idaho 2008 Beth Colket/IDFG

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 where derived from limestone.

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.



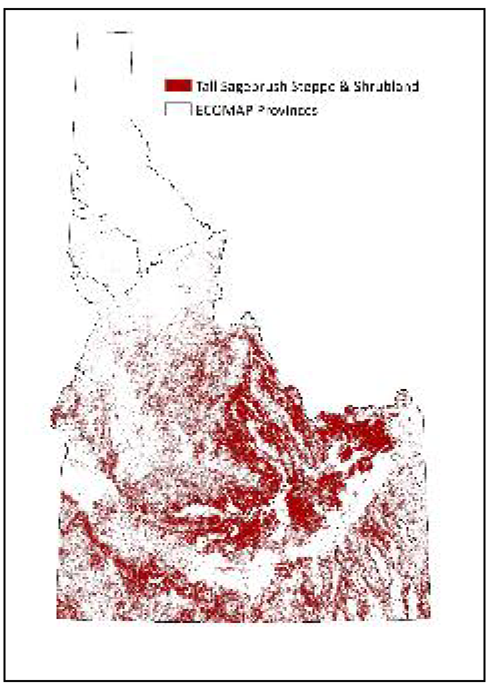
Dwarf sagebrush species and herb cover varies according to soil and climate. It occupies inter-mound flats and swales in areas of mounded topography. Black Sagebrush is widespread, occurring on gravelly, calcareous soils. Little Sagebrush also occurs widely, but on shallow, fine-textured soils over bedrock or pan that impedes drainage. Prairie Sagewort can occur at higher elevations. Adapted to poor drainage and spring saturation, Early Sagebrush occurs on shallow, alkaline, clayey soils, while Scabland Sagebrush is found on shallow lithic soils over basalt in western Idaho. On scabland sites shrubby buckwheats (Thymeleaf, Rock Buckwheat) are locally dominant. Other shrubs can be present or codominant, including Antelope Bitterbrush, Big Sagebrush, Spiny Hopsage, and Saltbush, especially on deep soil mounds. Herbaceous cover is lowest on scabland sites. Characteristic bunchgrasses are Sandberg Bluegrass, Idaho Fescue, Bluebunch Wheatgrass, Indian Ricegrass, Squirreltail, Onespike Danthonia, Thurber's Needlegrass, and introduced Bulbous Bluegrass. Forbs include cushion, woody-based, and deeply taprooted species such as Hooker's Balsamroot Buckwheat, desertparsley (Barestem, Wasatch, Gray's, Wyeth), Spiny Phlox, Fleabane, Goldenweed, Largehead Clover, Pussytoes, Lava Aster, Gairdner's Penstemon, Onion, Rockcress, Gairdner's Yampah, Indian paintbrush (*Castilleja*), Hawksbeard, and Stonecrop. Annuals, such as knotweeds, may be seasonally common. Moss and lichen cover is high in undisturbed areas.

Tall Sagebrush Steppe & Shrubland

Sagebrush-steppe ranges from hot, dry canyons and plains, to mesic foothills, to cool, snowy mountains in semiarid regions. Stands occur on plateaus, badlands, valley alluvial fans and terraces, glacial outwash flats, slopes, ridges, and stabilized dunes. Soils are well-drained, derived from alluvium, loess, sand, or bedrock. They vary from deep on gentle or north-east slopes, to shallow and rocky on steep or south-west slopes. Textures are sandy, silty, or clayey and loamy. Productivity and diversity increase with the amount and reliability of soil moisture, which increases eastward (moister summers), with elevation (more snow), and on north-east aspects.

Boise River WMA, Lucky Peak Reservoir 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 sagebrush with native understories is more likely to occur on north- to east-facing slopes or mesic regions of the Owyhee Plateau and east-central Idaho. Elsewhere, the extent and condition of this habitat is affected by various human land uses, invasive plant species, wildfire, and climate change.



Wyoming Big Sagebrush dominates xeric soils. Basin or Foothill Big Sagebrush, or Threetip Sagebrush, dominate mesic sites. Mountain Big Sagebrush occurs from montane basins with cold-air drainage to steep, rocky subalpine ridges and slopes. Wildfire reduces sagebrush. Sagebrush is often associated with Antelope Bitterbrush, Rabbitbrush (after fire), and Horsebrush. Xeric stands may have Spiny Hopsage, Granite Pricklyphlox, Saltbush, Winterfat, or Goldenbush intermixed. Mesic and mountain stands may include Mountain Snowberry, Serviceberry, Cherry, Snowbrush Ceanothus, Currant, and Prairie Sagewort. Native bunchgrasses dominate the herb layer, with Bluebunch Wheatgrass, Idaho Fescue, Sandberg Bluegrass, and Squirreltail being widespread. Indian Ricegrass, Needle and Thread, Thurber's Needlegrass, Thickspike Wheatgrass, Sand Dropseed, and Purple Threeawn occur on xeric sites. Basin Wildrye, Western Wheatgrass, Prairie Junegrass, needlegrass (*Achnatherum*), Slender Wheatgrass, Mountain Brome, Elk Sedge, and Spike Fescue occur in mesic or high elevation areas. Most forb genera are widespread. They include Fleabane, Globemallow, Pricklypear Cactus, phlox, onion, hawksbeard, milkvetch, yarrow (*Achillea*), sandwort, Arrowleaf Balsamroot, Indian paintbrush (*Castilleja*), buckwheat, Biscuitroot, Beardtongue Lupine, Larkspur, Western Stoneseed, Lambstongue Ragwort, cinquefoil, Pussytoes, Prairie Smoke, Nettleleaf Giant Hyssop, Jessica Sticktight, and Oneflower Helianthella. Annuals or soil crust fill gaps.

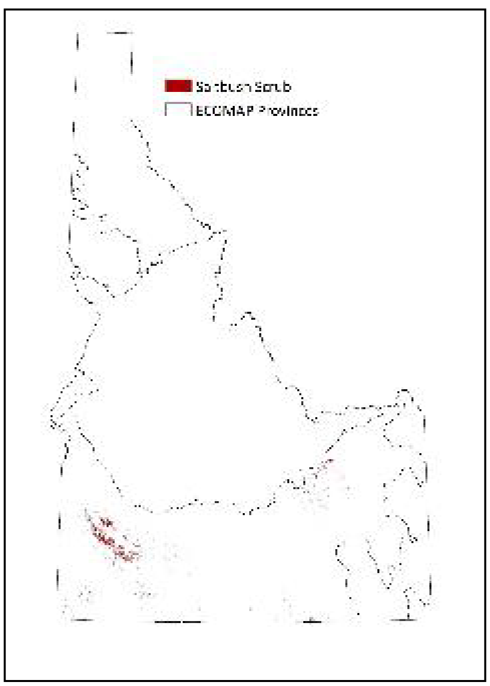
Saltbush Scrub

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.

East Canyon, Lemhi Range foothills
2008 Beth Colket/IDFG

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.

Extensive dwarf shrublands dominated by Shadecale 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 Fourwing Saltbush, Spiny Hopsage, or Greasewood. Other shrubs can be present but not codominant, including Wyoming Big Sagebrush, Rabbitbrush, horsebrush (Shortspine, Littleleaf), Broom Snakeweed, Fringed Sagebrush, Silver Chickensage, or Little Sagebrush. The herb layer is generally sparse and there may be expanses of bare soil or lichen crust. Perennial grasses, especially Indian Ricegrass, Squirreltail, Sandberg Bluegrass, Swallen's Needlegrass, and Thickspike Wheatgrass typically dominate. Saline Wildrye, Bluebunch Wheatgrass, Western Wheatgrass, Needle and Thread, and Sand Dropseed also occur. Forbs rarely contribute much cover. Perennial species include Gooseberryleaf Globemallow, Pricklypear Cactus, Desert Princesplume, and cushion-like species (e.g., King's Sandwort, Perennial Catseye, Springparsley, Fleabane, Buckwheat, Woollypod Milkvetch, Alkali False Whitlowgrass, Salmon River Beardtongue, Musk Phlox, Stemless Mock Goldenweed, Douglas' Dustymaiden, Fineleaf Hymenopappus). Annuals are present in years with more precipitation, such as Showy Townsend Daisy, Annual Buckwheat, and Nuttall's Povertyweed.



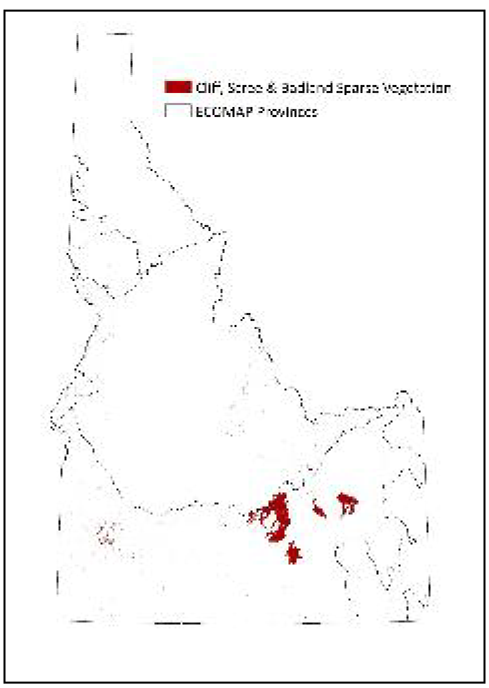
Cliff, Scree & Badland Sparse Vegetation

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, and 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 heavy 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 crust, making it particularly vulnerable to disturbance.

Unique soils or geology can result in high numbers of endemic or uncommon plant species. Characteristic shrubs in semidesert ash, badland, and calcarous rocks include saltbush (Fourwing, Gardner's, Shadscale Saltbush), Spiny Hopsage, Purple Sage, Slender Buckwheat, and Greasewood. Characteristic herbs in badlands include ricegrass, Saline Wildrye, Dustymaiden, Nakedstem Sunray, Skeletonweed, Princesplume, Spiderflower, Buckwheat, Goldenweed, and Yellow Phacelia. Calcareous foothills of eastern Idaho ranges also support Mat Rockspirea, Nailwort, and Oneflower Kelseya. Lava and cinder at CRMO support scattered Limber Pine and juniper trees with Fernbush, Dwarf Goldenbush, Rockspirea, Granite Pricklyphlox, Lewis' Mock Orange, and Antelope Bitterbrush shrubs. Herbs include Needle and Thread, Basin Wildrye, needlegrass (*Achnatherum*), Sandberg Bluegrass, Cushion Buckwheat, and Scabland Penstemon. In addition to many of the above species, basalt cliffs and talus in river canyons of the Snake, lower Clearwater, and lower Salmon can have Curl-leaf Mountain Mahogany, Ponderosa Pine, Big Sagebrush, Brickelbush, Rubber Rabbitbrush, Goldenbush, Spiny Greasebush, currants, Bluebunch Wheatgrass, Cheatgrass, Stonecrop, Biscuitroot, and Blazingstar. Rhyolite cliffs in southwest Idaho support a unique suite of species, including Gooding's Gooseberry, Parish's



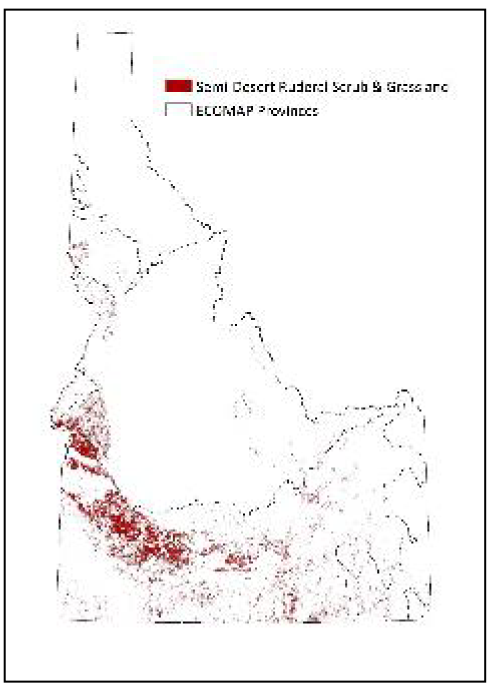
Snowberry, Packard's Wormwood, Owyhee River Stickseed, Pink Alumroot, Bailey's Ivesia, Rattan's Phacelia, Rock Loving Wavewing, Broad Fleabane, and Simpson's Hedgehog Cactus.

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 which 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 crusts absent due to severe or chronic disturbance.

Snake River Plain, New Plymouth

Scattered to patchy relict or recovering native woody species, such as juniper, big sagebrush, Low Sagebrush, Rabbitbrush, Greasewood, saltbush (Shadscale, Fourwing), 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, cereal rye), are diagnostic. Extensive perennial grasslands of introduced wheatgrass (Crested, Desert, Siberian), or less commonly Tall Wheatgrass or Wildrye, 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 Herb Sophia, Prickly Russian Thistle, 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 Field Bindweed. Native ruderal, relict, or seeded herbaceous species can be intermixed with minimal cover, including wheatgrass (Bluebunch, Snake River, Thickspike), Sandberg Bluegrass, Basin Wildrye, Needle and Thread, Sand Dropseed, Purple Threeawn, Squirreltail, Flatspine Stickseed, Globemallow, and Fiddleneck.



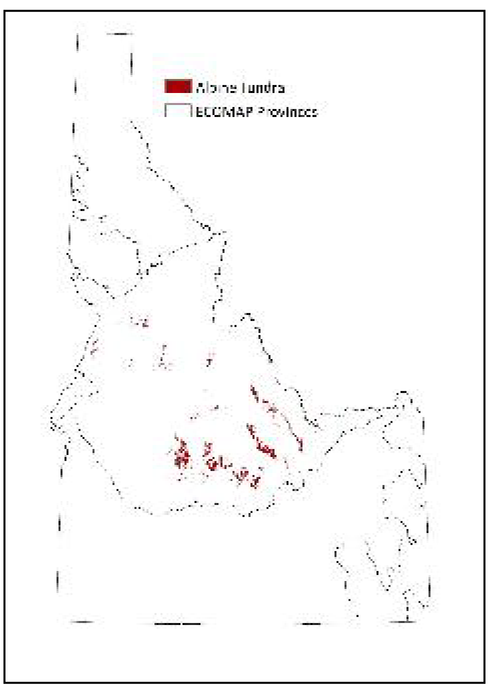
Polar & High Montane Scrub, Grassland & Barrens

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

Railroad Ridge RNA, White Cloud Mountains
2006 Steve Rust/IDFG



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 mosaic with sparsely vegetated bedrock and scree, fell-field, dwarf-shrubland, ice, and subalpine woodland or meadows.

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.

Turf can be dense and dominated by sod-forming sedges (Blackroot, Northern Singlespike, Curly) and Bellardi Bog Sedge, cushion-type forbs (e.g., Mountain

Sandwort, Ross' Avens, Twinflower Sandwort, Cinquefoil, Parry's Clover), and the dwarf-shrub Prairie Sagewort. Fell-fields are dominated by hairy or thickly cutinized cushion or matted plants. Characteristic forbs include Field Sagewort, Cushion Phlox, Gordon's Ivesia, Locoweed, Cushion Buckwheat, Moss Campion, Springparsley, Graylocks Four-nerve Daisy, Forget-me-not, Fleabane, Sticky Polemonium, Draba, Saxifrage, American Thorow Wax, Pacific Hulsea, and Spikemoss. Caespitose grasses, such as Drummond's Rush, fescue (Alpine, Idaho), bluegrass (Alpine, Glaucous), Purple Reedgrass, and Spike Fescue, occur. Heath shrubs (Western Moss Heather, Mountainheath, Alpine Laurel, Blueberry) or willows (Arctic, Snow; <0.5 m tall) characterize dwarf-shrublands. The herb layer includes turf and mesic species such as sedges (Nearly Black, Payson's), Tufted Hairgrass, White Marsh Marigold, Alpine Bistort, Partridgefoot, Woolly Pussytoes, Tundra Aster, and Creeping Sibbaldia. Patchy dwarf shrubs, namely Eightpetal Mountain-avens and Singlehead Goldenbush, occur on scree slopes with scattered bunchgrasses and forbs.

Open Rock Vegetation

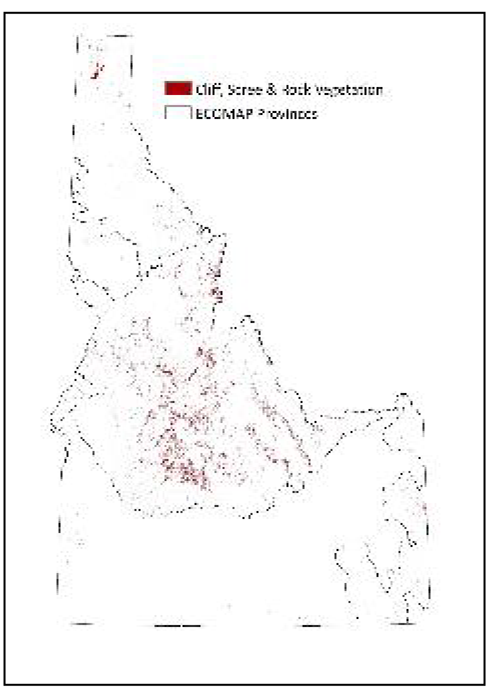
Sparsely vegetated cliffs, canyon walls, cirque slopes, talus, and scree slopes located throughout mountainous areas characterize this habitat. Plant cover is generally <10%. Soil development is limited and plants often grow in rock fissures. These are dry, sparsely vegetated places, where the biota reflects the surrounding area, unless it is an extreme parent material. Typically, there is high cover of spikemosses, 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

Boise Mountains, North Fork Boise River 2003
Chris Murphy/IDFG

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.

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.



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 spikemosses 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 Limber Pine, Whitebark Pine, Subalpine Fir, Douglas-fir, Lodgepole Pine, and Quaking Aspen, with Ponderosa Pine, juniper, and Mountain Mahogany at lower elevations. Scattered shrubs may be present, such as Sasakoon Serviceberrry, Goldenbush, Spiny

Greasebush, Rockspirea, Common Juniper, Creeping Barberry, Lewis' Mock Orange, Mallow Ninebark, Currant, Rose, American Red Raspberry, Thimbleberry, Snowberry, Elderberry, and Bush Penstemon. Herbaceous species are diverse but have minimal cover. Grasses include Basin Wildrye, Bluebunch Wheatgrass, Squirreltail, and Sandberg Bluegrass. Xeric site sedges (*Carex* spp.) and rushes (*Juncus* spp.) may occur in the subalpine. Forbs often include species with long taproots or matted growth forms, such as Buckwheat, Cordroot Beardtongue, Mat Rockspirea, Alumroot, Oneflower Kelseya, Lewisia, Nailwort, Phlox, Saxifrage, Stonecrop, Goldenweed, Fleabane, and Horsemint. Ferns may also be present.

Agricultural Habitat

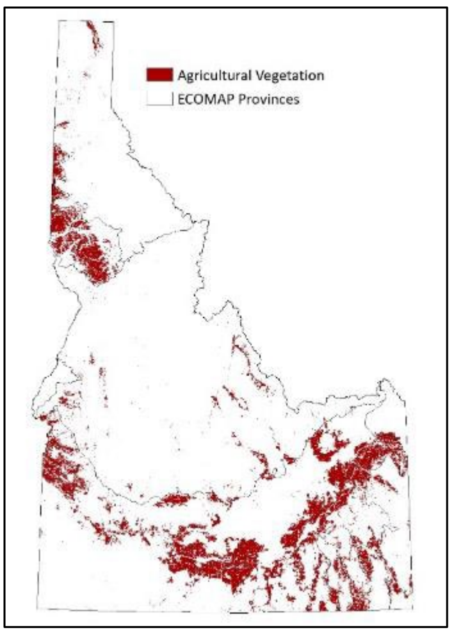
These habitats include cultivated crops, pastures, and hayfields. For the purpose of this plan, it also includes developed vegetation such as lawns, gardens, and recreational vegetation occurring in urban, suburban, and rural communities. Cultivated crops include annual vegetables, grains, oil seeds, 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

Agricultural land, north Idaho IDFG

Idaho has approximately 11.5 million acres of agricultural and ranch lands. Nearly 50% of these acres are herbaceous agricultural vegetation that includes cultivated crops, pastures, and hayfields. Cultivated cropland accounts for about half of herbaceous agricultural acreage. Primary cultivated crops are annual vegetables (e.g., potatoes, sugar beets, chickpeas, peas, lentils, onions, corn), grains (wheat, barley, oats), oilseeds and herbs (e.g., safflower, canola, mint), and horticultural commodities (e.g., flowers, seeds). This habitat is characterized by regularly-spaced rows (often linear) of herbaceous plants with annual plowing, planting, and management (e.g., irrigation, fertilization, pest and weed management, erosion prevention) that determines structure and growth. This habitat also includes fallow or recently-tilled fields. 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. Cultivated cropland commonly occurs on deep, well-drained loamy or loess soils of plains or rolling terrain at lower elevations with longer growing seasons (formerly sagebrush-steppe or grasslands). Pastures and hayfields are more common on alluvial soils of river valleys (including former floodplains and drained wetlands), but may occur anywhere from plains to montane basins. Herbaceous agriculture is heavily dependent on irrigation, especially in drier regions. Idaho has approximately 3.4 million acres of irrigated agriculture, using 17 million acre-feet of diverted surface water and pumped groundwater per year (2nd highest in nation). About 80% of cultivated cropland and a large proportion of alfalfa hay is irrigated, with most nonirrigated land being grain, legume, and oilseed farms in the Palouse region. Most cultivated cropland is irrigated by center pivot or wheel line sprinkler or drip systems, while pastures and hayfields often use flood irrigation. Flood-irrigated fields can provide foraging habitat for resident and migratory birds (e.g., White-faced Ibis, Sandhill Crane), while residual crops in cultivated fields can support migratory or wintering waterfowl and other birds. No longer cultivated agricultural fields are classified as ruderal vegetation and typically dominated by nonnative or native seeded perennial plants or invasive weeds (often annuals).

Lawns, gardens and recreational vegetation occurs in urban, suburban, and rural communities in the form of designed, managed, and maintained grassy lawns, open woodlands, and shrub patches (exclusive of impervious surfaces) planted for recreation, 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 urban stormwater detention ponds or wetlands. Vegetation is characterized by nonnative grass and ornamental plants, but may include landscaped native plant, wetland, or xeriscape gardens that may provide habitat for native pollinators (e.g., Monarch Butterfly). A wide variety of structure and growth forms may occur and provide habitat for songbirds, raptors, mammals, and other SWAP species. Regularly mowed short-height lawns predominate, including under patchy tree or shrub cover. Plants vary from regularly to irregularly or clumped in spatial distribution, with vegetation blocks fragmented by trails and infrastructure. Growth and structure forms are often atypical compared to the local microclimate, hydrology, substrates, and soils because of infrastructure and design (rock placement, topographic and drainage alteration, soil amendments, irrigation, etc.). This habitat is distinguished by frequent, repeated intensive management and maintenance, including mowing, clipping, pest and weed control, fertilization, and irrigation. Minimally-managed vegetation in these settings dominated or codominated by native trees, shrubs, or herbaceous species are classified as other natural or ruderal habitat.



Aquatic Vegetation & Freshwater Habitat

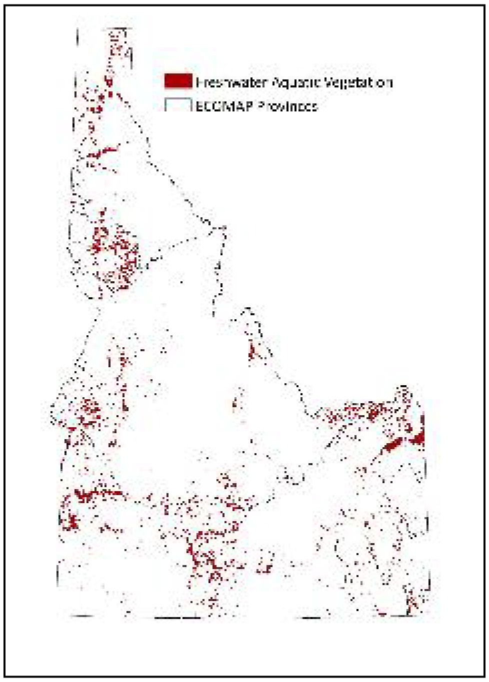
Aquatic habitats typically occur in permanently or semipermanently flooded waterbodies that vary in depth, magnitude of water fluctuation, and size. Habitats include groundwater-fed springs, flowing rivers and streams, and lakes, ponds, and reservoirs. These occur from low to high elevations across all 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 semi-permanently 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 supporting aquatic vegetation often occurs in a mosaic with tall emergent vegetation. Without periodic water drawdown that promotes decomposition of organic matter and disturbance to slow expansion of cattail and bulrush, emergent vegetation may eventually limit aquatic plants.

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.

Warm Lake, Idaho 2008
Chris Murphy/IDFG



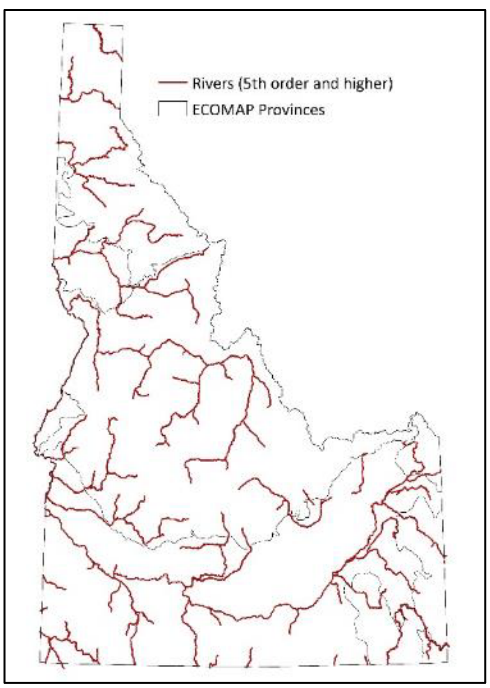
Floating leaf and rooted species may dominate at high elevations and in north Idaho, such as Rocky Mountain Pond-lily, Watershield, Floating Pondweed, and bur-reed (Narrowleaf, Small). Free floating species, such as Waterfern, Duckweed, and Duckmeat, are abundant in nutrient rich water. Abundant submerged aquatic species include early seral Sago Pondweed, Waternymph, Widgeongrass, Water-starwort, and Waterwort, and mid- to late-seral Coon's Tail, Shortspike Watermilfoil, waterweed (Canadian, Western), pondweed (Leafy Pondweed most common; also Variableleaf, Richardson's, and Robbins' pondweed), Common Bladderwort, Horned Pondweed (alkaline water), and Whitewater Crowfoot (slow moving streams). Macroalgae (Muskgrass Stonewort) are locally abundant and may act as a nutrient sink. Water Awlwort, Water Pygmyweed, Quillwort, Needle Spikerush, and other short herbs tolerant of extended flooding grow on temporarily exposed mud. Aquatic bryophytes, such as Fontinalis Moss and Floating Liverwort, also occur. Rare aquatic species include Water Howellia and Swaying Bulrush.

Rivers (5th order and higher)

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.

Selway River, Idaho 2006 Chris Murphy/IDFG

Idaho has numerous rivers with intact, diverse aquatic habitats (e.g., Salmon, Bruneau, and Selway rivers). Of all streams and rivers monitored for water quality by Idaho Department of Environmental Quality (DEQ) in Idaho, 39% do not support one or more beneficial uses (i.e., the desired uses that waterbodies should support). Many large Idaho rivers are affected by human land uses and minimally-buffered developments that constrain and simplify floodplains, reduce riparian habitat, the abundance and distribution of large woody debris, and alter river flows.



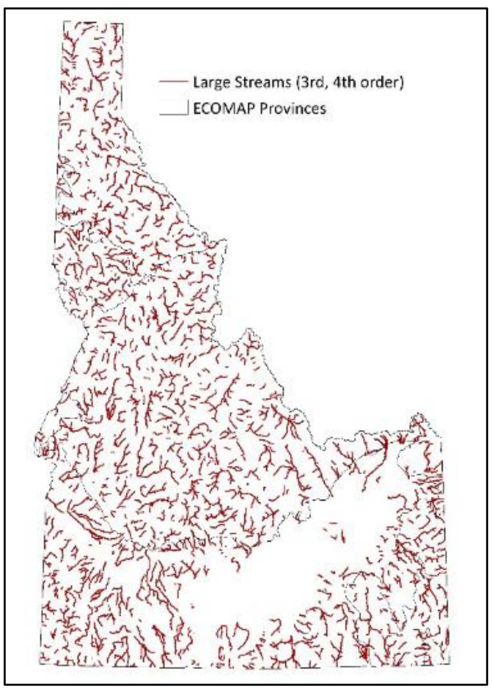
Foothill and lower montane rivers with moderate gradients have boulder and cobble rapids and riffles, cobble and gravel runs, and large pools with sand, gravel, and silt. In valleys unconfined by topography or levees, rivers form wide, dynamic floodplains with complex aquatic habitats and diverse cottonwood 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.

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. Of all streams and rivers monitored for water quality by DEQ in Idaho, 39% do not support one or more beneficial uses (i.e., the desired uses that waterbodies should support). Some large streams in Idaho are affected by historical or current human land uses that constrain and simplify floodplains, reduce habitat diversity and function, alter river flows, or impair water quality.



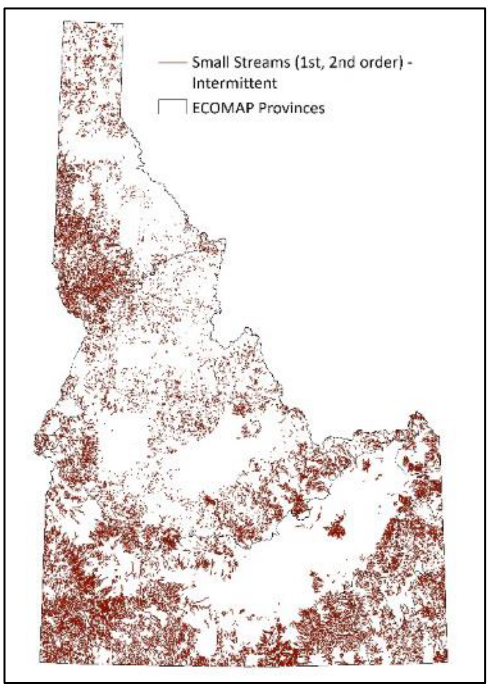
In narrower valleys, streams are step-pool habitats dominated by boulders, cobbles, and gravel or sand in pools. In glacial troughs and broad alluvial valleys, streams have greater meandering, which allows floodplain features such as alluvial bars, side channels, and overhanging banks to develop. Aquatic 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 provide 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 requiring cold, clear water. Freshwater mussels may be present.

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

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.

Road Gulch, Idaho 2007 IDFG

Intact intermittent streams occur across the state. However, many of these habitats are affected by warming temperatures, drought, and human land uses that alter stream flow, water temperature, sediment transport, and nutrient cycling.



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.

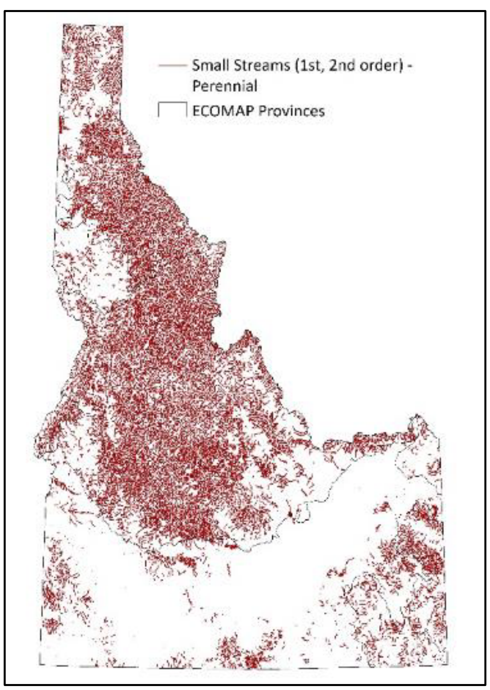
Small Streams (1st, 2nd order) – Perennial

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 large spring pulses to minimal groundwater-supported flows in summer. Streams often originate at lakes or ponds in subalpine cirques. Other streams are sustained by mountain-slope springs.

Little French Creek, Idaho 2009
Chris Murphy/IDFG

Many small perennial streams in remote headwater montane and subalpine locations in Idaho remain minimally altered by human activities. However, changes in precipitation and hydrologic regimes may decrease the condition of these aquatic habitats and negatively affect cold-water-dependent biotic communities. At lower elevations, various stressors may reduce aquatic habitat extent and condition.

These streams are often high gradient, with step-pool habitat, low sinuosity, and substrates of boulders, cobbles, and gravel. Waterfalls occur at bedrock outcrops. Debris flows are occasional system altering events, especially after wildfires. Lake outflow and meadow streams are low gradient and often sinuous, with small cobble, gravel, and sand substrates. Large woody debris from surrounding forests increase habitat complexity. Many streams are fishless due to natural barriers. In broad valleys, channel width increases, gradients lessen, and substrates include cobble riffles, sand and gravel 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 mayfly, stonefly, caddisfly, and dipterans that require cold, clear water. In contrast, spring-fed foothill and canyon streams often have wider channels, lower gradients, more stable flows and temperatures, and less turbidity. Substrates include occasional riffles, long gravel or sand runs, and pools. Spring-fed streams can be high in



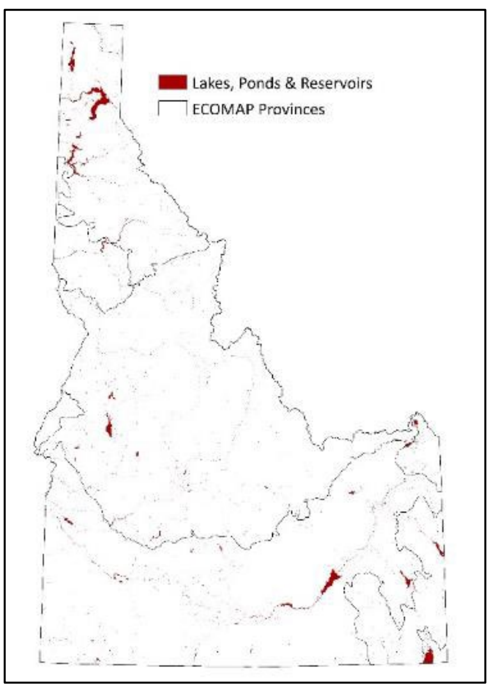
dissolved minerals and pH, which favors submerged aquatic vegetation growth. This habitat supports native and nonnative cold-water fish populations highly valued by anglers. Constant cool water in spring-fed streams can provide thermal refuge for fish during the summer and winter months. Macroinvertebrates are abundant, but diversity is low. Key taxa include mayflies, amphipods, chironomids, caddisflies, beetles, and aquatic snails.

Lakes, Ponds & Reservoirs

Payette Lake, Idaho

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. Of lakes monitored by DEQ, 53% did not support one or more beneficial uses (i.e., the desired uses that waterbodies should support), primarily due to metal pollutants, dissolved oxygen and nutrient levels that lead to eutrophication, and sedimentation.



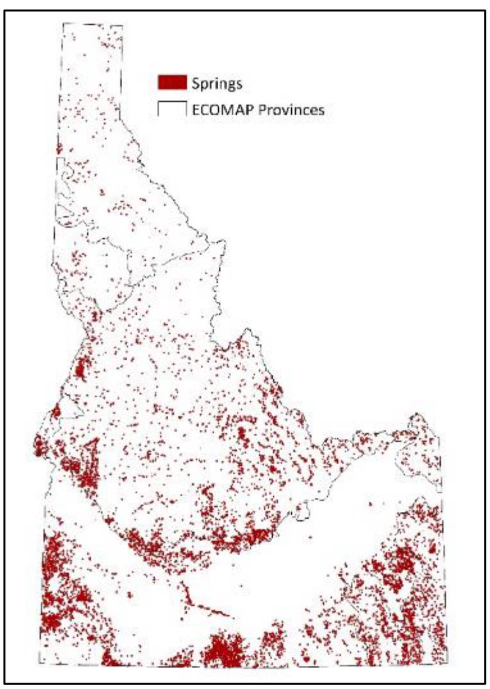
Lakes are at least 20 acres (8 ha) in size, have wave-formed or bedrock shorelines, and have depths of >8.2 ft (>2.5 m) in their deepest parts (i.e., limnetic deepwater habitat). Larger reservoirs share many features of lakes, including thermal stratification. In contrast, ponds are <20 acres (<8 ha) 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 “Aquatic Vegetation.”

Springs

Springs form where water flows from the ground. They are groundwater-dependent ecosystems supporting unique communities of spring-dependent 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 groundwater discharges from slopes at faults, rock fractures, or where forced to the surface by impermeable layers. Gravity springs form where water emerges from a fault or fracture, while artesian springs emerge where water is forced to the surface by thermal or pressure gradients.

Devils Corral Spring, Snake River Canyon, Idaho
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.



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. Examples of travertine springs occur in southeast Idaho.

Other

Caves & Subterranean Habitats

Lucile Cave, Idaho

Caves and 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 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).

Caves and subterranean environments 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 SWAP discussed in Chapter 1, Chapter 3 addresses elements 3 (stressors) and 4 (actions) (FWS 2017). Element 3 defines stressors as problems that negatively affect SWAP species or their habitats (see Chapter 2). Element 4 identifies actions needed 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 we lack the scientific knowledge or expert understanding about their taxonomy, distribution, or ecology

The purpose of Chapter 3 is to identify conservation actions (hereafter actions) that might alleviate potential stressors associated with negative effects to SWAP species or their habitats. All actions are voluntary and include a range of types such as conservation programs, projects, or best management practices (BMPs). Conservation partners, including industry, American Indian tribes, private landowners, government entities, and nongovernmental organizations (NGOs), will collaboratively implement voluntary actions.

Stressors potentially cause undesirable effects or resulting conditions. Human activities, including land and water resource uses, can be sources of stressors on 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, minerals, 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 rural communities. Stressors that negatively affect both SWAP species and human activities can create opportunities for stakeholders to collaborate on voluntary and incentivized conservation actions to address stressors for mutually beneficial results. Therefore, 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.

Chapter 3 is organized into sections labeled by category of "challenge." 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 section identifies potential negative effects to SWAP species or their habitats caused by stressors and proposes voluntary actions to address stressors ideally 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):

- 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

Within each section, we include the following applicable subsections:

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

The subsection "Overarching Effects & Actions" within each challenge section 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 SGCN habitat. The subsection "Species-Specific Effects & Actions" addresses stressors causing undesirable conditions for individual species or groups of SGCN. Chapter 2 and Appendix 4 provide a list of SWAP species (Tables 2.1 and 2.2) and the habitats essential to their conservation. Proposed voluntary actions include monitoring described in Chapter 4.

Each action proposed in Chapter 3 is both a priority and feasible based on estimates of effectiveness and feasibility to address stressors negatively affecting SGCN or to fill information needs for SGIN during the next 10 years. 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 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. 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 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 (https://idahoatwork.com/2020/06/01/idaho-cities-continue-strong-population-growth-in-2019-housing-growth-lags/). 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 Monarch butterflies 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 potential voluntary actions are broadly applicable for addressing stressors that have the potential to cause negative effects on the health and productivity of lands and waters important for Idaho's SGCN, economic vitality, and community amenities:

Voluntary Actions Related to Native Species and Their Habitats

- Collaborate with local governments, stakeholders, resource managers, and the public to develop and implement actions that incentivize development in areas with low SGCN value and high development value for landowners and local communities.
- Support community, business, and industry efforts to implement mitigation for habitat affected by development.
- Incentivize landowners to conserve and manage strategic parcels to benefit priority SGCN populations or habitat and sustain Idaho's natural resource-based economy, culture and heritage, and community amenities (e.g., Forest Legacy Program and Forest Stewardship Program).
- 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.
- Promote and incentivize implementation of Idaho Invasive Species Strategic Plan (IISC 2017).

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 potential SGCN conservation opportunities.

- Promote monitoring pollinators and weather conditions.
- 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.
- Encourage the use of wildlife-friendly building materials (e.g., glass products that lessen 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, especially in historically underserved communities.
- 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.
- Conduct community outreach events to provide information about coexisting with wildlife in urban, suburban, and rural-residential settings.
- Promote landscaping with flowering plants where appropriate to benefit pollinators including Monarch Butterfly and bumble bees.
- Develop and distribute information for landowners about landscaping plants that are poisonous to wildlife (e.g., ornamental yew).
- Encourage landscaping with plants that are not edible where wildlife are unwelcome.
- Participate in collaborative programs that involve stakeholders in resource stewardship including SGCN conservation.
- Respond to concerns about big game depredations and promote landowner understanding of SGCN (e.g., Moose and Pronghorn).

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on SGCN habitats and propose collaborative voluntary actions to offset negative effects if they occur. Habitats described in Chapter 2 (also see Appendix 3) form the organizational structure of the following subsections. Voluntary actions apply to 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 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 and US Clean Water Act (CWA), respectively (https://idwr.idaho.gov/). Therefore, development in riparian forests might need state and federal permits that could include protective measures for SGCN.

Examples of high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by development include Mountain Goat, Moose, Wolverine, Clark's Nutcracker, Cassin's Finch, Lewis's Woodpecker, Great Gray Owl, Western Bumble Bee, and Whitebark Pine. Table 3.1.1 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation, responsible development, and valued community amenities.

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

<table>
<tr><th>Habitat</th><th>Effects if stressors occur</th><th>Voluntary actions, programs, projects, and BMPs</th></tr>
<tr><td rowspan="3">Dry Lower Montane-Foothill Forest

Mesic Lower Montane Forest

Subalpine–High Montane Forest</td><td>Forestlands are changed to nonhabitat.</td><td>Incentivize landowners and resource managers to conserve forests to benefit Idaho's SGCN, forest products economy, and communities (e.g., Forest Legacy Program and Forest Stewardship Program).</td></tr>
<tr><td rowspan="2">Forestlands are harmed by destructive wildfire.

Fire-resistant mature forest characteristics are decreased by vegetation management.</td><td>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).</td></tr>
<tr><td>Restore WUI forests negatively affected by destructive wildfire (e.g., erosion control, strategic salvage logging, desirable vegetation planting and management, and invasive species control).</td></tr>
</table>

Table 3.1.1 Potential voluntary actions intended to benefit SGCN and responsible development 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**
Aspen Forest & Woodland Pinyon–Juniper Woodland	Bird nesting habitat is decreased by vegetation management.	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).
	SGCN movements or migrations are hindered by 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, and removing unnecessary fences.
Subalpine–High Montane Forest	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 sustainable recreation economy and communities (e.g., camping facilities and ski resorts).
		Manage forests to benefit SGCN and access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreation 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 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, 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, 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.

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 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 Idaho Stream Channel Protection Act and CWA, respectively (https://idwr.idaho.gov/). 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 and National Pollutant Discharge Elimination System (NPDES) administered by the Environmental Protection Agency (EPA) under the CWA (https://www.deq.idaho.gov/, https://idwr.idaho.gov/, https://www.epa.gov/). IDPES and NPDES permits include measures to meet water quality standards.

Examples of high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by development include Moose, Silver-haired Bat, Hoary Bat, Little Brown Myotis, Northern Pintail, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, and Ute Lady's Tresses. Table 3.1.2 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation, responsible development, and valued community amenities.

Table 3.1.2 Potential 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**
Freshwater Marsh Bog & Fen	Wetlands and riparian zones are changed to nonhabitat.	Incentivize landowners and resource managers to conserve wetlands and riparian zones to benefit Idaho's SGCN, natural resource-based economy, and communities.
	Domestic, municipal, or	Improve wetlands and riparian zones to benefit SGCN and community amenities (e.g., setbacks, desirable

Table 3.1.2 Potential 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 <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Alkali–Saline Marsh, Playa & Shrubland Montane Marsh, Wet Meadow & Shrubland Lowland–Foothill Riparian Shrubland Ruderal Marsh, Wet Meadow & Shrubland Vernal Pool Lowland Marsh, Wet Meadow & Shrubland	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.	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., 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, 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 and access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, erosion prevention and control, and information and education).

Desert & Semidesert

Desert & Semidesert habitats support economies including ranching and mining, and lifestyle amenities including outdoor recreation and open space. Privately owned Desert & Semidesert habitat surrounding Idaho's growing communities is therefore appealing for suburban and rural-residential development. 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 including Boise, Twin Falls, Pocatello, 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, 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 high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by development include Pronghorn, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Burrowing Owl, Woodhouse's Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Table 3.1.3 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation, responsible development, and valued community amenities.

Table 3.1.3 Potential voluntary actions intended to benefit SGCN and responsible development 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="4">Dry Shrubland & Grassland

Dwarf Sagebrush Steppe & Shrubland

Tall Sagebrush Steppe & Shrubland</td><td>Shrublands are changed to nonhabitat.</td><td>Incentivize landowners and resource managers to conserve shrublands to benefit Idaho's SGCN, natural resource-based economy, and communities.</td></tr>
<tr><td rowspan="3">Shrublands are harmed by destructive wildfire.</td><td>Reduce risks of destructive wildfire in WUIs and adjacent fire-prone shrublands (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).</td></tr>
<tr><td>Restore WUI shrublands negatively affected by destructive wildfire (e.g., erosion control, desirable vegetation planting and management, and invasive species control).</td></tr>
<tr><td>Implement the Idaho 2021 Sage-Grouse Management Plan and Idaho Sage-Steppe Mitigation Principles (State of Idaho, Executive Department 2022).</td></tr>
</table>

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

	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 to benefit SGCN and access to outdoor community amenities (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, erosion prevention and control, and information and education).
	SGCN movements or migrations are hindered by 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, and removing unnecessary fences.

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 run-off and facility discharges, surface water and groundwater diversions, and 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 Idaho Stream Channel Protection Act, 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 and NPDES administered by EPA under the CWA (https://www.deq.idaho.gov/, https://idwr.idaho.gov/, https://www.epa.gov/). IDPES and NPDES permits include pollutant measures to meet water quality standards.

Examples of high-profile SGCN occurring in Aquatic Habitat and potentially influenced by development include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Harlequin Duck, Caspian Tern, Ring-billed Gull, White-faced Ibis, Western Grebe, and Moose. Table 3.1.4 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation, responsible development, and valued community amenities.

Table 3.1.4 Potential voluntary actions intended to benefit SGCN and responsible development 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	Aquatic Habitat is changed to nonhabitat.	Incentivize landowners and resource managers to conserve 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., 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, 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 and access to outdoor community amenities (e.g., access management, erosion prevention and control, and information and education).

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 of US agricultural lands, including 4.4 million acres 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 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 high-profile 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. Table 3.1.5 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation, responsible development, and valued community amenities.

Table 3.1.5 Potential 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 Vegetation	Agricultural lands and waters are changed to nonhabitat by development.	Incentivize landowners and resource managers to conserve 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.

Species-specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.1.6 identifies potential SGCN-specific effects of stressors and proposes voluntary actions to offset negative effects if they occur. Ideally, SGCN conservation will also mutually benefit responsible development.

Table 3.1.6 Potential 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
Insect-eating bird SGCN including: Common Nighthawk Yellow-billed Cuckoo Insect-eating bat SGCN including: Townsend's Big-eared Bat Silver-haired Bat Western Small-footed Myotis Little Brown Myotis Yuma Myotis	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	Abundance is reduced by pest control.	Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on beneficial pollinators (USDA 2021, USDA 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 SGCN.

Table 3.1.6 Potential 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
Western Bumble Bee		
Amphibian SGCN including: Western Toad Woodhouse's Toad Northern Leopard Frog Columbia Spotted Frog	Abundance is reduced by pest control.	Implement Integrated Pest Management principles to avoid or minimize negative effects of pest control on amphibians (USDA 2022).
Bat SGCN including: Pallid Bat Townsend's Big-eared Bat Little Brown Myotis Yuma Myotis	Abundance is reduced from loss of roosting habitat in buildings and other structures.	Implement programs, projects, and BMPs to provide artificial roosting habitat.
Grizzly Bear	Abundance is reduced by control actions needed in response to human–bear conflict.	Implement BMPs to reduce human–bear conflicts by managing food sources and other bear attractants (e.g., garbage, animal feeds, gardens, and fruit trees).
		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.

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 $27 billion, agricultural producers are the largest contributors to Idaho's economy, producing more than 185 commodities that account for 18% of the state's total economic output. In addition, agriculture accounts for approximately 17% of statewide sales, 12% of jobs, and 12.5% of Idaho's gross domestic product (ISDA 2022).

Idaho's approximately 25,000 farms and ranches cover 11.5 million acres (ISDA 2022). Idaho also has about 115 permitted aquaculture businesses producing trout, steelhead, salmon, sturgeon, catfish, 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 (Bodirskyr et al. 2015, FAO 2017, Searchinger et al. 2019). Agricultural producers must therefore increase productivity, which could unintentionally cause issues for conserving natural resources including 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. Private lands, public 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 Policy Resolution 2020-06 and 2021-03). These same lands and waters also provide crucial habitat for fish, wildlife, and plants across Idaho.

Agriculture's 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) 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 privately and publicly 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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of stressors on 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 potential 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 on private and public lands that benefit joint SGCN and agriculture goals and objectives. The following are examples of potential voluntary actions:
    - Implement soil and water conservation projects and BMPs to benefit water supplies, water quality, and soil health.
    - Improve forest and rangeland health (e.g., Pronghorn, California and Rocky Mountain bighorn sheep, Moose, and Mountain Goat).
    - Construct and upgrade livestock fencing to wildlife-friendly specifications that facilitate big game movements, reduce bird collisions, and protect rare plant populations (e.g., MacFarlane's Four O'clock).

  - Implement sustainable agricultural BMPs including conservation tillage, crop rotations, cover cropping, and erosion prevention and control.
  - Protect sensitive or vulnerable SGCN populations.
  - Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
  - Conserve SGCN pollinators and benefit sustainable agriculture with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (e.g., Yellow Bumble Bee, Western Bumble Bee and Monarch Butterfly) (WAFWA 2019, USDA 2021, USDA 2022).
  - Manage pollution per the Idaho Agricultural Pollution Abatement Plan (Resource Planning Unlimited 2003).
  - Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).
  - 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: 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 in projects to benefit both SGCN and agriculture goals and objectives across private, state, and federal 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).

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 sustainable agriculture.

- Collaborate with agricultural producers, industry, resource managers, and other stakeholders to identify and fill knowledge and capacity needs for implementing programs, projects, and BMPs beneficial to both SGCN and sustainable agriculture.
- Encourage and incentivize agricultural producers, industry, resource managers, and universities to develop collaborative agricultural programs and BMPs that benefit SGCN and support sustainable 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 potential 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, especially in historically underserved communities.
- Incentivize participation in sustainable agriculture programs, projects, and BMPs that also benefit SGCN conservation.
- Establish collaborative working groups as appropriate including communities, agricultural producers, and resource managers to facilitate the exchange of information and knowledge about cooperative management opportunities and efforts to benefit SGCN conservation, improve sustainable agriculture, and support communities.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation into sustainable agriculture.
- Encourage public and stakeholder participation in land and water-use planning and permitting processes to raise awareness and ensure consideration of sustainable 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.
- Respond to concerns about big game (e.g., Moose and Pronghorn) depredations and promote landowner understanding of SGCN.

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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

Private and public-land 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, the legacy of past improper livestock management and other isolated circumstances can be ongoing stressors affecting SGCN habitat and 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, 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 high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by livestock management include Western Toad, Moose, Fisher, Yellow-billed Cuckoo, Pinyon Jay, White-headed Woodpecker, Great Gray Owl, and Western Bumble Bee. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture are listed in Table 3.2.1.

Table 3.2.1 Potential 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	SGCN movements or migrations are hindered by 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, and removing unnecessary fences.

Table 3.2.1 Potential 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
Pinyon–Juniper Woodland		
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).

Temperate & Boreal Grassland & Shrubland

Private and public 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, 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 high-profile SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by livestock management include Mountain Goat, Rocky Mountain Bighorn Sheep, Northern Idaho Ground Squirrel, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Yellow Bumble Bee, Western Bumble Bee, and Monarch Butterfly. Table 3.2.2 includes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture.

Table 3.2.2 Potential 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. 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 off-site livestock watering infrastructure).
	SGCN movements or migrations are hindered by 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, and removing unnecessary fences.
Subalpine–High Montane Mesic Meadow	Wet meadows are harmed by improper livestock management.	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

Private and public 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. 2021). Additional stressors potentially affecting Shrub & Herb Wetland habitats include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, 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 high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by livestock management include Moose, Silver-haired Bat, Little Brown Myotis, Northern Pintail, Cinnamon Teal, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, and Ute Lady's Tresses. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture are listed in Table 3.2.3.

Table 3.2.3 Potential voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland 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="3">Bog & Fen

Freshwater Marsh

Vernal Pool

Lowland Marsh, Wet Meadow & Shrubland

Montane Marsh, Wet Meadow & Shrubland

Alkali–Saline Marsh, Playa & Shrubland

Lowland–Foothill Riparian Shrubland</td><td rowspan="3">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.</td><td>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).</td></tr>
<tr><td>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).</td></tr>
<tr><td>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).</td></tr>
</table>

Desert & Semidesert

Private and public 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, 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 high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by livestock management include Pronghorn, California and Rocky Mountain bighorn sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Burrowing Owl, Woodhouse's Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture are listed in Table 3.2.4.

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

Habitat	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Dry Shrubland & Grassland Sparsely Vegetated Dune Scrub & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush	Rangeland health and productivity are decreased by invasive species infestation and destructive wildfire. Rangeland productivity is decreased by improper livestock management. SGCN survival rates decrease from colliding with or	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).
		Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).

Table 3.2.4 Potential 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
Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation	becoming entangled in livestock fences. SGCN movements or migrations are hindered by livestock fences.	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), and removing unnecessary fences.
		Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).

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 2022). Additional stressors potentially affecting Aquatic Habitat include prolonged drought, changing precipitation and snowpack trends, shifting seasonal water runoff patterns, nonagricultural water pollutants, and 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 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 and NPDES administered by EPA under the CWA (https://www.deq.idaho.gov/, https://idwr.idaho.gov/, https://www.epa.gov/). 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, USDA 2022).

Examples of high-profile SGCN occurring in Aquatic Habitat and potentially influenced by agriculture include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Caspian Tern, Ring-billed Gull, White-faced Ibis, Western Grebe, and Moose. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture are listed in Table 3.2.5.

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

<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="5">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</td><td rowspan="5">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.</td><td>Improve Aquatic Habitat to benefit SGCN and conserve water supply and water quality for sustainable agriculture (e.g., instream flow conservation, erosion prevention and control, streambank and shoreline restoration, invasive species control, and improved stormwater management).</td></tr>
<tr><td>Conserve SGCN by improving water conservation for sustainable 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).</td></tr>
<tr><td>Manage Aquatic Habitat to conserve SGCN and meet water quality standards at agricultural and aquacultural facilities (e.g., upgraded water management and containment infrastructure, pollution prevention and control, erosion prevention and control, and vegetated wetland buffers).</td></tr>
<tr><td>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).</td></tr>
<tr><td>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, setbacks, habitat restoration, mitigation, and invasive species).</td></tr>
</table>

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 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 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 high-profile 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 negative effects of stressors if occurring to benefit SGCN conservation and sustainable agriculture are listed in Table 3.2.6.

Table 3.2.6 Potential 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 Vegetation	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., 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).
		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, irrigation equipment, livestock watering, wildlife escape ramps, and stormwater management).
		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).

Table 3.2.6 Potential voluntary actions intended to benefit SGCN and sustainable agriculture if stressors are affecting the quantity, quality, or connectivity of Agricultural Habitat

Habitat	Effects <u>if</u> 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).
	Agricultural Habitat is harmed by invasive species infestation and crop diseases.	Implement *The Idaho Invasive Species Strategic Plan 2017–2021* (IISC 2017).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Potential SGCN-specific effects of stressors and proposed voluntary actions to offset negative effects if they occur are identified in Table 3.2.7. Ideally, SGCN conservation will also mutually benefit sustainable agriculture.

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

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Fish SGCN including: White Sturgeon Burbot Bull Trout Sockeye Salmon Steelhead	Abundance is reduced by invasive species or diseases released from an aquaculture facility.	Implement actions in the Idaho *Fisheries Management Plan 2019–2024* (IDFG 2019).
		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.
		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.

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

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Chinook Salmon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Whitefish		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 *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
		Implement the *Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho 2015–2025* (IDFG 2015).
California and Rocky Mountain bighorn sheep	Abundance is reduced by harmful diseases.	Implement the *Idaho Bighorn Sheep Management Plan* (IDFG 2022)
		Reduce risk of disease transmission by implementing BMPs and maintaining spatial or temporal separation with livestock.
		Provide information and education to agricultural producers about livestock disease transmission and preventative BMPs.
Pollinating insect SGCN including: Monarch Butterfly Yellow Bumble Bee Morrison Bumble Bee Western Bumble Bee	Abundance is reduced by pest control.	Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (WAFWA 2019, USDA 2021, USDA 2022).

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

Species	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Insect-eating bird SGCN including: Common Nighthawk Yellow-billed Cuckoo Bobolink Greater Sage-Grouse Sharp-tailed Grouse Insect-eating bat SGCN including: Townsend's Big-eared Bat Silver-haired Bat Western Small-footed Myotis Little Brown Myotis Yuma Myotis	Abundance is reduced from pest control decreasing food source.	Implement Integrated Pest Management principles to reduce negative effects of pest control on food sources for insect-eating SGCN (USDA 2022).
	Abundance is reduced from pesticides decreasing survival rates.	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.
Grizzly Bear	Abundance is reduced by control actions needed in response to human–bear conflict.	Implement BMPs to reduce human–bear conflicts by managing food sources and other bear attractants (e.g., livestock feed, crops, and fruit trees).
		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.

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 is increasing as the human population grows locally, nationally, and globally. WGA issued policy resolutions 2022-01 (Energy in the West) and 2022-08 (National Minerals Policy) recognizing priorities to develop sustainable energy and responsible mineral resources to benefit the nation and other modern and developing societies around the world.

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 Policy Resolution 2022-01).

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 2016). 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 miles 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 most commonly produced 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. 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 (https://idwr.idaho.gov/water-rights/), federal permits, National Environmental Policy Act (NEPA) processes, and state-regulated mine site reclamation (https://www.idl.idaho.gov/mining-minerals/).

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 Policy Resolution 2022-06).

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, 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 strikes with turbines, and bird strikes with solar panels and fences)

Regulatory licensing and permitting can create opportunities for project proponents, resource management agencies, and stakeholders to collaborate when identifying potential 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 voluntary opportunities to conserve SGCN (WGA Policy Resolution 2021-04). 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 after decommissioning. Recommendations can also include voluntary compensatory mitigation for negative project effects not adequately avoided or minimized (WGA Policy Resolution 2022-06).

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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing stressors on 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 potential 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 potential 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 potential 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 lifecycle.
  - Recommend monitoring and adaptive management approaches to guide implementation of the mitigation hierarchy and conserve SGCN throughout project lifecycles.

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 and capacity needs for implementing programs, projects, and BMPs 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, especially in historically underserved communities.

- 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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Chapter 2 habitats form the organization of the following subsections. Voluntary actions apply to 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.

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 and lifestyle amenities including ranching and outdoor recreation. Consequently, Energy Production & Mining projects in Desert & Semidesert habitats have the potential to 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, introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity.

Examples of high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by Energy Production & Mining include Pronghorn, California and Rocky Mountain bighorn sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Short-eared Owl, Woodhouse's Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Energy Production & Mining are listed in Table 3.3.1.

Table 3.3.1 Potential 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).
		Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
	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 (WAFWA 2019, USDA 2021, USDA 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).
	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.	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, and removing unnecessary fences.

Table 3.3.1 Potential 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 <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
	SGCN fatality rates increase from colliding with or become entangled in fencing.	Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).

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 high-profile SGCN occurring in Caves & Subterranean Habitats and potentially influenced by Energy Production & Mining include the Townsend's Big-eared Bat, Silver-haired Bat, Western Small-footed Myotis, Little Brown Myotis, and Yuma Myotis. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Energy Production & Mining are listed in Table 3.3.2.

Table 3.3.2 Potential 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 <u>if</u> 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.	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).
		Conserve subterranean habitat and SGCN by implementing programs, projects, and BMPs as appropriate to reduce risks of disease introduction and

Table 3.3.2 Potential voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Caves & Subterranean Habitats

	Decreased SGCN survival from harmful diseases.	spread, particularly bats and *Pd*/white-nose syndrome (e.g., access management, gating, signage, and information and education).
		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.

Aquatic Vegetation & Freshwater Habitat

Energy Production & Mining has the potential to affect 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 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 and NPDES administered by EPA under the CWA (https://www.deq.idaho.gov/, https://idwr.idaho.gov/, https://www.epa.gov/). 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 (https://www.deq.idaho.gov/waste-management-and-remediation/mining-in-idaho/).

Examples of high-profile SGCN occurring in Aquatic Habitat and potentially influenced by Energy Production & Mining include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Harlequin Duck, Ring-billed Gull, Western Grebe, and Moose. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Energy Production & Mining are listed in Table 3.3.3.

Table 3.3.3 Potential voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Aquatic Habitat

Habitat		

Table 3.3.3 Potential voluntary actions intended to benefit SGCN and responsible Energy Production & Mining if stressors are affecting the quantity, quality, or connectivity of Aquatic Habitat

	Effects if stressors occur	**Voluntary actions, programs, projects, and BMPs**
Freshwater Aquatic Vegetation Rivers (5th order & higher) Large Streams (3rd, 4th order) Small Streams (1st, 2nd order) – Intermittent Lakes, Ponds & Reservoirs Springs	Water supplies, streamflow, and spring flow are reduced by surface water and groundwater diversions. Water quality is reduced by industrial discharges. Shorelines, lakebeds, and stream channels are harmed by project construction, operations, and maintenance.	Manage Aquatic Habitat to benefit SGCN and conserve water supply for responsible Energy Production & Mining (e.g., water supply and instream flow conservation, groundwater recharge, streambank and shoreline restoration, and invasive species control).
		Manage Aquatic Habitat to benefit SGCN and conserve water quality for responsible Energy Production & Mining (e.g., upgraded water management infrastructure, reduced water use, pollution prevention and control, erosion prevention and control, vegetated buffers, improved stormwater management, and upgraded water containment and treatment facilities).
		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).
		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, 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. Potential SGCN-specific effects of stressors and proposed voluntary actions to offset negative effects if they occur are identified in Table 3.3.4. Ideally, SGCN conservation will also mutually benefit responsible Energy Production & Mining.

Table 3.3.4 Potential 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**
Bird SGCN including:	Bird or bat fatality rates increase from colliding with	Implement programs, projects, and BMPs to avoid, minimize, and mitigate for negative effects of energy and mining infrastructure, operations, and maintenance.

Table 3.3.4 Potential voluntary actions intended to benefit SGCN and responsible Energy Production & Mining by addressing effects of stressors if occurring

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Trumpeter Swan Golden Eagle Ferruginous Hawk Greater Sage-Grouse Sharp-tailed Grouse Bats including: Townsend's Big-eared Bat Silver-haired Ba Hoary Bat Little Brown Myotis	energy production equipment, facilities, fences, power lines, or other infrastructure. 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).	Provide technical assistance as appropriate to licensing and permitting 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).
Fish including: White Sturgeon Burbot Bull Trout Sockeye Salmon Steelhead	Abundance is reduced by entrainment, impingement, or other harm from energy or mining infrastructure, operations, or maintenance. Abundance and distribution are reduced by disturbance or displacement, movement or	Implement the Idaho Fisheries Management Plan (IDFG 2019).
		Implement the Management Plan for the Conservation of Yellowstone Cutthroat Trout in Idaho (IDFG 2019).
		Implement the Management Plan for the Conservation of Bonneville cutthroat Trout in Idaho (IDFG 2022).
		Implement the Management Plan for the Conservation of Snake River White Sturgeon in Idaho (IDFG 2008).
		Implement programs, projects, and BMPs to avoid, minimize, and mitigate for negative effects of water management infrastructure and operations.
		Provide technical assistance as appropriate to licensing and permitting regulatory authorities, industry, and other stakeholders about opportunities to avoid, minimize, and mitigate negative effects of water management and project infrastructure (e.g., instream

Table 3.3.4 Potential 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
Chinook Salmon Yellowstone Cutthroat Trout Bonneville Cutthroat Trout Whitefish	migration barriers, or habitat loss and degradation from energy and mining infrastructure, operations, or maintenance.	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.
Greater Sage-Grouse Sharp-tailed Grouse Pronghorn California and Rocky Mountain Bighorn Sheep Moose Mountain Goat Wolverine	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 *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
		Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).
		Implement the Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho (IDFG 2015).
		Implement the Idaho Bighorn Sheep Management Plan (IDFG 2022).
		Implement the Idaho Moose Management Plan (IDFG 2020).
		Implement the Idaho Mountain Goat Plan (IDFG 2019).
		Implement the Management Plan for the Conservation of Wolverines in Idaho (IDFG 2014).

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 Policy Resolution 2021-07). 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 miles in 2010 to 107,568 miles in 2019 (FHWA 2010, FHWA 2020). This increase is likely to accelerate during the next decade as part of the Idaho Transportation Department's (ITD) aggressive transportation expansion and congestion mitigation program (https://www.itd.idaho.gov). 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 miles 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 Corridor projects, especially if public lands, waters, or funding is involved (WGA Policy Resolution 2021-07). 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 Corridor 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 Policy Resolution 2022-06).

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 Corridor 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 and 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 potential 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 Corridor 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 voluntary opportunities to conserve SGCN (WGA Policy Resolution 2021-04). 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 Policy Resolution 2022-06).

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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing stressors that have the potential to cause negative effects on 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 Corridor goals and objectives. The following are examples of potential 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 Corridor 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 Corridor related stressors that could negatively affect SGCN goals and objectives.
- Assist Transportation & Service Corridor project proponents, resource managers, regulatory authorities, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of potential 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 lifecycles.
- Collaborate with utility industries, ITD, resource managers, landowners, and other stakeholders to plan and implement approaches to achieve joint SGCN and transportation goals and objectives. The following are examples of potential voluntary actions:
    - Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).

  - 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 (IISC 2017, WAFWA 2019, USDA 2021, 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 with high risks of bird SGCN dying from electrocution or collision, and retrofit according to the APLIC protocols as appropriate.
  - Encourage utilities to route power lines and other infrastructure if feasible away from areas, habitats, and movement routes important for SGCN.
  - 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, 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 Corridor related stressors to achieve SGCN goals and objectives.
- Collaborate with ITD, industry, resource managers, and other stakeholders to identify and fill knowledge and capacity needs for implementing programs, projects, and BMPs to offset effects of Transportation & Service Corridor 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, especially in historically underserved communities.
- 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 Corridor 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 Corridor projects on SGCN.
- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation in Transportation & Service Corridor projects and BMPs.
- 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.

Habitat-Specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on SGCN habitats and propose collaborative voluntary actions to offset negative effects if they occur. Chapter 2 habitats form the organization of the following subsections. Voluntary actions apply to 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 Corridor 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, 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 high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by Transportation & Service Corridors include Moose, Fisher, Grizzly Bear, Lewis's Woodpecker, White-headed Woodpecker, Olive-sided Flycatcher, Cassin's Finch, Western Bumble Bee, and Gillette's Checkerspot. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Transportation & Service Corridor projects are listed in Table 3.4.1.

Table 3.4.1 Potential 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).
	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 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 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 Idaho Stream Channel Protection Act and CWA, respectively (https://idwr.idaho.gov/). 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 high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by Transportation & Service Corridors include Moose, Silver-haired Bat, Hoary Bat, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Lady's Tresses. Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Transportation & Service Corridor projects are listed in Table 3.4.2.

Table 3.4.2 Potential 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
Freshwater Marsh Bog & Fen Alkali–Saline Marsh, Playa & Shrubland Montane Marsh, Wet Meadow & Shrubland Ruderal Marsh, Wet Meadow & Shrubland Vernal Pool Lowland Marsh, Wet	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 is decreased by vegetation management, invasive species infestation, and soil erosion.	Manage wetlands and riparian zones to benefit SGCN (e.g., 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	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).
		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

Table 3.4.2 Potential 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
Meadow & Shrubland Lowland–Foothill Riparian Shrubland	excess road salt runoff.	connection, desirable vegetation planting and management, fish passage, and wildlife movements).
	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.	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, 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.
	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, 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 high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by Transportation & Service Corridors include Pronghorn, California and Rocky Mountain bighorn sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Burrowing Owl, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Proposed voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and responsible Transportation & Service Corridor projects are listed in Table 3.4.3.

Table 3.4.3 Potential 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).
		Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
	Shrublands are harmed by destructive wildfire.	Reduce risks of destructive wildfire 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 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 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 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 Corridor 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 Idaho Stream Channel Protection Act, Idaho Lake Protection Act, and CWA, respectively. Therefore, Transportation & Service Corridor infrastructure in Aquatic Habitat might need state and federal permits that could include protective measures for SGCN.

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

Table 3.4.4 Potential 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) Large Streams (3rd, 4th order)	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.	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).
		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).

Table 3.4.4 Potential 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
Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Lakes, Ponds & Reservoirs Springs	Shorelines, lakebeds, 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.	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, 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).

Species-Specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Potential SGCN-specific effects of stressors and proposed voluntary actions to offset negative effects if they occur are identified in Table 3.4.5. Ideally, SGCN conservation will also mutually benefit responsible Transportation & Service Corridor projects.

Table 3.4.5 Potential 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:	Abundance and distribution are	Implement the Idaho Fisheries Management Plan (IDFG 2019).

Table 3.4.5 Potential 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
White Sturgeon Burbot Bull Trout Sockeye and Chinook salmon Steelhead Yellowstone and Bonneville cutthroat trout Whitefish	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 the Management Plan for the Conservation of Yellowstone Cutthroat Trout in Idaho (IDFG 2019).
		Implement the Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho (IDFG 2022).
		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).
		Provide technical assistance as appropriate to licensing and permitting 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 White-faced Ibis Clark's and Western grebes	Bird fatality rates increase 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.
Raptor SGCN including: Golden Eagle	Bird fatality rates increase 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.

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

Habitat	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Ferruginous Hawk Great Gray Owl		
Greater Sage-Grouse Sharp-tailed Grouse Pronghorn California and Rocky Mountain bighorn sheep Moose Wolverine	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.	Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
		Implement the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).
		Implement the Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho (IDFG 2015).
		Implement the Idaho Bighorn Sheep Management Plan (IDFG 2022).
		Implement the Idaho Moose Management Plan (IDFG 2020).
		Implement the Management Plan for the Conservation of Wolverines in Idaho (IDFG 2014).
		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, 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).

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 address more holistically the production of forest products with forest management. Similarly, Hunting & Collecting Terrestrial Animals and Fishing & Harvesting Aquatic Resources is referenced here collectively as recreational Hunting, Fishing & Trapping, which is managed by IDFG under supervision of the Idaho Fish and Game Commission.

Forestry

Forestry includes private and public forest management, harvesting, and manufacturing of wood products. Idaho's private and public forests and waters provide society abundant renewable resources and services including forest products, livestock forage, healthy soils, clean water, pollination, erosion and flood control, and outdoor recreation. Forests also provide important habitat for fish, wildlife, and plants, including SGCN. The Forestry industry also contributes importantly to Idaho's economy, local communities, and overall way of life. For example, managing Idaho's 16.5 million acres 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 locally, nationally, and globally.

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) emphasizes the importance of collaboration and strategic planning among 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, forest-based economy, and community culture and heritage.

Hunting, Fishing & Trapping

Idaho's abundant populations of fish and wildlife 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 fish and game policy in state code Section 36-103 (https://idfg.idaho.gov/about/commission). Recreational Hunting, Fishing & Trapping also contribute importantly to Idaho's economy, particularly for rural communities. Being major economic drivers, Hunting, Fishing & Trapping generate 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 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 Hunting, Fishing & Trapping increases with Idaho's expanding human population.

Overarching Effects & Actions—Forestry

Natural resources provided by healthy forests and waters, both privately and publicly owned, sustain the state's Forestry economy 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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of stressors on the health and productivity of forests and waters important to Forestry, 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 potential 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 habitat 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.
- Promote and incentivize collaborative programs, projects, and BMPs on private and public lands that benefit joint SGCN and Forestry goals and objectives. The following are examples of potential voluntary actions:
    - Implement the Idaho Forest Action Plan (IDL 2020).
    - Implement soil and water conservation projects and BMPs to benefit water supplies, water quality, and soil health.
    - Improve forest and rangeland health (e.g., Rocky Mountain Bighorn Sheep, Moose, and Mountain Goat).

  - Apply SGCN-friendly forest management and forestry BMPs (e.g., Northern Idaho Ground Squirrel, Fisher, White-headed Woodpecker, amphibians, and beneficial pollinators).
  - Construct and upgrade livestock fencing to wildlife-friendly specifications that facilitate big game movements and protect rare plant populations.
  - Protect sensitive or vulnerable SGCN populations.
  - Implement the Idaho Invasive Strategic Plan (IISC 2017).
  - Conserve SGCN pollinators and benefit sustainable Forestry with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (e.g., Yellow Bumble Bee, Western Bumble Bee and Monarch Butterfly) (WAFWA 2019, USDA 2021, USDA 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, private landowners, and resource managers to use existing forestry programs and incentivize voluntary (1) soil, water, and SGCN conservation projects; (2) BMPs; (3) technology upgrades; and (4) conservation of working forestlands (e.g., Forest Stewardship Program, Forest Legacy Program, Good Neighbor Authority, American Tree Farm Program, and Idaho Forest Group Incentives).
- Partner with willing private landowners and resource managers in projects to benefit both SGCN and Forestry goals and objectives across private, state, and federal 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 among 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 Forestry.
- Collaborate with Forestry producers, industry, resource managers, and other stakeholders to identify and fill knowledge and capacity needs for implementing programs, projects, and BMPs beneficial to both SGCN and sustainable Forestry.
- Encourage and incentivize Forestry producers, industry, resource managers, and universities to develop collaborative Forestry programs and BMPs that benefit SGCN and support sustainable Forestry, adaptive management, and monitoring.
- Assist Forestry project proponents, resource managers, and other stakeholders with information to address project effects on SGCN. The following are examples of potential voluntary actions:
  - Participate in early project planning to communicate SGCN goals and objectives.
  - Support pre-project 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, especially in historically underserved communities.
- 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 sustainable 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 sustainable Forestry.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of sustainable 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—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 these regulations. Overarching actions in the following subsections align with IDFG's 2015 Strategic Plan (https://idfg.idaho.gov/old-web/docs/about/StrategicPlan2015.pdf), and are broadly applicable for conserving all SGCN, SGIN, and 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 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 of Hunting, Fishing & Trapping with the following objectives and actions:
  - Maintain a diversity of fishing, hunting, and trapping opportunities.
  - Sustain fish and wildlife recreation on public lands.
  - Increase the variety and distribution of access to private land for Hunting, Fishing & Trapping (e.g., improve landowner/sportsman cooperation through communication and enforcement of hunting, fishing, and trapping rules).
  - Increase opportunities for wildlife viewing and appreciation.
  - Maintain broad public support for 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 education).
  - Improve information management and business systems (e.g., develop a 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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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 sustainable 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. 2017, Morin 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, 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 sustainable Forestry and communities, especially along expanding WUIs.

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

Table 3.5.1 Potential 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	Forestlands are changed to nonhabitat.	Incentivize landowners and resource managers to conserve 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. Forestlands are harmed by	Implement the Idaho Forest Action Plan (IDL 2020).
		Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
		Reduce of 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).
		Protect high-priority SGCN populations and habitat during firefighting (e.g., mature Ponderosa Pine,

Table 3.5.1 Potential voluntary actions intended to benefit SGCN and sustainable forestry 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
Aspen Forest & Woodland Whitebark Pine Forest & Woodland Pinyon–Juniper Woodland Lowland–Foothill Riparian Forest Montane Riparian & Swamp Forest	destructive wildfire (e.g., unnatural wildfire frequency, extent, and severity).	Whitebark Pine, 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 sustainable Forestry (e.g., invasive species control, forest restoration; desirable vegetation planting and management, access management, and erosion prevention and control).
		Conserve SGCN and benefit sustainable 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 sustainable 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 Blister Rust, using prescribed burning or thinning (e.g., to remove Subalpine Fir), and focusing restoration in colder locations (Keane 2018).
	Soils are eroded and compacted by improper forest management.	Control soil erosion (e.g., unneeded road and trail decommissioning, forest restoration, desirable vegetation planting and management, woody debris maintenance, and access management).

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

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.5.2 identifies potential SGCN-specific effects of stressors and proposes voluntary actions to offset negative effects if they occur. Ideally, SGCN conservation will also mutually benefit sustainable Hunting, Fishing & Trapping.

Table 3.5.2 Potential voluntary actions intended to benefit SGCN and sustainable Hunting, Fishing & Trapping (see IDAPA 13.01.06, "Rules Governing Classification and Protection of Wildlife")

<table>
<tr><th>Species</th><th>Effects if stressors occur</th><th>Voluntary actions, programs, projects, and BMPs</th></tr>
<tr><td rowspan="3">Protected Wildlife

Big Game Animals

Upland Game Animals

Game Birds

Game Fish

Furbearing Animals

Protected Nongame Species</td><td rowspan="2">Abundance is reduced by illegal capture or take.</td><td>Enforce laws and rules protecting SWAP species (e.g., surveys, patrols, check stations, patrols, investigations, and prosecutions).</td></tr>
<tr><td>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).</td></tr>
<tr><td>Supplies of legally hunted, fished, and trapped SWAP species are not meeting management objectives.</td><td>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).</td></tr>
</table>

3.6 Human Intrusions & Disturbance

Overview

Human Intrusions & Disturbance consists of Recreational Activities (i.e., Outdoor Recreation) and Military Exercises. Idaho's lands and waters provide abundant opportunities for a diversity of sustainable 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, motor boating, rafting, snow and water skiing, snowmobiling, and off-road vehicle 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 2020, BEA 2021).

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 National Defense. 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 Resource Management Plans (INRMP). The DoD also addresses potential 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 potential 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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of stressors on 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 sustainable Outdoor Recreation goals and objectives. The following are examples of potential 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 SGCN and their habitat.
    - Implement soil and water conservation to promote water supplies, water quality, soil stability, and forest and rangeland health.
    - Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
    - Conserve SGCN pollinators with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (e.g., Yellow Bumble Bee,

    - Western Bumble Bee, Gillette's Checkerspot, and Monarch Butterfly) (WAFWA 2019, USDA 2021, USDA 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 among 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 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 sustainable Outdoor Recreation, adaptive management, and monitoring.
- Assist Outdoor Recreation project proponents, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of potential voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support pre-project 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, especially in historically underserved communities.
- 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 sustainable Outdoor Recreation, and support communities.

- Prepare and disseminate information, education, and outreach materials informing stakeholders about opportunities to incorporate SGCN conservation in sustainable Outdoor Recreation.
- Encourage public and stakeholder participation in land- and water-use planning and permitting processes to raise awareness and ensure consideration of sustainable 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.
- Provide information about low disturbance-causing opportunities to view and photograph Idaho's SGCN (e.g., Idaho Birding Trail, Mountain Goat interpretive sites, Sharp-tailed Grouse viewing areas, etc.).

Overarching Effects & Actions—Military Exercises

Potential 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 potential 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 potential effects and recommend voluntary 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. Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing stressors that have the potential to cause negative effects on 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 potential 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 habitat 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 with DoD, resource managers, and other stakeholders with addressing project-specific effects on SGCN. The following are examples of potential voluntary actions:
    - Participate in INRMP and NEPA processes during early project planning to communicate SGCN goals and objectives.
    - Support pre-project 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 lifecycle.
    - Recommend monitoring and adaptive management approaches to guide implementation of the mitigation hierarchy and conserve SGCN throughout project lifecycles.

Voluntary Actions Related to Information and Knowledge Gaps

- Inform DoD and stakeholders about Idaho's SGCN conservation goals and objectives in collaboration among 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 and capacity needs for implementing programs, projects, and BMPs to offset effects of Military Exercises.

- 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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to habitats with the potential for negative SGCN effects from stressors associated with Outdoor Recreation. Ideally, SGCN conservation will be mutually beneficial for sustainable Outdoor Recreation.

Forest & Woodland

Camping, hiking, biking, off-highway vehicle 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 locally to 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, introduction and spread of invasive species, and unnatural wildfire frequency, extent, and severity. Outdoor Recreation can potentially 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 high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by Outdoor Recreation include Mountain Goat, Moose, Wolverine, Fisher, Yellow-billed Cuckoo, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Lewis's Woodpecker, Western Bumble Bee, and Whitebark Pine. Table 3.6.1 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable Outdoor Recreation.

Table 3.6.1 Potential 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 <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Dry Lower Montane-Foothill Forest Mesic Lower Montane Forest Pinyon – Juniper Woodland Subalpine-High Montane Forest Whitebark Pine Forest & Woodland Aspen Forest & Woodland Montane Riparian & Swamp Forest Lowland-Foothill Riparian Forest	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 sustainable Outdoor Recreation economy and communities.
		Manage forests to benefit SGCN and sustainable Outdoor Recreation (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, erosion prevention and control, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods.
	Vegetation productivity is decreased by invasive species introduction and spread.	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
		Improve forest health to benefit SGCN and sustainable 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 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 high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by Outdoor Recreation include Moose, Hoary Bat, Little Brown Myotis, Northern Pintail, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, and Ute Lady's Tresses. Table 3.6.2 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable Outdoor Recreation.

Table 3.6.2 Potential 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 sustainable Outdoor Recreation economy and communities.
		Manage wetlands and riparian zones to benefit SGCN and sustainable Outdoor Recreation (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, pedestrian bridges and boardwalks, viewing areas, and information and education).
		Implement BMPs that reduce SGCN disturbance in important locations and during important seasonal periods.
	Vegetation productivity is decreased by invasive species introduction and spread. Soils are eroded and compacted by	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
		Manage wetlands and riparian zones to benefit SGCN and sustainable Outdoor Recreation (e.g., erosion prevention and control, access management, recreation trail routing, pedestrian bridges and boardwalks, wetland and streambank restoration, desirable vegetation planting and management, and information and education).

	recreational activities. Water quality is reduced by soil erosion, increased sediment inputs, and pollutants.	Conserve water supplies and water quality (e.g., water supply and streamflow improvement, 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, 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 USFS. These public lands provide abundant open spaces and opportunities for Outdoor Recreation. Camping, hiking, biking, off-highway vehicle 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 locally to 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 (1) prolonged drought, (2) decreased snowpack, (3) natural resource development, (4) introduction and spread of noxious weeds and invasive species, and (5) 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 high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by Outdoor Recreation include Pronghorn, California and Rocky Mountain Bighorn Sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Burrowing Owl, Woodhouse's Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Table 3.6.3 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable Outdoor Recreation.

Table 3.6.3 Potential 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 Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation	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 sustainable Outdoor Recreation economy and communities.
		Manage rangelands to benefit SGCN and sustainable Outdoor Recreation (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, 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).
	Vegetation productivity is decreased by invasive species introduction and spread.	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
		Improve rangeland health to benefit SGCN and sustainable 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 have the potential locally to affect Alpine Tundra. For example, the fragile vegetation and soils of Alpine Tundra can be sensitive to trampling by nonmotorized and motorized 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 high-profile SGCN occurring in Alpine Tundra and potentially influenced by outdoor recreation include Mountain Goat, Wolverine, Grizzly Bear, Silver-haired Bat, Hoary Bat, Golden Eagle, Black Rosy-Finch, Gray-crowned Rosy-Finch, and Christ's Indian Paintbrush. Table 3.6.4 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable outdoor recreation.

Table 3.6.4 Potential 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 sustainable Outdoor Recreation economy and communities.
		Manage Alpine Tundra to benefit SGCN and sustainable Outdoor Recreation (e.g., access management, targeted protective fencing or other barriers, recreation trail routing, 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.
	Vegetation productivity is decreased by invasive species introduction and spread.	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
	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).

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, USFS, 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 caving and cave tourism. Negative effects can include disturbing and 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. 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 potentially reduce habitat effectiveness for cave-obligate SGCN.

Examples of high-profile SGCN occurring in Caves & Subterranean Habitats (including abandoned mines) and potentially affected by Outdoor Recreation include the Townsend's Big-eared Bat, Silver-haired Bat, Western Small-footed Myotis, Little Brown Myotis, and Yuma Myotis (also see Sections 3.11 and 3.12). Table 3.6.5 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable Outdoor Recreation.

Table 3.6.5 Potential 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. Decreased SGCN survival from 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).
		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).
		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.

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, waterskiing, 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 locally to affect Aquatic Habitat. For example, Outdoor Recreation-related stressors potentially include streambank and shoreline erosion, introduction and spread of invasive species, SGCN disturbance and displacement, and water pollutants. Additional stressors potentially affecting Aquatic Habitat more broadly include (1) prolonged drought, (2) changing precipitation and snowpack trends, (3) shifting seasonal water runoff patterns, (4) other pollutant sources decreasing water quality, and (5) 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 high-profile SGCN occurring in Aquatic Habitat and potentially influenced by Outdoor Recreation include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Harlequin Duck, Ring-billed Gull, Western Grebe, and Moose. Table 3.6.6 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and sustainable Outdoor Recreation.

Table 3.6.6 Potential 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 Small Streams (1st, 2nd order) – Intermittent Small Streams (1st, 2nd order) – Perennial Large Streams (3rd, 4th order) Rivers Major (5th Order & Higher)	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 sustainable Outdoor Recreation economy and communities.
		Manage Aquatic Habitat to benefit SGCN and sustainable 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.
	Aquatic Habitat productivity is decreased by invasive species introduction and spread. Shorelines, lakebeds, and	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
		Manage Aquatic Habitat to benefit SGCN and sustainable Outdoor Recreation by controlling shoreline erosion (e.g., access management, monitoring and enforcement, setbacks, lakebed and shoreline restoration, desirable vegetation planting and management, flood-resilient recreation infrastructure, and information and education).

Table 3.6.6 Potential voluntary actions intended to benefit SGCN and sustainable outdoor recreation if stressors are affecting the quantity, quality, or connectivity of Aquatic Habitat

Habitat	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Lakes, Reservoirs, and Ponds Springs	stream channels are harmed by recreational facilities, infrastructure, or human activities. Shorelines and streambanks are eroded by boat wakes. Water quality is reduced by soil erosion, increased sediment inputs, and pollutants.	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).
		Conserve water supplies and water quality (e.g., 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, 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 3.6.7 identifies potential SGCN-specific effects of stressors and proposes voluntary actions to offset negative effects if they occur. Ideally, SGCN conservation will also mutually benefit sustainable outdoor recreation.

Table 3.6.7 Potential 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
California & Rocky Mountain bighorn sheep Mountain Goat	Local abundance is reduced by disturbance or displacement from important seasonal habitat by recreational activities, infrastructure, or	Coordinate with resource managers to identify important seasonal habitat and protect SGCN 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 vulnerable to recreational activities and the need for protective measures.

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

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Pronghorn Moose Greater Sage-Grouse Sharp-tailed Grouse	facility maintenance.	Implement the Idaho Bighorn Sheep Management Plan (IDFG 2022).
		Implement the Idaho Mountain Goat Plan (IDFG 2019).
		Implement the Idaho Moose Management Plan (IDFG 2020).
		Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
		Implement the Management Plan for the Conservation of Columbian Sharp-tailed Grouse in Idaho (IDFG 2015).
Plant SGCN including: Christ's Indian Paintbrush Idaho Pepperweed MacFarlane's Four O'clock Ute Lady's Tresses Dune-related SGCN including: Idaho Dune Tiger Beetle Columbia River Tiger Beetle Bruneau Dune Tiger Beetle	Local abundance is reduced by harm from recreational activities, infrastructure, or facility maintenance.	Implement projects and BMPs that protect SGCN vulnerable to disturbance caused by recreational activities such as crushing, trampling, and soil erosion (e.g., access management, protective fencing, enclosures, and other protective barriers).
		Provide information and education informing recreationists about plant and invertebrate SGCN that are vulnerable to recreational activities and the need for protective measures.
Pollinating insect SGCN including:	Local abundance is reduced by harm from recreational activities and	Implement pollinator-friendly Integrated Pest Management principles, vegetation management, and BMPs (WAFWA 2019, USDA 2021, USDA 2022).

Table 3.6.7 Potential 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
Yellow, Morrison, and Western bumble bees Gillette's Checkerspot Monarch Butterfly	vegetation management during facility maintenance.	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: Clark's and Western grebes Common Loon Caspian Tern	Nest success decreases from recreational activities disturbing floating nests and shallow-water habitat.	Coordinate with resources managers as appropriate to protect SGCN vulnerable to disturbance caused by recreational activities (e.g., access and boating management).
		Provide information and education informing recreationists about SGCN that are vulnerable to recreational activities and the need for protective measures.
Grizzly Bear	Abundance is reduced by control actions needed in response to bear-human conflict.	Provide bear-human 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 resources managers to avoid or minimize bear-human conflict associated with recreational activities.
		Provide information and education to Outdoor Recreation users about bear safety precautions and BMPs.

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. Historically, wildland Fire & Fire Suppression (i.e., Fire Management) focused on protecting loss of products and services provided by forests and rangelands. Dams & Water Management/Use (i.e., 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 (https://idwr.idaho.gov/water-rights/overview/). 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 Policy Resolution 2021-03). Wildland fire is also the most influential large-scale stressor affecting forest and rangeland health. Depending on circumstances, fire can contribute either positively or negatively to forest and rangeland health (https://idrange.org/wp-content/uploads/2018/02/Fire2bFact2bSheet.pdf). 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 Native Americans were important for maintaining the health and productivity of many forests and rangelands (Hessburg and Agee 2003, Twidwell et al. 2021). For example, relatively frequent pre-settlement 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. 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 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) 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 among 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 Policy Resolutions 2021-08 and 2021-10). Water is also Idaho's most important natural resource and strength of the state's economy and way of life:

- Idaho has 880 square miles of surface water, comprising more than 2,000 lakes and 93,000 miles of streams and rivers.
- Reservoir and lake storage systems have a total capacity of over 12 million acre-feet and support water supplies, flood management, hydropower generation, and outdoor recreation.
- Annual stream inflow into Idaho is about 37 million acre-feet, but annual outflow is about 75 million acre-feet making Idaho a net exporter of water to the Columbia River system (IDWR 2022).
- Surface water diversion, groundwater pumping, managed aquifer recharge, and reservoir storage comprise the basis of Idaho's water delivery system.
- Surface water accounts for the majority of water use.
- Groundwater comprises 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 (less than 10-inches of precipitation per year), the 779-mile-long Snake River and its tributaries supply water to 3-million acres 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 (Article XV, Section 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 State Water Plan and oversees the public water allocation and distribution process (i.e., water rights) (https://idwr.idaho.gov/water-rights/). DEQ ensures the Idaho's water quality standards are met (https://www.deq.idaho.gov/water-quality/). 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 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 among 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 Policy Resolution 2021-08). 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 has the potential harm the lands and waters, both privately and publicly owned, that sustain Idaho's natural resource-based economy and communities. Similarly, unnatural wildfire has the potential to affect habitat for fish, wildlife, and plants, including SGCN. Fire Management, including prescribed burning as a management tool, is needed for (1) protecting, restoring, and enhancing forest and rangeland health; (2) conserving Idaho's lands and waters to benefit SGCN; and (3) 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 Policy

Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of stressors on 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 potential 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 potential voluntary actions:
  - Implement the Idaho Forest Action Plan (IDL 2020) (https://www.idl.idaho.gov/noboundariesforestry/forest-action-plan/).
  - 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.
  - 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 post-wildfire 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 habitat as appropriate during firefighting (e.g., Greater Sage-Grouse habitat, big game winter range, and mature Ponderosa Pine, Whitebark Pine, and cottonwood stands).
- Apply wildlife-friendly BMPs during post-fire habitat restoration.
- Apply pollinator-friendly Integrated Pest Management principles, vegetation Management, and BMPs during post-fire habitat restoration (e.g., Yellow Bumble Bee, Western Bumble Bee, and Monarch Butterfly) (WAFWA 2019, USDA 2021, USDA 2022).
- Implement the Idaho Invasive Species Strategic Plan (IISC 2017).

- Collaborate with fire managers, private landowners, and resource managers to use existing Fire Management programs and incentivize voluntary (1) water, soil, and SGCN conservation projects; (2) Fire Management projects; and (3) 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 among 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 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, post-wildfire 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 potential voluntary actions:
  - Participate in early project planning to communicate SGCN goals and objectives.
  - Support pre-project 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, especially in historically underserved communities.
- 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 USDA Natural Resource Conservation Service. 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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of stressors on 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 potential 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 potential 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.
    - Provide fish passage and aquatic habitat connectivity (e.g., stream restoration of Panther Creek to improve habitat connectivity for Chinook Salmon, steelhead, 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.
    - 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 Potlach River to reduce summer water temperatures for steelhead and other SGCN).
    - Install and maintain priority stream-flow and water quality monitoring equipment to support Water Management and decision-making.

    - Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
    - Propagate SGCN as appropriate to mitigate, conserve, supplement, or reintroduce populations.
    - Conserve high-priority SGCN populations and habitat, 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 (1) soil, water, and SGCN conservation projects; (2) BMPs; (3) technology upgrades; and (4) water storage and delivery infrastructure upgrades (e.g., Regional Conservation Partnership Program, Environmental Quality Improvement 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 among 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 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 potential voluntary actions:
    - Participate in early project planning to communicate SGCN goals and objectives.
    - Support pre-project 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, especially in historically underserved communities.
- 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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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 Fire Management, part of 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 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 high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by Fire Management include Mountain Goat, Moose, Wolverine, Fisher, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Lewis's Woodpecker, Great Gray Owl, Western Bumble Bee, and Whitebark Pine. Table 3.7.1 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and forest health.

Table 3.7.1 Potential 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 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 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 (IISC 2017).
		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 of 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	Aspen stands are decreasing from lack of burning to stimulate sprouting and remove competition from	Regenerate Aspen stands with prescribed burning as appropriate to remove invading conifer trees and stimulate Aspen sprouting.

Table 3.7.1 Potential 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 if stressors occur	Voluntary actions, programs, projects, and BMPs
	invading conifer trees.	

Temperate & Boreal Grassland & Shrubland

Temperate & Boreal Grassland & Shrubland habitats has been significantly affected by nonnative invasive plants including Cheatgrass, 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 provides to Idaho communities.

Examples of high-profile SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by Fire Management include California and Rocky Mountain bighorn sheep, Mountain Goat, American Pika, Northern Idaho Ground Squirrel, Southern Idaho Ground Squirrel, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Grasshopper Sparrow, Yellow Bumble Bee, Western Bumble Bee, Monarch Butterfly, and Spalding's Silene. Table 3.7.2 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and rangeland health.

Table 3.7.2 Potential 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	Rangelands and rangeland health	Implement the Idaho Invasive Species Strategic Plan (IISC 2017).

Table 3.7.2 Potential 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**
Grassland & Shrubland Subalpine-High Montane Mesic Meadow Snowbrush Ceanothus Chaparral	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 infestation.	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 of high-priority SGCN populations and habitat 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).
		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 grasslands 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 2022), 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 Habitat provides to Idaho communities.

Examples of high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by Fire Management include Pronghorn, California and Rocky Mountain bighorn sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Pinyon Jay, Sagebrush Sparrow, Burrowing Owl, Woodhouse's Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Table 3.7.3 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and rangeland health.

Table 3.7.3 Potential 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 (IISC 2017).
		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 *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
	Rangeland health is harmed by invading juniper and Pinyon Pine from past wildfire suppression.	Conserve SGCN and benefit Fire Management by controlling tree species invading shrublands (e.g., juniper removal in sagebrush steppe).
		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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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 has the potential either to 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 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 high-profile SGCN occurring in riparian Forest & Woodland habitats and potentially influenced by Water Management include Moose, Silver-haired Bat, Hoary Bat, Harlequin Duck, Yellow-billed Cuckoo, Wilson's Warbler, Lewis's Woodpecker, Western Bumble Bee, Water Howellia, and Ute Lady's Tresses. Table 3.7.4 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and riparian forest health.

Table 3.7.4 Potential 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, 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 therefore has the potential either to benefit or negatively affect the health of wetlands and riparian zones. Additional stressors potentially affecting Shrub & Herb Wetland habitats include (1) prolonged drought, (2) changing precipitation and snowpack trends, (3) shifting seasonal water runoff patterns, (4) pollutants decreasing water quality, and (5) introduction and spread of invasive species.

Examples of high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by Water Management include Moose, Hoary Bat, Little Brown Myotis, Northern Pintail, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, Water Howellia, and Ute Lady's Tresses. Table 3.7.5 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and wetland and riparian health.

Table 3.7.5 Potential voluntary actions intended to benefit SGCN and sustainable water management if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland 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="3">Bog & Fen

Freshwater Marsh

Lowland Marsh, Wet Meadow & Shrubland

Montane Marsh, Wet Meadow & Shrubland

Lowland–Foothill Riparian Shrubland</td><td rowspan="3">Wetlands and riparian zones are reduced by surface water and groundwater diversions, levees, dams, and Water Management that reduce water supplies and streamflow.</td><td>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).</td></tr>
<tr><td>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).</td></tr>
<tr><td>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, setbacks, habitat restoration, mitigation, and invasive species).</td></tr>
</table>

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 has the potential either to benefit or negatively affect the health of Aquatic Habitat. Additional stressors potentially affecting Aquatic Habitat include (1) prolonged drought, (2) changing precipitation and snowpack trends, (3) shifting seasonal water runoff patterns, (4) pollutants decreasing water quality, and (5) introduction and spread of invasive species.

Examples of high-profile SGCN occurring in Aquatic Habitat and potentially influenced by Water Management include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Harlequin Duck, Ring-billed Gull, White-faced Ibis, Western Grebe, and Moose. Table 3.7.6 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and water supplies and water quality.

Table 3.7.6 Potential voluntary actions intended to benefit SGCN and sustainable water 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 Small Streams (1st, 2nd order) – Perennial Large Streams (3rd, 4th order) Rivers (5th Order & Higher) Lakes, Ponds & Reservoirs Springs	Aquatic Habitat is reduced by water supplies affected by Water Management infrastructure or operations. Fish movements and survival rates 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 Potential 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**
		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, 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 potential SGCN-specific effects of stressors and proposes voluntary actions to offset negative effects if they occur. Ideally, SGCN conservation will also mutually benefit sustainable Fire Management and Water Management.

Table 3.7.7 Potential 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 Burbot Bull Trout Sockeye and Chinook salmon Steelhead Yellowstone and Bonneville	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 the Idaho Fisheries Management Plan (IDFG 2019).
		Implement the Management Plan for the Conservation of Yellowstone Cutthroat Trout in Idaho (IDFG 2019).
		Implement the Management Plan for the Conservation of Bonneville cutthroat Trout in Idaho (IDFG 2022).
		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.
		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).
		Release cold water from reservoirs as appropriate to support anadromous fish migration.

Table 3.7.7 Potential 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
cutthroat trout Whitefish		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, 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.
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 (Somershoe et al. 2020).
Clark's Nutcracker Whitebark Pine	Distribution, abundance, and survival are reduced by post-wildfire conditions not conducive to seed caching.	Manage wildfire and prescribed burning patterns to benefit seed caching by Clark's Nutcracker and subsequent Whitebark Pine regeneration and growth (Keane 2018, Keane and Cushman 2018).

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 potentially more harmful to the state's SGCN and natural resource-based economy including farming, ranching, forest products, recreation, and energy production (WGA Policy Resolution 2022-11). 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 Policy Resolution 2022-11). In 2022, WGA Policy Resolution 2022-11 (Biosecurity and Invasive Species Management) 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) (https://invasivespecies.idaho.gov/) 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 2017) and produces technical resources to inform and guide invasive species management around the state (IISC 2003, IISC 2007).

In coordination with the IISC, ISDA leads invasive species management in Idaho with multiple prevention, education, early detection, and treatment programs (https://invasivespecies.idaho.gov/idaho-invasive-species-council). 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 have the potential to affect fish, wildlife, and plants, including SGCN. Invasive species management is therefore necessary to (1) protect, restore, and enhance Idaho's lands and waters; (2) conserve SGCN populations and habitat; and (3) 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 Policy Resolution 2021-04). 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 potential voluntary actions are broadly applicable for addressing effects of stressors on 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 potential 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. The following are examples of potential voluntary actions:
    - Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
    - Support Cooperative Weed Management Areas.
    - Implement the Idaho Forest Action Plan (IDL 2020).
    - Perform surveillance monitoring to detect the prevalence, spread, and establishment of existing and newly introduced invasive species.
    - 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.

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 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, especially in historically underserved communities.
- 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 (https://invasivespecies.idaho.gov/, https://invasivespecies.idaho.gov/idaho-invasive-species-council).
- 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 SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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, 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 high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by invasive species include Mountain Goat, Moose, Wolverine, Fisher, Yellow-billed Cuckoo, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Lewis's Woodpecker, White-headed Woodpecker, Great Gray Owl, Western Bumble Bee, and Whitebark Pine. Table 3.8.1 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and riparian forest health.

Table 3.8.1 Potential voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Forest & Woodland 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="4">Dry Lower Montane-Foothill Forest

Mesic Lower Montane Forest

Subalpine–High Montane Forest

Aspen Forest & Woodland

Whitebark Pine Forest & Woodland</td><td rowspan="4">Forests and forest health are harmed by insect and disease outbreaks.

Invasive plants decrease vegetation diversity and productivity and limit the potential to restore forest health.</td><td>Implement the Idaho Invasive Species Strategic Plan (IISC 2017) 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, decontamination BMPs, forest restoration, and information and education).</td></tr>
<tr><td>Implement the Idaho Forest Action Plan (IDL 2020).</td></tr>
<tr><td>Develop and propagate disease-resistant trees for restoration (e.g., Whitebark Pine resistant to White Pine Blister Rust).</td></tr>
<tr><td>Restore forests negatively affected by invasive species, damaging insects, and forest diseases.</td></tr>
</table>

Temperate & Boreal Grassland & Shrubland

Undesirable invasive plants 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 high-profile SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by invasive species include Mountain Goat, California and Rocky Mountain bighorn sheep, American Pika, Northern Idaho Ground Squirrel, Mountain Quail, Sharp-tailed Grouse, Long-billed Curlew, Western Bumble Bee, Monarch Butterfly, and Spalding's Silene. Table 3.8.2 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and rangeland health.

Table 3.8.2 Potential 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 (IISC 2017) 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 harm the health of Shrub & Herb Wetland habitats. Invasive plants have the potential to 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. The American Bullfrog can also worsen the effects of an invasive fungal disease (i.e., *Batrachochytrium dendrobatidis* [*Bd*]) that is negatively affecting native amphibians. Consequently, invasive species have the potential to impair the health of wetland and riparian habitat. 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 high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by invasive species include Moose, Silver-haired Bat, Hoary Bat, Little Brown Myotis, Northern Pintail, Trumpeter Swan, White-faced Ibis, Sandhill Crane, Short-eared Owl, Northern Leopard Frog, Western Bumble Bee, Monarch Butterfly, and Ute Lady's Tresses. Table 3.8.3 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and wetland and riparian health.

Table 3.8.3 Potential voluntary actions intended to benefit SGCN and invasive species management if stressors are affecting the quantity, quality, or connectivity of Shrub & Herb Wetland 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="4">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</td><td rowspan="4">Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore healthy wetlands or riparian zones.

SGCN survival rates decrease from predation by invasive aquatic animals.

SGCN are displaced or otherwise harmed by invasive aquatic animals.</td><td>Implement the Idaho Invasive Species Strategic Plan (IISC 2017) 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).</td></tr>
<tr><td>Manage effects of invasive species on unique habitats and related SGCN (e.g., Bog & Fen and Northern Bog Lemming).</td></tr>
<tr><td>Restore wetlands and riparian zones negatively affected by invasive species (e.g., desirable vegetation planting and management, invasive species control, and erosion control).</td></tr>
<tr><td>Control invasive aquatic animals preying upon native SGCN as appropriate and feasible.</td></tr>
</table>

Desert & Semidesert

Undesirable invasive plants, particularly nonnative annual grasses, 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 2022), 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 2022). These interacting stressors can impair rangeland health, which can also negatively affect SGCN and amenities provided to Idaho communities.

Examples of high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by invasive species include Pronghorn, California and Rocky Mountain Bighorn Sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Long-billed Curlew, Sagebrush Sparrow, Burrowing Owl, Woodhouse’s Toad, Yellow Bumble Bee, Morrison Bumble Bee, and Idaho Pepperweed (aka Slickspot Peppergrass). Table 3.8.4 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and rangeland health.

Table 3.8.4 Potential voluntary actions intended to benefit SGCN and invasive species 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 Sparsely Vegetated Dune Scrub & Grassland Dwarf Sagebrush Steppe & Shrubland Tall Sagebrush Steppe & Shrubland	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.	Implement the Idaho Invasive Species Strategic Plan (IISC 2017) 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).

Table 3.8.4 Potential voluntary actions intended to benefit SGCN and invasive species 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
Saltbush Scrub Cliff, Scree & Badland Sparse Vegetation		

Aquatic Vegetation & Freshwater Habitat

Invasive species, both plant and animal, have the potential to harm the health of Aquatic Vegetation & Freshwater Habitat (hereafter Aquatic Habitat) for SGCN and damage water management and recreation infrastructure. Aquatic invasive plants 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 high-profile SGCN occurring in Aquatic Habitat and potentially influenced by invasive species include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Mountain Whitefish, Harlequin Duck, Ring-billed Gull, White-faced Ibis, Western Grebe, and Moose. Table 3.8.5 proposes voluntary actions intended to address negative effects of stressors if occurring to benefit SGCN conservation and water supplies and water quality.

Table 3.8.5 Potential voluntary actions intended to benefit SGCN and invasive species 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 Major (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	Invasive plants decrease vegetation diversity and productivity and limit the potential to maintain or restore healthy Aquatic Habitat. SGCN survival rates decrease from predation by invasive aquatic animals. SGCN are displaced or otherwise harmed by invasive aquatic animals. Aquaculture release of aquatic Invasive Species, diseases, or undesirable aquaculture products	Implement the Idaho Invasive Species Strategic Plan (IISC 2017) 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).

Species-specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.8.6 identifies potential SGCN-specific effects of stressors and proposes voluntary actions to offset negative effects if they occur. Ideally, SGCN conservation will also mutually benefit invasive species management.

Table 3.8.6 Potential voluntary actions intended to benefit SGCN/SGIN 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 Burbot Bull Trout Sockeye and Chinook salmon Steelhead Yellowstone and Bonneville cutthroat trout Whitefish	Survival rates decrease 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 the Idaho Fisheries Management Plan (IDFG 2019).
		Implement the Management Plan for the Conservation of Yellowstone Cutthroat Trout in Idaho (IDFG 2019).
		Implement the Management Plan for the Conservation of Bonneville Cutthroat Trout in Idaho (IDFG 2022).
		Implement the Management Plan for the Conservation of Snake River White Sturgeon in Idaho (IDFG 2008).
Bird SGCN	Survival rates decrease 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 2015).
		Advise the public and researchers handling birds on proper personal protective equipment, decontamination, carcass disposal, and BMPs to prevent disease spread.
		Implement carcass collection efforts as appropriate to minimize disease spread and provide samples for laboratory analysis (e.g., IDFG Wildlife Health Laboratory).
		Coordinate with wildlife rehabilitators and game bird captive-rearing operators to implement biosecurity protocols.
		Implement the *Idaho 2021 Sage-Grouse Management Plan* and *Idaho Sage-Steppe Mitigation Principles* (State of Idaho, Executive Department 2022).
Mountain Goat California and Rocky	Survival rates decrease 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 219, 2022).
		Implement the Idaho Mountain Goat Plan (IDFG 2019).

Table 3.8.6 Potential voluntary actions intended to benefit SGCN/SGIN and invasive species management by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Mountain bighorn sheep		Implement the Idaho Bighorn Sheep Management Plan (IDFG 2022).
		Reduce risk of disease transmission by implementing BMPs and maintaining spatial or temporal separation with livestock.
Moose	Survival rates decrease 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 (IDFG2020).
		Monitor and document mortality events or population declines that might indicate a disease outbreak.
		Implement actions in the 2021 Strategy for Chronic Wasting Disease (IDFG 2021).
		Implement the Moose Management Plan 2020-2025 (IDFG 2020).
Fisher Wolverine	Survival rates decrease 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.
Bat SGCN: Townsend's Big-eared Bat Silver-haired Bat Hoary Bat Western Small-footed Myotis Little Brown Myotis Yuma Myotis Bat SGIN: Pallid Bat	Survival or reproduction rates decrease from bat white-nose syndrome or other diseases.	Develop and implement strategies to control effects of bat white-nose syndrome or other diseases.
		Participate in the National Strategic *Pd* Surveillance Project to identify distribution of *Pd* and bats affected by white-nose syndrome.
		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 white-nose syndrome (e.g., access management, work permissions, decontamination BMPs, bat-compatible gates at abandoned mines, internal cave climate considerations, and subterranean temperature/humidity monitoring).
		Manage other mortality sources that further affect populations affected by white-nose syndrome 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).

Table 3.8.6 Potential voluntary actions intended to benefit SGCN/SGIN and invasive species management by addressing effects of stressors if occurring

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Big Brown Bat Spotted Bat Long-eared Myotis Fringed Myotis Long-legged Myotis Canyon Bat		
Pygmy Rabbit American Pika	Survival rates decrease from Rabbit Hemorrhagic Disease Virus or other diseases.	Develop and implement strategies to control effects of Rabbit Hemorrhagic Disease Virus or other diseases.
		Monitor for mortality events or population declines that might indicate a disease outbreak.
		Vaccinate at risk populations as appropriate.
Northern Idaho Ground Squirrel Southern Idaho Ground Squirrel Pygmy Rabbit Pika	Survival rates decrease 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 Northern Idaho Ground Squirrel Recovery Plan (USFWS 2003).
		Implement disease management strategies as appropriate (e.g., vector control with insecticides or vaccines).
Western Toad Woodhouse's Toad Northern Leopard Frog	Survival rates decrease 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.

Table 3.8.6 Potential voluntary actions intended to benefit SGCN/SGIN and invasive species management by addressing effects of stressors if occurring

Species	Effects if stressors occur	Voluntary actions, programs, projects, and BMPs
Columbia Spotted Frog		Control invasive species to benefit distribution and abundance of amphibian SGCN (e.g., American Bullfrog control and monitoring).

3.9 Pollution

Overview

Pollution consists of Household Sewage & Urban Waste Water, Industrial & Military Effluents, Agricultural & Forestry Effluents, and Garbage & Solid Waste, 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 Policy Resolution 2021-10). Most Chapter 3 sections also address Pollution. Accordingly, no Habitat-specific or Species-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. 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 potential negative effects of pollution requires ever-greater attention, collaboration, investment, and community-driven solutions.

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 (https://www.deq.idaho.gov/public-information/pollution-prevention/; https://www.epa.gov/p2/pollution-prevention-law-and-policies). In coordination with communities, industries, health districts, and citizens, DEQ is responsible for ensuring Idaho's surface, ground, and drinking water meet state standards (https://www.deq.idaho.gov/water-quality/). 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 and NPDES administered by EPA under the CWA (https://www.deq.idaho.gov/, https://idwr.idaho.gov/, https://www.epa.gov/). 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 (https://www.deq.idaho.gov/waste-management-and-remediation/).

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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential overarching actions are broadly applicable for addressing effects of stressors on 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 potential 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. The following are examples of potential voluntary actions:

  - 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 to benefit water supplies, water quality, and soil health (USDA 2022).
  - 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.
  - 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 non-target 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 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 (1) water, soil, and SGCN conservation projects; (2) BMPs; (3) waste management; (4) water treatment improvements; and (5) pollutant remediation and cleanup.
- 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.

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 among 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 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 potential 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, especially in historically underserved communities.
- 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.

3.10 Geological Events

Overview

Geological Events consist of Volcanoes, Earthquakes, and Avalanches/Landslides (CMP 2016a). Geological Events have the potential to affect SGCN populations and habitat. 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 an SGCN or its habitat.

Overarching Effects & Actions

Overarching voluntary actions are broadly applicable for addressing effects of Geological Events that might negatively affect SGCN or their habitat (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 providing important bat 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 (1) warming average temperatures, (2) prolonged and severe drought, (3) changing precipitation and snowpack trends, and (4) 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 heatwaves becoming more frequent (Fig. 3.11.1a).
    - 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. 3.11.1b).

- o 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).
- o Snowpack is peaking earlier, shifting upwards, and more inconsistent (Catalano et al. 2019, Marshall et al. 2019).
- o Soil and fuel moistures are decreasing causing increasing wildfire (Abatzoglou and Williams 2016).

- Water Supply
  - o Decreasing summer streamflow and warming air temperatures have warmed streams approximately 1.5 °F (0.8 °C).
  - o Annual streamflow has decreased and peak springtime streamflow is 1-2 weeks earlier.
  - o Summer streamflow will continue to decrease and springtime peak streamflow will be 4-9 weeks earlier (Hamlet et al. 2013, Chegwidden 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, introduction and spread of invasive species, 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 forestlands, 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 Policy Resolution 2021-04). Focusing on achieving mutually beneficial results, the following potential voluntary actions are broadly applicable for addressing effects of climate-related stressors on 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 potential 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.

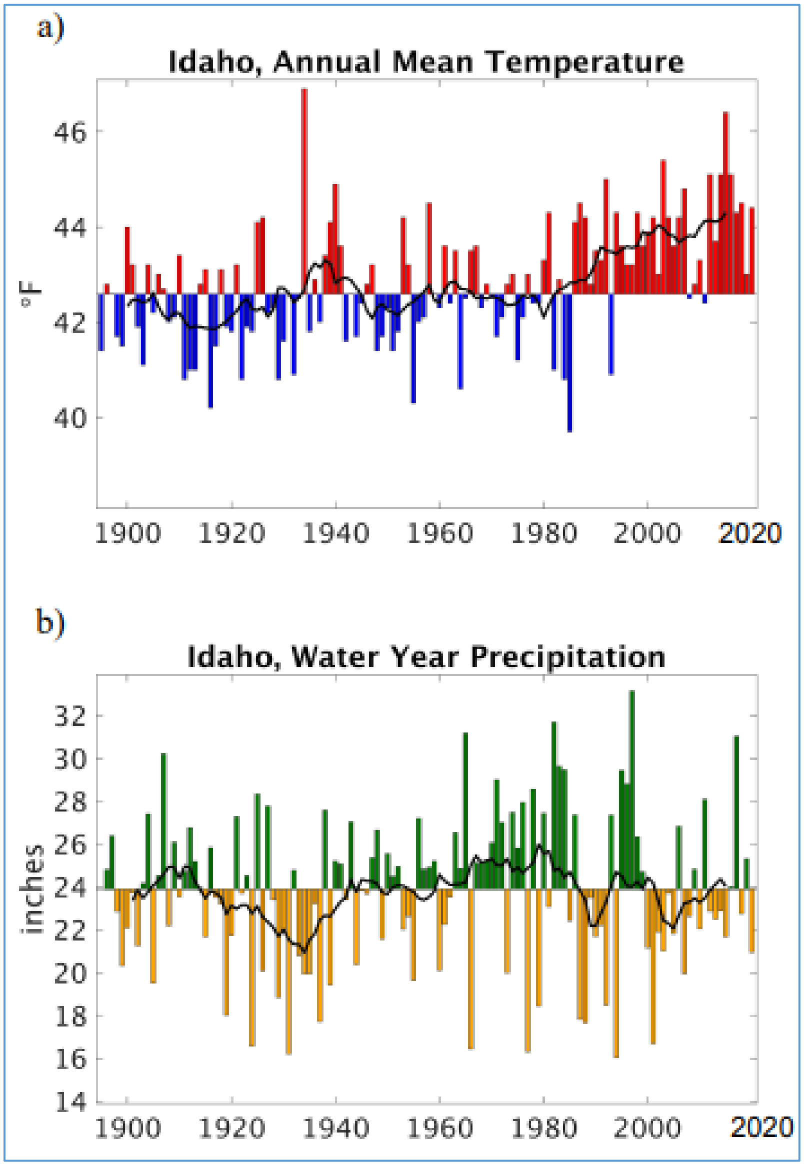


Fig. 3.11.1 Annual average air temperature (a) and total annual precipitation (b) in Idaho, 1901 to 2020 (data are plotted relative to the 1901 to 2000 average and black line indicates the 11-year moving average (from Abatzoglou et al. 2021).

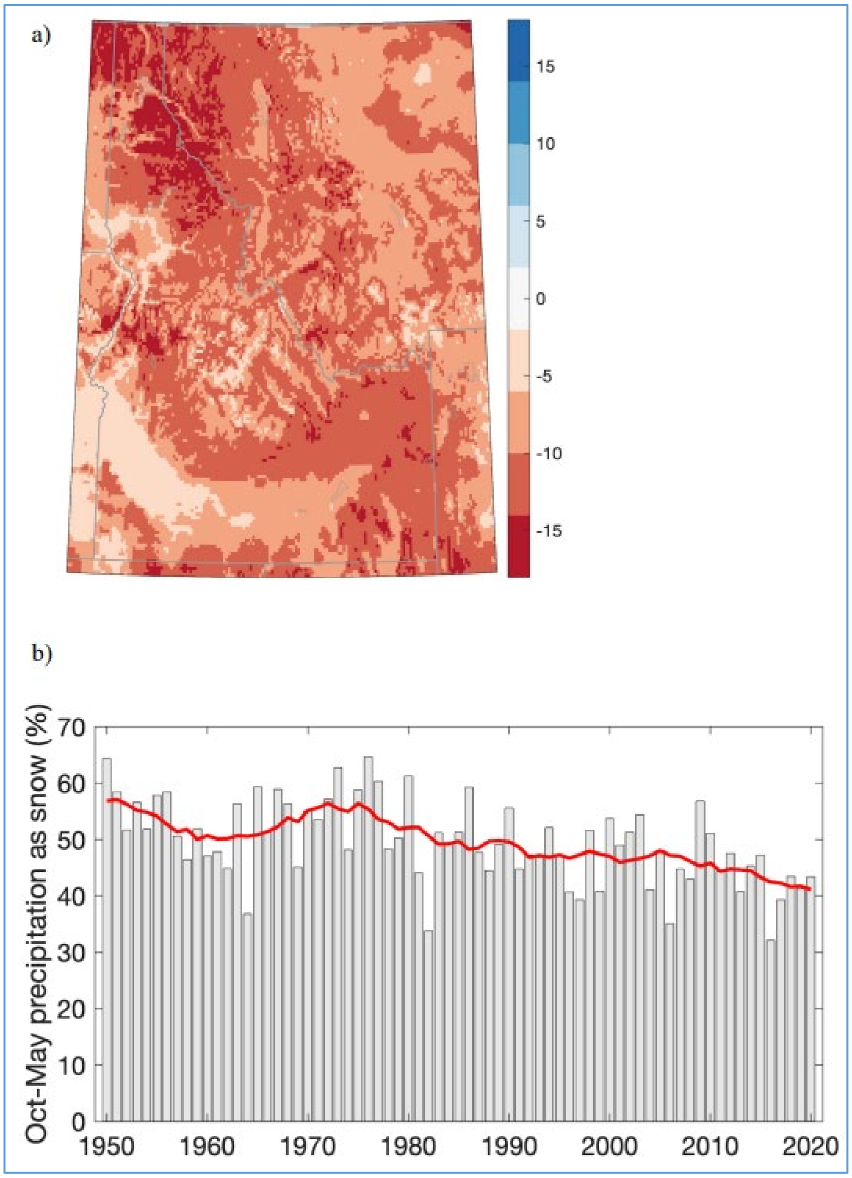


Fig. 3.11.2 Precipitation falling as snow across Idaho, 1950 to 2020 (from Lynn et al. 2020, Abatzoglou et al. 2021).

    - 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 potential 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 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 lifecycle 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, acquire and strategically position firefighting resources, and implement the Idaho Forest Action Plan (IDL 2020).
    - 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 and up in elevation) including implementing the *Idaho Action Plan (V3.0) for Implementing the Department of the Interior Secretarial Order 3362: Improving Habitat Quality in Western Big Game Winter Range and Migration Corridors* (IDFG 2020).
    - Implement the Idaho Invasive Species Strategic Plan (IISC 2017).
    - Conserve SGCN pollinators with pollinator-friendly Integrated Pest Management, vegetation management, and BMPs (WAFWA 2019, USDA 2021, USDA 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).
- Collaborate with resource-based industries, private landowners, and resource managers to address climate-related stressors with existing conservation programs and incentivize voluntary (1) soil, water, and SGCN conservation projects; (2) BMPs; (3) infrastructure and technology upgrades; and (4) conservation of working lands (e.g., Cheatgrass Challenge, Environmental Quality Improvement 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 among 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 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 potential voluntary actions:
  - Conduct surveys, inventories, and analyses to evaluate existing distributions, abundances, and conservation status of SGCN and their habitat relative to potential stressors.
  - Model and predict future distribution and abundance of SGCN populations and habitat 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).

Voluntary Actions Related to Outreach

- Promote and incentivize SGCN conservation education, especially in historically underserved communities.
- 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.

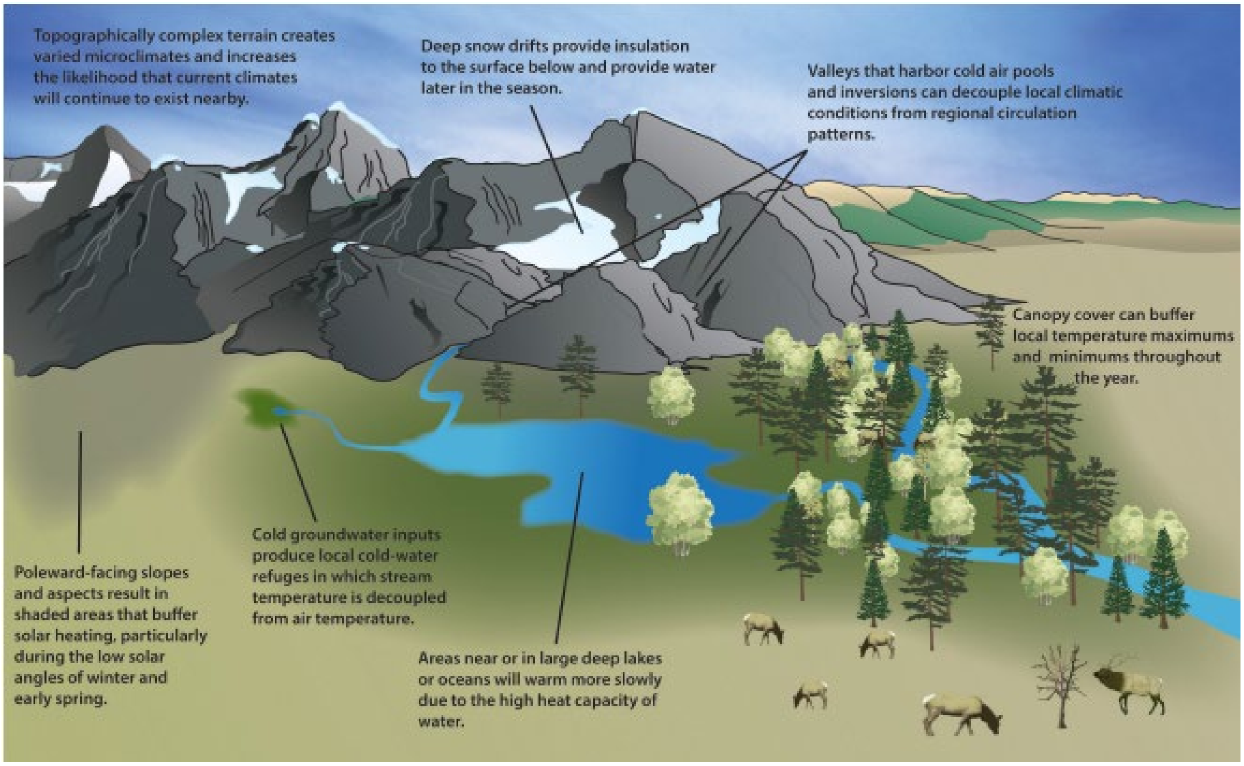


Fig. 3.11.3 Conceptual model of potential areas likely to be resilient to climate-related stressors and change (from Morelli et al. 2016).

Habitat-specific Effects & Actions

In addition to Overarching Effects & Actions, the following subsections identify potential effects of stressors on SGCN habitat and propose collaborative voluntary actions to offset negative effects if they occur. Habitats in Chapter 2 form the organization of the following subsections. Voluntary actions apply to 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 introduction and spread of invasive species. These stressors are interacting to increase the prevalence of less productive and drier forest types, which are prone eventually to becoming shrublands and grasslands (Parks et al. 2019). Examples of high-profile SGCN occurring in Forest & Woodland habitats and potentially influenced by climate-related stressors include Mountain Goat, Moose, Fisher, Wolverine, Pinyon Jay, Clark's Nutcracker, Cassia Crossbill, Great Gray Owl, Western Bumble Bee, and Whitebark Pine. Table 3.11.1 proposes voluntary actions intended to SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.1 Potential 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 Mesic Lower Montane Forest Subalpine–High Montane Forest Whitebark Pine Forest & Woodland Pinyon–Juniper Woodland	Forest health is decreased by climate-related stressors. Moist productive forests are changing to drier forests.	Incentivize landowners and resource managers to conserve priority forests to benefit Idaho's SGCN, natural resource-based economy, and communities.
		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 Blister Rust, using prescribed burning and mechanical thinning to remove Subalpine Fir, and focusing restoration in colder locations (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 habitat 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

Table 3.11.1 Potential 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
		vegetation planting and management, and invasive species control).
Aspen Forest & Woodland	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).
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, BDAs/North American Beaver, 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 high-profile SGCN occurring in Temperate & Boreal Grassland & Shrubland habitats and potentially influenced by climate-related stressors include Mountain Goat, Rocky Mountain Bighorn Sheep, California Bighorn Sheep, Moose, American Pika, Northern Idaho Ground Squirrel, Southern Idaho Ground Squirrel, Mountain Quail, Sharp-tailed Grouse, Monarch Butterfly, and Spalding's Silene. Table 3.11.2 proposes voluntary actions intended to benefit SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.2 Potential 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 of high-priority SGCN populations and habitat 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 depends 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 Watermilfoil) 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). Examples of high-profile SGCN occurring in Shrub & Herb Wetland habitats and potentially influenced by climate-related stressors include Moose, Townsend's Big-eared Bat, Silver-haired Bat, Sandhill Crane, Clark's and Western Grebes, Short-eared Owl, Northern Leopard Frog, Monarch Butterfly, Western Bumble Bee, and Ute Lady's Tresses. Table 3.11.3 proposes voluntary actions intended to benefit SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.3 Potential 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 <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Bog & Fen Freshwater Marsh Vernal Pool Lowland Marsh, Wet Meadow & Shrubland Montane Marsh, Wet Meadow & Shrubland Alkali–Saline Marsh, Playa & Shrubland Montane Marsh, Wet Meadow & Shrubland	Wetland and riparian health is 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.
		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, 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 are capable of tolerating extreme temperatures and little precipitation, but ultimately needs appropriate winter and spring precipitation to persist. The following climate-related stresses are making many sagebrush shrublands even drier and prone to becoming annual grasslands: (1) warming temperatures, (2) prolonged drought, (3) changing precipitation and snowpack trends, (4) introduction and spread of invasive species (e.g., Cheatgrass), and (5) unnatural wildfire frequency, extent, and severity. Severe wildfire fueled by Cheatgrass is especially harmful to sagebrush shrublands and related SGCN. Examples of high-profile SGCN occurring in Desert & Semidesert habitats and potentially influenced by climate-related stressors include Pronghorn, Rocky Mountain and California bighorn sheep, Pygmy Rabbit, Greater Sage-Grouse, Golden Eagle, Burrowing Owl, Sagebrush Sparrow, Morrison's Bumble Bee, MacFarlane's Four O'clock, and Idaho Pepperweed (aka Slickspot Peppergrass). Table 3.11.4 proposes voluntary actions intended benefit SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.4 Potential voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Desert & Semidesert habitats

Habitat	**Effects <u>if</u> 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 Limber Pine at Craters of the Moon National Monument & Preserve).
	Rangeland health is decreased by invasive species infestation, which	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

Table 3.11.4 Potential 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
	increases risks of unnatural destructive wildfire. Rangelands are harmed by destructive wildfire.	response and suppression, and information and education).
		Protect of 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 high-profile SGCN occurring in Alpine Tundra and potentially influenced by climate-related stressors include Mountain Goat, Wolverine, Grizzly Bear, American Pika, Golden Eagle, Black Rosy-Finch, Gray-crowned Rosy-Finch, and Whitebark Pine. Table 3.11.5 proposes voluntary actions intended to benefit SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.5 Potential 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	Protect priority Alpine Tundra as a connected network that will help SGCN move as the distribution of high-

Table 3.11.5 Potential voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Alpine Tundra

Habitat	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
	decreased by climate-related stressors. Alpine meadows and tundra are changing to forest from invading conifer trees.	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.

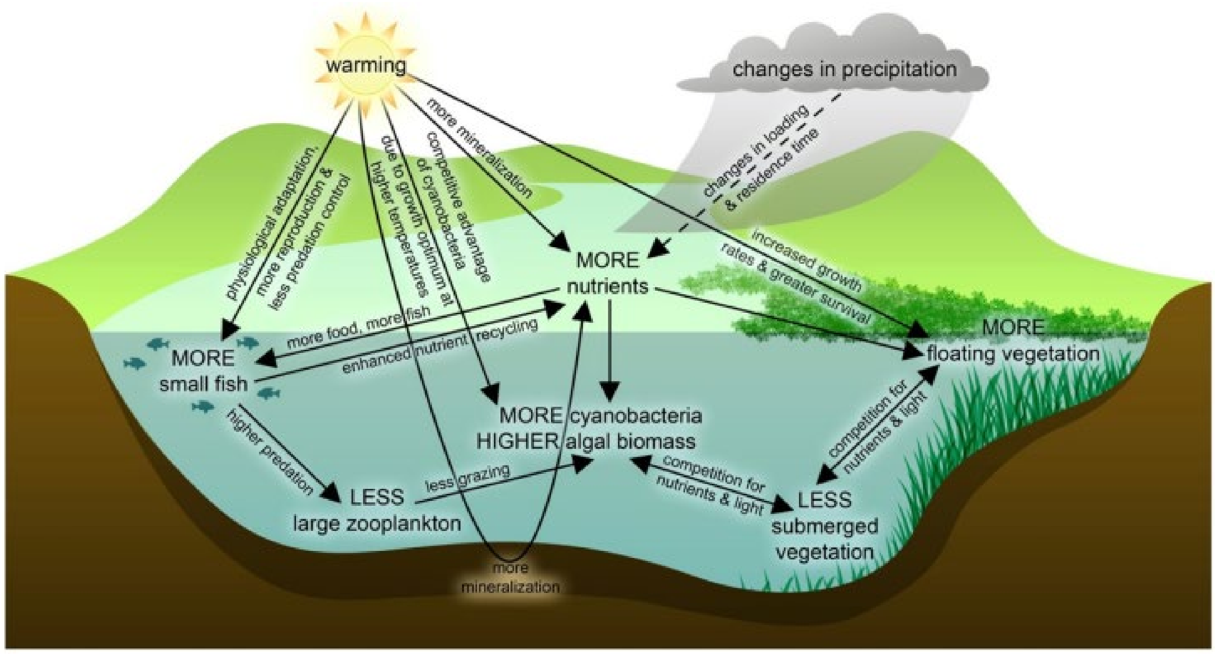


Fig. 3.11.4 General effects of warmer and drier conditions on Aquatic Habitat (from Short et al. 2016).

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 harms 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 high-profile SGCN occurring in Aquatic Vegetation & Freshwater Habitat and potentially influenced by climate-related stressors include Chinook Salmon, Sockeye Salmon, steelhead, Bull Trout, Yellowstone Cutthroat Trout, Bonneville Cutthroat Trout, White Sturgeon, Moose, Yuma Myotis, Common Loon, Clark's and Western grebes, and Water Howellia. Table 3.11.6 proposes voluntary actions intended to benefit SGCN by addressing negative effects of climate-related stressors if occurring.

Table 3.11.6 Potential voluntary actions intended to benefit SGCN and address climate-related stressors if 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 Small Streams (1st, 2nd order) – Perennial Large Streams (3rd, 4th order) Rivers (5th Order & Higher) Freshwater Aquatic Vegetation 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, 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).

Agricultural Habitat

Agriculture is 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., Greater Sage-Grouse, Pronghorn, Bobolink, and White-faced Ibis). However, a warmer and dryer 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 heatwaves. 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 dryer 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 of US agricultural lands were converted to non-agricultural 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 high-profile SGCN occurring in Agricultural Habitat and potentially influenced by climate-related stressors include Pronghorn, Moose, Little Brown Myotis, Silver-haired Bat, Hoary Bat, Franklin's Gull, White-faced Ibis, Bobolink, Monarch Butterfly, and Western Bumble Bee. Table 3.11.7 proposes voluntary actions intended to benefit SGCN by addressing negative effects of climate-related stressors.

Table 3.11.7 Potential voluntary actions intended to benefit SGCN and address climate-related stressors if affecting the quantity, quality, or connectivity of Agricultural Habitat

Habitat	**Effects <u>if</u> stressors occur**	**Voluntary actions, programs, projects, and BMPs**
Agricultural Vegetation	Agricultural Habitat is changed to nonhabitat.	Incentivize Agriculture 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	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

	stressors, invasive species infestation, and crop diseases.	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).
		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).

Species-specific Effects & Actions

In addition to affecting habitat, stressors can also affect specific SGCN or groups of SGCN. Table 3.11.8 identifies potential SGCN-specific effects of climate-related stressors and proposes voluntary actions to offset negative effects if they occur.

Table 3.11.8 Potential 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**
Amphibian SGCN	Reduced range extent or abundance associated with changing climate.	Investigate potential stressors affecting the distribution and abundance of amphibian SGCN and identify conservation actions to offset potential negative stressors.
Fish SGCN including: White Sturgeon Burbot Bull Trout	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 affects, 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).

Table 3.11.8 Potential 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
Sockeye and Chinook salmon Steelhead Yellowstone and Bonneville cutthroat trout Whitefish		Implement the Idaho Fisheries Management Plan (IDFG 2019).
		Implement the Management Plan for the Conservation of Yellowstone Cutthroat Trout in Idaho (IDFG 2019).
		Implement the Management Plan for the Conservation of Bonneville cutthroat Trout in Idaho (IDFG 2022).
		Implement the Management Plan for the Conservation of Snake River White Sturgeon in Idaho (IDFG 2008).
Rocky Mountain and California bighorn sheep Mountain Goat Moose Pronghorn Migratory bird and bat SGCN	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.
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, Morrison, and Western bumble bees	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:	Survival or reproduction is reduced by heat	Increase understanding of potential heat stress consequences on the survival and reproduction of cold-weather SGCN.

Table 3.11.8 Potential 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**
Mountain Goat Moose American Pika Wolverine Hoary Marmot Black Rosy-Finch Christ's Indian Paintbrush	or cold stress from warming temperatures and less insulating snowpack.	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).
Hibernating SGCN including: American Pika Northern Idaho Ground Squirrel Southern Idaho Ground Squirrel	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: Clark's Nutcracker Cassia Crossbill Pinyon Jay American Pika	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 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.
Pinyon Jay	Reduced nest success with changing climate.	Evaluate factors affecting Pinyon Jay nest success and forage availability and identify conservation actions to offset potential negative effects.

Table 3.11.8 Potential voluntary actions intended to benefit SGCN and address effects of climate-related stressors if occurring

Species	Effects <u>if</u> stressors occur	Voluntary actions, programs, projects, and BMPs
Harlequin Duck	Reduced survival and reproductive success associated with changing climate.	Identify important Harlequin Duck habitat, assess potential stressors affecting survival and reproduction, and identify conservation actions to offset potential negative stressors (Rockwell 2018).
Western and Clark's grebes	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.
Aquatic Invertebrate SGCN including: Banbury Springs Limpet Bliss Rapids Snail Bruneau Hot Springsnail Snake River Physa Western Pearlshell Western Ridged Mussel	Distribution or abundance is 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 including: Western Toad Woodhouse's Toad	Distribution or abundance is 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 conditions on amphibian SGCN.

Table 3.11.8 Potential 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
Northern Leopard Frog Columbia Spotted Frog		
Dune-related SGCN including: Idaho Dune Tiger Beetle Columbia River Tiger Beetle Bruneau Dune Tiger Beetle	Distribution or abundance is 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).
Whitebark Pine	Survival or reproduction are 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 and Pinyon 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).

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, 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 = 133 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:

- Columbia Oregonian (*Cryptomastix hendersoni*)—Under review for ESA protection as of this writing, this species was previously thought to only occur along the Columbia and Snake Rivers in OR, WA, and ID. 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. 2015). 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.
- 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 2017). Recent analysis by Linscott et al. (2020) suggested that species and subspecies designations in Idaho are uncertain and require additional evaluation.

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 is an example:

- 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. Or, Lake Chub might seasonally move from Kootenay Lake in BC upriver into the Kootenai River in Idaho.

In some cases, SGIN with distribution 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, distribution 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:

- 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 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.
- 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 2011). Additional population assessments are needed to document species distribution and abundance trends.

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:

- Big Brown Bat, Long-eared Myotis, and Long-legged Myotis—In June 2022, the fungus *Pd* that causes white-nose syndrome 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.
- 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, sub-adults or adults.
- 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 distribution-restricted SGIN with known risks to habitat and suspected, but undocumented, population declines:

- Black Swift, American Pipit, and Boreal Owl—these species occur in restricted habitats potentially affected by a loss of snowpack and changing seasonal runoff patterns. All 3 species are suspected to be declining, but current monitoring data is insufficient to estimate reliable 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. In 2021, a Merriam's Ground Squirrel survey found only 2 active colonies occurring on approximately 13,000 acres.
- 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.

Overarching Effects & Actions

Filling knowledge gaps is the overarching action for all SGIN: (1) clarify taxonomic uncertainty, (2) document distribution, (3) assess status and trend, and (4) identify additional gaps hindering conservation actions. 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, and substantially increased the understanding of 163 other species. Similar proactive and collaborative efforts would be most efficient for filling existing SGIN knowledge gaps. Table 3.12.1 proposes voluntary actions intended to address knowledge gaps for SGIN.

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.
5 mammals 2 reptiles 2 fish 63 invertebrates 17 plants	Distributional uncertainty	Implement collaborative multi-species 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.
4 amphibians 7 birds 10 mammals 3 reptiles 5 fish 7 invertebrates	Ecological uncertainty	Implement collaborative multi-species 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 monitoring. 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 as well as learn and improve the Idaho SWAP over time, as needed (i.e., practice adaptive management).

As part of our SWAP revision, we have 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. We intend this to serve as a dynamic database that allows us to both track monitoring for SWAP as well as to coordinate monitoring with our conservation partners.

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, 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 and 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 a range of key monitoring references, and have designed our monitoring program for SWAP around these recommendations, in particular, the following sources:

- [AFWA] Association of Fish and Wildlife Agencies, Teaming With Wildlife Committee, Effectiveness Measures Working Group. 2011. *Measuring the effectiveness of State Wildlife Grants: Final Report* [Internet]. Washington (DC): Association of Fish and Wildlife Agencies; [accessed 2012 Jul 14]. http://www.teaming.com/tool/measuring-effectiveness-state-wildlife-grants-final-report-2011. [CMP] Conservation Measures Partnership. 2020. *Open standards for the practice of conservation. Ver. 4.0*. [place unknown]: Conservation Measures Partnership. https://conservationstandards.org.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] Foundations of Success. 2019. *Designing monitoring and evaluation approaches for learning: An FOS how-to guide*. Bethesda (MD): Foundations of Success. [FOS] Foundations of Success. 2021. *Planning for conservation: a conservation standards how-to guide*. Bethesda (MD): Foundations of Success; [accessed 2022 Jun 20]. https://fosonline.org/library/planning-for-conservation-a-conservation-standards-how-to-guide/.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. https://fosonline.org/library/monitoring-wildlife-populations/.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 will have 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.

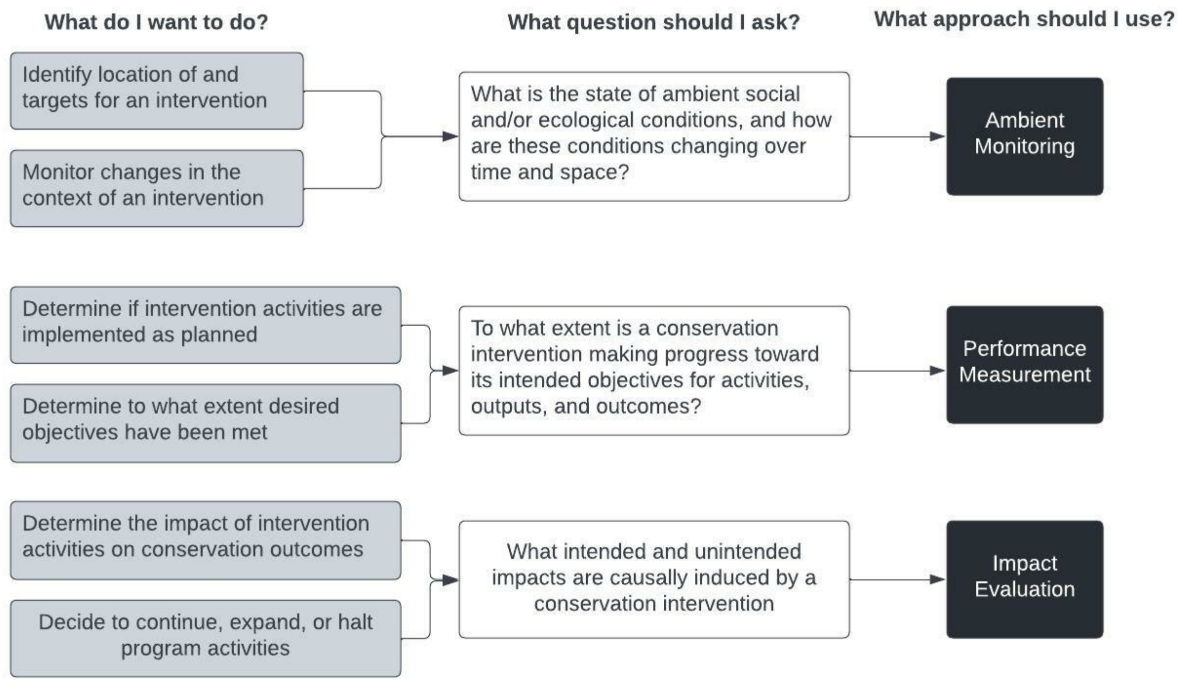


Fig. 4.1 Decision tree highlighting common information needs in conservation, and the question and approach to M&E that can best respond to those needs. Adapted from Mascia et al. (2014); Groves and Game (2016).

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.

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.

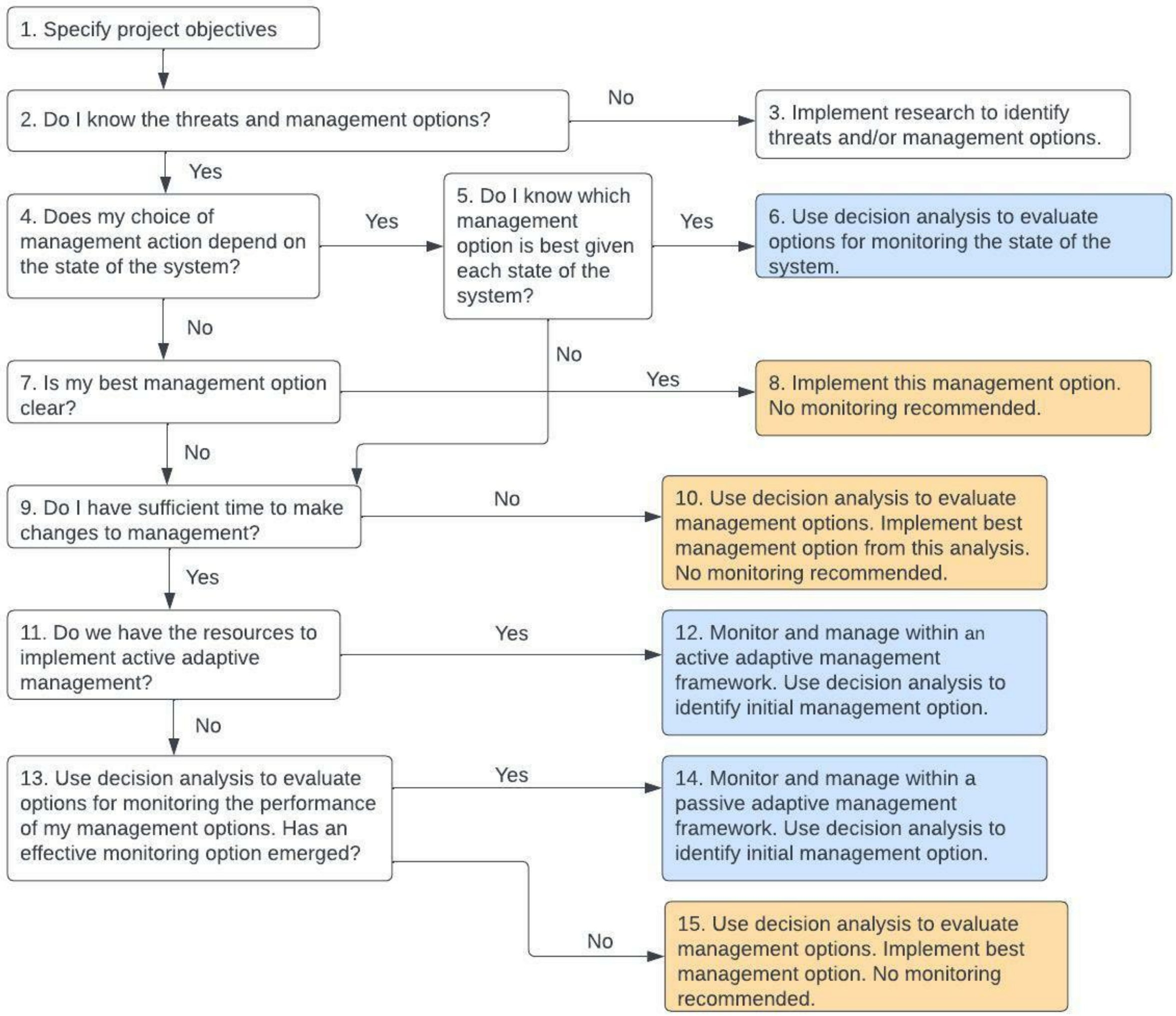


Fig. 4.2 Decision tree for helping decide whether and when to invest in monitoring conservation projects. Source: McDonald-Madden et al. (2010).

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).

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.

Chapter 5 Coordination & Review

Coordination and 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[w] 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, nongovernmental organizations (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 SWAP. We also gathered broad-based input from

[w] 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.

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 5). 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 it 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 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 will host a 30-day public comment period on the IDFG website in August 2022 where anyone can 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 includes the option to upload files for those who prefer to provide a formal letter or additional documentation (e.g., formal organizations). We will also make every effort to accommodate those stakeholders who wish to convey their input verbally over the phone or in person. We will also encourage public participation by sending a targeted email announcing the public comment period to a comprehensive list of known entities we have coordinated with in the past as well as newly identified stakeholders (Appendix 6).

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 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.

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 effort is currently underway by an AFWA work group to update the 2009 *Voluntary Guidance for States to Incorporate Climate Change into State Wildlife Action Plans & Other Management Plans* (AFWA 2009). As draft materials have become available, we have incorporated recommendations into the current revision. 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 English 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) 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 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 United States. 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 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 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.

English 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 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 mud snail	*Taylorconcha insperata*
a skiff beetle	*Hydroscapha redfordi*
a tiger beetle	*Cicindela decemnotata montevolans*
a yellow-masked bee	*Hylaeus lunicraterius*
American Bittern	*Botaurus lentiginosus*
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*

English common name	Scientific name
Bonneville Cisco	*Prosopium gemmifer*
Bonneville Cutthroat Trout	*Oncorhynchus clarkii utah*
Bonneville Whitefish	*Prosopium spilonotus*
Boreal Owl	*Aegolius funereus*
Boulder Pile Mountainsnail	*Oreohelix jugalis*
Brewer's Sparrow	*Spizella breweri*
Bruneau Dune Tiger Beetle	*Cicindela waynei*
Bruneau Hot Springsnail	*Pyrgulopsis bruneauensis*
bullhead	genus *Ameiurus* [I]
Bull Trout	*Salvelinus confluentus*
Burbot	*Lota*
Burrowing Owl	*Athene cunicularia*
caddisflies	Insecta: Trichoptera
California Gull	*Larus californicus*
Canada Jay	*Perisoreus canadensis*
Canada Lynx	*Lynx canadensis*
Canyon Bat	*Parastrellus hesperus*
Caribou	*Rangifer tarandus*
carp	genus *Ctenopharyngodon*, *Cyprinus*, *Hypophthalmichthys*, or *Mylopharyngodon* [I]
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*
chironomids	Diptera: Chironomidae
Cinnamon Teal	*Spatula cyanoptera*
Clark's Grebe	*Aechmophorus clarkii*
Clark's Nutcracker	*Nucifraga columbiana*
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 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*
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*
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*

English common name	Scientific name
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 Dune 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*
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 Goat	*Oreamnos americanus*
Mountain Quail	*Oreortyx pictus*
Mountain Pine Beetle	*Dendroctonus ponderosae*
Mountain Whitefish	*Prosopium williamsoni*
mountainsnail	genus *Oreohelix*
Nez Perce Pebblesnail	*Fluminicola gustafsoni*
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*

English common name	Scientific name
Pygmy Rabbit	*Sylvilagus idahoensis*
Pygmy Short-Horned Lizard	*Phrynosoma douglasii*
Pygmy Whitefish	*Prosopium coulterii*
Raptor Fairy Shrimp	*Branchinecta raptor*
Red-necked Phalarope	*Phalaropus lobatus*
Ring-billed Gull	*Larus delawarensis*
Rocky Mountain Axetail	*Securicauda hermani*
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*
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*
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*
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 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*

English common name	Scientific name
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 clarkii bouvieri*
Yuma Myotis	*Myotis yumanensis*

Appendix 2: Common and Scientific Names of Plant Species in this Plan

English common name	**Scientific name**
a liverwort	*Sphaerocarpos hians*
a liverwort, Northern Naugahyde Liverwort	*Ptilidium ciliare*
a rockcress	*Boechera rollinsiorum*
alder	genus *Alnus*
Alderleaf Buckthorn	genus *Rhamnus alnifolia*
Alfalfa	*Medicago sativa*
Alkali Cordgrass	*Spartina gracilis*
Alkali Cusickiella, Alkali False Whitlow-grass	*Cusickiella douglasii*
Alkali Mallow	*Malvella leprosa*
Alkali Sacaton	*Sporobolus airoides*
alkaligrass	genus *Puccinellia*
Alpine Bistort	*Polygonum viviparum*
Alpine Bluegrass	*Poa alpina*
Alpine Fescue	*Festuca brachyphylla*
Alpine Laurel	*Kalmia microphylla*
Alpine Leafybract Aster, Leafy or Leaf-bracted Aster	*Symphyotrichum foliaceum*
Alpine Meadow-Rue	*Thalictrum alpinum*
American Bistort	*Polygonum bistortoides*
American Elm	*Ulmus americana*
American Globeflower	*Trollius laxus*
American Licorice	*Glycyrrhiza lepidota*
American Mannagrass	*Glyceria grandis*
American Red Raspberry, Red Raspberry	*Rubus idaeus*
American Saw-Wort	*Saussurea americana*
American Skunkcabbage	*Lysichiton americanus*
American Thorow Wax	*Bupleurum americanum*
Analogue Sedge	*Carex simulata*
angelica	genus *Angelica*
Annual Hairgrass	*Deschampsia danthonioides*
Annual Rabbitsfoot Grass	*Polypogon monspeliensis*
Antelope Bitterbrush	*Purshia tridentata*
apple	genus *Malus*
Apricot	*Prunus armeniaca*
Arctic Willow	*Salix arctica*
arnica	genus *Arnica*
arrowgrass	genus *Triglochin*
arrowhead	genus *Sagittaria*
Arrowleaf Balsamroot	*Balsamorhiza sagittata*
Arrowleaf Ragwort, Arrowleaf Groundsel	*Senecio triangularis*
Arroyo Willow	*Salix lasiolepis*
aster	genus *Eucephalus*, *Eurybia*, *Ionactis, Oreostemma*, or genus *Symphyotrichum*
Bailey's Ivesia, Owyhee Ivesia	*Ivesia baileyi*
Bald Brome	*Bromus racemosus*
Baltic Rush	*Juncus balticus*
Barestem Biscuitroot	*Lomatium nudicaule*
barley	genus *Hordeum*
Barnyardgrass	*Echinochloa crus-galli*
Basin Big Sagebrush	*Artemisia tridentata*
Basin Wildrye	*Leymus cinereus*
Beaked Spikerush	*Eleocharis rostellata.*
Beardless Wildrye	*Leymus triticoides*
beardtongue	genus *Penstemon*
Bebb Willow	*Salix bebbiana*
bedstraw	genus *Galium*
beggarticks	genus *Bidens*
Bellardi Bog Sedge	*Kobresia myosuroides*
bellflower	genus *Campanula*
bentgrass	genus *Agrostis*
Big Sagebrush	*Artemisia tridentata*

English common name	Scientific name
Big Sagebrush, Foothill Big Sagebrush	*Artemisia tridentata* ssp. *xericensis*
Big Sagebrush, Snowfield Big Sagebrush	*Artemisia tridentata* ssp. *spiciformis*
Bigtooth Maple	*Acer grandidentatum*
Bishop's Goutweed	*Aegopodium podagraria*
Bitter Cherry	*Prunus emarginata*
bitterbrush	genus *Purshia*
Black Alpine Sedge	*Carex nigricans*
Black Cottonwood	*Populus balsamifera* ssp. *trichocarpa*
Black Hawthorn	*Crataegus douglasii*
Black Locust	*Robinia pseudoacacia*
Black Sagebrush	*Artemisia nova*
blackberry	genus *Rubus* [L48 I]
Blackroot Sedge	*Carex elynoides*
Blanketflower	*Gaillardia aristata*
blazingstar	genus *Mentzelia*
Blister Sedge	*Carex vesicaria*
Bloom Peak Dwarf-primrose, Bloom Peak Douglasia	*Douglasia conservatorum*
Blue Elderberry	*Sambucus nigra* ssp. *cerulea*
Blue Flax, Blue Garden Flax	*Linum perenne* [L48 I]
Blue Mountain Prairie Clover	*Dalea ornata*
Blue Wildrye	*Elymus glaucus*
bluebells	genus *Mertensia*
blueberry	genus *Vaccinium*
Bluebunch Wheatgrass	*Pseudoroegneria spicata*
Bluedome Primrose	*Primula alcalina*
bluegrass	genus *Poa*
Bluejoint	*Calamagrostis canadensis*
Bodin's Milkvetch, Bodin's Milk-vetch	*Astragalus bodinii*
Bog Birch	*Betula pumila*
Bog Blueberry	*Vaccinium uliginosum*
Bolander's Silver Sagebrush	*Artemisia cana* ssp. *bolanderi*
Booth's Evening Primrose	*Camissonia boothii*
Booth's Willow	*Salix boothii*
Boxelder	*Acer negundo*
brackenfern	genus *Pteridium*
bramble, blackberry, raspberry	genus *Rubus*
brickellbush	genus *Brickellia*
Bride's Bonnet	*Clintonia uniflora*
Bristlystalked Sedge	*Carex leptalea*
British Columbia Wildginger	*Asarum caudatum*
Broad Fleabane	*Erigeron latus*
Broadleaf Cattail	*Typha latifolia*
Broadleaved Pepperweed	*Lepidium latifolium*
brome	genus *Bromus*
Broom Snakeweed	*Gutierrezia sarothrae*
Brown Sedge	*Carex subfusca*
Brunsfeld's Desertparsley, Brunsfeld's Biscuitroot	*Lomatium brunsfeldianum*
Bryum Moss	*Bryum calobryoides*
Buckbean	*Menyanthes trifoliata*
buckwheat	genus *Eriogonum*
Bud Sagebrush	*Picrothamnus desertorum*
Buek's Groundsel, Few-leaved Groundsel, Alpine Meadow Butterweed	*Packera subnuda*
Bulbous Bluegrass	*Poa bulbosa* [L48 I]
bulrush	genus *Bolboschoenus*, *Schoenoplectus*, *Scirpus*, or *Trichophorum*
Bunchberry Dogwood	*Cornus canadensis*
Burningbush, Kochia	*Bassia scoparia* [L48 I]
bur-reed	genus *Sparganium*
Bush Penstemon, Shrubby Penstemon	*Penstemon fruticosus*
buttercup	genus *Ranunculus*
Buxbaum's Sedge	*Carex buxbaumii*
calicoflower	genus *Downingia*
California Damsonium	*Damasonium californicum*
California False Hellebore	*Veratrum californicum*

English common name	Scientific name
California Oatgrass	*Danthonia californica*
camas	genus *Camassia*
Canada Bluegrass	*Poa compressa*
Canada Thistle	*Cirsium arvense*
Canadian Burnet	*Sanguisorba canadensis*
Canadian Waterweed	*Elodea canadensis*
Canby's Licorice-root	*Ligusticum canbyi*
Carolina Bugbane	*Trautvetteria caroliniensis*
Carolina Foxtail	*Alopecurus carolinianus*
carpetweed	genus *Mollugo*
Carveseed	*Glyptopleura marginata*
Catnip	*Nepeta cataria* [L48 I]
cattail	genus *Typha*
Cereal Rye	*Secale cereale*
Chaffweed	*Anagallis minima*
Chairmaker's Bulrush	*Schoenoplectus americanus*
chamomile	genus *Anthemis* [L48 I]
Cheatgrass	*Bromus tectorum*
cherry	genus *Prunus*
Chickpea Milkvetch	*Astragalus cicer*
Chokecherry	*Prunus virginiana*
Christ's Indian Paintbrush	*Castilleja christii*
cinquefoil	genus *Potentilla*
Clasping Pepperweed	*Lepidium perfoliatum*
Claspleaf Twistedstalk	*Streptopus amplexifolius*
Clearwater Phlox	*Phlox idahonis*
Climbing Nightshade	*Solanum dulcamara*
clover	genus *Trifolium*
Clustered Field Sedge	*Carex praegracilis*
cocklebur	genus *Xanthium*
Colorado Rush	*Juncus confusus*
Columbia Brome	*Bromus vulgaris*
Columbia Needlegrass	*Achnatherum nelsonii*
Columbian Monkshood	*Aconitum columbianum*
Common Beargrass	*Xerophyllum tenax*
Common Bladderwort	*Utricularia macrorhiza*
Common Cowparsnip	*Heracleum maximum*
Common Duckweed	*Lemna minor*
Common Juniper	*Juniperus communis*
Common Ladyfern	*Athyrium filix-femina*
Common Mare's-tail	*Hippuris vulgaris*
Common Mullein	*Verbascum thapsus*
Common Reed	*Phragmites australis*
Common Rush	*Juncus effusus*
Common Sheep Sorrel	*Rumex acetosella* [L48 I]
Common Snowberry	*Symphoricarpos albus*
Common Spikerush	*Eleocharis palustris*
Common St. Johnswort	*Hypericum perforatum*
Common Starlily	*Leucocrinum montanum*
Common Tansy	*Tanacetum vulgare*
Common Threesquare	*Schoenoplectus pungens*
Common Velvetgrass	*Holcus lanatus*
Coon's Tail	*Ceratophyllum demersum*
Cosmopolitan Bulrush	*Bolboschoenus maritimus*
cottonwood	genus *Populus*
cowparsnip	genus *Heracleum*
Crack Willow	*Salix fragilis*
Creeping Barberry	*Mahonia repens*
Creeping Bentgrass	*Agrostis stolonifera*
Creeping Meadow Foxtail	*Alopecurus arundinaceus*
Creeping Sibbaldia	*Sibbaldia procumbens*
Crested Wheatgrass	*Agropyron cristatum*
Crossflower, Chlorispora, Blue Mustard	*Chorispora tenella* [L48 I]
cryptantha	genus *Cryptantha*
Curl-leaf Mountain Mahogany	*Cercocarpus ledifolius*

English common name	Scientific name
Curly Dock	*Rumex crispus*
Curly Sedge	*Carex rupestris*
currant	genus *Ribes*
Curveseed Butterwort, Bur Buttercup	*Ceratocephala testiculata*
Cushion Buckwheat	*Eriogonum ovalifolium*
Cushion Cryptantha	*Cryptantha circumscissa*
Cushion Phlox	*Phlox pulvinata*
Cusick’s Sedge	*Carex cusickii*
Cutleaf Waterparsnip	*Berula erecta*
Dalmatian Toadflax	*Linaria dalmatica*
Darkwoods Violet	*Viola orbiculata*
Davis’ Pepperweed	*Lepidium davisii*
Dendroalsia Moss	*Dendroalsia abietina*
Dense Silkybent, Interrupted Windgrass	*Apera interrupta* [L48 I]
Desert Centaury	*Centaurium exaltatum*
Desert Princesplume	*Stanleya pinnata*
Desert Sweet, Fern-bush	*Chamaebatiaria millefolium*
Desert Wheatgrass	*Agropyron desertorum*
desertdandelion, desert dandelion	genus *Malacothrix*
desertparsley, biscuitroot, biscuit-root, Lomatium	genus *Lomatium*
Devilsclub	*Oplopanax horridus*
Dewey Sedge	*Carex deweyana*
Diamondleaf Willow	*Salix planifolia*
Disappearing Monkeyflower	*Mimulus evanescens*
dock	genus *Rumex*
Dog Rose	*Rosa canina*
Douglas’ Dustymaiden	*Chaenactis douglasii*
Douglas-fir	*Pseudotsuga menziesii*
Douglass’ Springparsley, Douglass’s Spring Parsley	*Cymopterus douglassii*
draba	genus *Draba*
Drooping Woodreed	*Cinna latifolia*
Drummond’s Willow	*Salix drummondiana*
Drummond’s Rush	*Juncus drummondii*
duckmeat	genus *Spirodela*
duckweed	genus *Lemna*
Dusky Willow	*Salix melanopsis*
Dwarf Bilberry	*Vaccinium cespitosum*
Dwarf Goldenbush	*Ericameria nana*
Dwarf Milkvetch, Least Bladdery Milk-vetch	*Astragalus microcystisy*
Dwarf Mountain Lupine	*Lupinus lyallii*
Dwarf Rose	*Rosa gymnocarpa*
Eightpetal Mountain-avens	*Dryas octopetala*
elderberry	genus *Sambucus*
Elephanthead Lousewort	*Pedicularis groenlandica*
Elk Sedge	*Carex garberi*
elm	genus *Ulmus*
Elusive Jacob’s-ladder, Elusive Polemonium	*Polemonium elusum*
Engelmann Spruce	*Picea engelmannii*
Engelmann’s Aster	*Eucephalus engelmannii*
English sundew	*Drosera anglica*
Eurasian Watermilfoil	*Myriophyllum spicatum*
fairybells	genus *Prosartes*
false hellebore	genus *Veratrum*
false indigo	genus *Amorpha*
False Mayweed	*Tripleurospermum maritimum* [L48 I]
false pimpernel	genus *Lindernia*
Falsegold Groundsel	*Packera pseudaurea*
Fendler’s Meadow-rue	*Thalictrum fendleri*
fescue	genus *Festuca*, *Schedonorus*, or *Vulpia*
Fewflower Spikerush	*Eleocharis quinqueflora*
fiddleneck	genus *Amsinckia*
Field Bindweed	*Convolvulus arvensis*
Field Brome	*Bromus arvensis*
Field Horsetail	*Equisetum arvense*
Field Pennycress	*Thlaspi arvense*

English common name	Scientific name
Field Sagewort	*Artemisia campestris*
Field Sowthistle, Perennial Sow-thistle, Field Sow-thistle	Sonchus arvensis [L48 I]
Fineleaf Hymenopappus	*Hymenopappus filifolius*
Fireweed	*Chamerion angustifolium*
Fivehorn Smotherweed	*Bassia hyssopifolia*
Fivestamen Miterwort	*Mitella pentandra*
flatsedge	genus *Cyperus*
Flatspine Bur Ragweed	*Ambrosia acanthicarpa*
Flatspine Stickseed	*Lappula occidentalis*
Flat-top Pussytoes	*Antennaria corymbosa*
fleabane	genus *Erigeron*
Fleshy Porterella	*Porterella carnosula*
Floating Pondweed	*Potamogeton natans*
Forage Kochia	*Bassia prostrata*
forget-me-not	genus *Myosotis*
Fourwing Saltbush	*Atriplex canescens*
Fowl Bluegrass	*Poa palustris*
Fowl Mannagrass	*Glyceria striata*
Foxtail Barley	*Hordeum jubatum*
Foxtail Pricklegrass	*Crypsis alopecuroides*
Fragrant Bedstraw	*Galium triflorum*
Franklin's Sandwort	*Arenaria franklinii*
Fremont Cottonwood	*Populus fremontii*
Fringed Grass of Parnassus	*Parnassia fimbriata*
Fringed Willowherb	*Epilobium ciliatum*
Fuller's Teasel	*Dipsacus fullonum*
Gairdner's Beardtongue, Gairdner's Penstemon	*Penstemon gairdneri*
Gardner's Saltbush	*Atriplex gardneri*
Gardner's Yampah	*Perideridia gairdneri*
gentian	genus *Gentiana*
geranium	genus *Geranium*
German-madwort	*Asperugo procumbens*
Geyer Willow	*Salix geyeriana*
Geyer's Sedge	*Carex geyeri*
Geyer's Milkvetch	*Astragalus geyeri*
Giant Hyssop, Horse-mint	genus *Agastache*
Giant Mountain Aster	*Canadanthus modestus*
gilia	genus *Gilia*
Glaucous Bluegrass	*Poa glauca*
Globe Penstemon	*Penstemon globosus*
globemallow	genus *Sphaeralcea*
Golden Currant	*Ribes aureum*
goldenbush	genus *Ericameria*
goldenrod	genus *Solidago*
goldenweed	genus *Pyrrocoma*
goldenweed, mock goldenweed	genus *Nestotus*
Gooding's Gooseberry	*Ribes velutinum*
Gooseberry Currant	*Ribes montigenum*
Gooseberryleaf Globemallow	*Sphaeralcea grossulariifolia*
goosefoot	genus *Chenopodium*
Gordon's Ivesia	*Ivesia gordonii*
Grand Fir	*Abies grandis*
Granite Prickly Phlox	*Linanthus pungens*
Gray Alder	*Alnus incana*
Graylocks Four-nerve Daisy	*Tetraneuris grandiflora*
Gray's Biscuitroot	*Lomatium grayi*
Greasewood	*Sarcobatus vermiculatus*
Great Basin Langloisia	*Langloisia setosissima*
Green Ash	*Fraxinus pennsylvanica*
Green Molly	*Bassia americana*
Greenleaf Willow	*Salix lucida* ssp. *caudata*
Ground Nama	*Nama aretioides*
Grouse Whortleberry	*Vaccinium scoparium*
Gypsyflower, Common Hound's-tongue	*Cynoglossum officinale* [L48 I]
Hairy False Goldenaster	*Heterotheca villosa*

English common name	Scientific name
Hairy Waterclover	*Marsilea vestita*
Hardstem Bulrush	*Schoenoplectus acutus*
hawksbeard	genus *Crepis*
hawthorn	genus *Crataegus*
Heartleaf Arnica	*Arnica cordifolia*
heath family	family *Ericaceae*
hedgehyssop	genus *Gratiola*
hedgenettle	genus *Stachys*
Herb Sophia	*Descurainia sophia*
Hillman's Stinkweed	*Cleomella hillmanii*
Himalayan Blackberry	*Rubus armeniacus*
Hitchcock's Smooth Woodrush	*Luzula glabrata* var. *hitchcockii*
Hoary Tansyaster	*Machaeranthera canescens*
Hood's Sedge	*Carex hoodii*
Hooker's Balsamroot	*Balsamorhiza hooker.*
Hooker's Buckwheat	*Eriogonum hookeri*
Horned Pondweed	*Zannichellia palustris*
horsebrush	genus *Tetradymia*
horsetail	genus *Equisetum*
hound's tongue, hound's-tongue	genus *Cynoglossum* [L48 I]
Houndstongue Hawkweed	*Hieracium cynoglossoides*
Idaho Fescue	*Festuca idahoensis*
Idaho Goldthread	*Coptis occidentalis*
Idaho Pepperweed, Slickspot Peppergrass	*Lepidium papilliferum*
Idaho Stonecrop	*Sedum valens*
Idaho Xanthoparmelia Lichen	*Xanthoparmelia idahoensis*
Indian paintbrush	genus *Castilleja*
Indian Ricegrass	*Achnatherum hymenoides*
Indian Valley Sedge	*Carex aboriginum*
Indianhemp	*Apocynum cannabinum*
Intermediate Wheatgrass	*Thinopyrum intermedium*
Iodinebush	*Allenrolfea occidentalis*
Jacob's-ladder	*Polemonium pulcherrimum*
Jagged Chickweed	*Holosteum umbellatum*
Jessica Sticktight	*Hackelia micrantha*
juniper	genus *Juniperus*
Katie's Fleabane	*Erigeron katiae*
Kentucky Bluegrass	*Poa pratensis*
King's sandwort	*Arenaria kingii*
Kinnikinnick	*Arctostaphylos uva-ursi*
knapweed	genus *Centaurea*
knotweed, smartweed	genus *Polygonum*
ladyfern	genus *Athyrium*
Lakeshore Sedge	*Carex lenticularis*
Lambsquarters	*Chenopodium album*
Lambstongue Ragwort	*Senecio integerrimus*
Largehead Clover	*Trifolium macrocephalum*
Largeleaf Avens	*Geum macrophyllum*
larkspur	genus *Delphinium*
Lava Aster	*Ionactis alpina*
Leafy Pondweed	*Potamogeton foliosus*
Leafy Spurge	*Euphorbia esula*
Lemmon's Willow	*Salix lemmonii*
Lemon Scurfpea	*Psoralidium lanceolatum*
Leslie Gulch Monardella	*Monardella angustifolia*
Lesser Burdock	*Arctium minus*
Lewis' Mock Orange	*Philadelphus lewisii*
licorice-root	genus *Ligusticum*
Limber Pine	*Pinus flexilis*
Little Hogweed	*Portulaca oleracea*
Little Sagebrush, Low Sagebrush, Dwarf Sagebrush	*Artemisia arbuscula*
Little Sunflower	*Helianthus pumilus*
Littleleaf Horsebrush	*Tetradymia glabrata*
Littleleaf Pussytoes	*Antennaria microphylla*
Livid Sedge	*Carex livida*

English common name	Scientific name
locoweed	genus *Oxytropis*
Lodgepole Pine	*Pinus contorta*
Longleaf Phlox	*Phlox longifolia*
loosestrife	genus *Lythrum*
lovegrass	genus *Eragrostis*
lupine	genus *Lupinus*
Lyall's Angelica	*Angelica arguta*
MacFarlane's Four O'clock, Macfarlane's Four-o'clock	*Mirabilis macfarlanei*
Mackenzie's Willow	*Salix prolixa*
maidenhair fern	genus *Adiantum*
Mallow Ninebark	*Physocarpus malvaceus*
mannagrass	genus *Glyceria*
Manyflower Stickseed	*Hackelia floribunda*
Marsh Grass of Parnassus	*Parnassia palustris*
marsh marigold	genus *Caltha*
Marsh Phlox	*Phlox kelseyi*
Mat Muhly	*Muhlenbergia richardsonis*
Mat Rockspirea	*Petrophytum caespitosum*
Matted Buckwheat	*Eriogonum caespitosum*
Meadow Barley	*Hordeum brachyantherum*
Meadow Foxtail	*Alopecurus pratensis*
Meadow Milkvetch	*Astragalus diversifolius*
Meadow Sedge	*Carex praticola*
meadow-rue	genus *Thalictrum*
Medusahead	*Taeniatherum caput-medusae*
Midget Quillwort	*Isoetes miniman*
milkvetch	genus *Astragalus*
milkweed	genus *Asclepias*
Milkwort Knotweed	*Polygonum polygaloides*
miterwort	genus *Mitella*
mock goldenweed	genus *Stenotus*
monkshood	genus *Aconitum*
moss	*Bryopsida—true mosses*
Moss Campion	*Silene acaulis*
mountain ash	genus *Sorbus*
Mountain Ball Cactus, Simpson Hedgehog Cactus, Simpson's Ball Cactus	*Pediocactus simpsonii*
Mountain Big Sagebrush	*Artemisia tridentata ssp. vaseyana*
Mountain Brome	*Bromus marginatus*
Mountain Deathcamas	*Zigadenus elegans*
Mountain Hemlock	*Tsuga mertensiana*
Mountain Sedge	*Carex scopulorum*
Mountain Snowberry	*Symphoricarpos oreophilus*
Mountain Willow, Eastwood's Willow	*Salix eastwoodiae*
mountainheath	*Phyllodoce ×intermedia* (pro sp.) [*empetriformis × glanduliflora*]
mountainheath	genus *Phyllodoce*
Mouse Barley	*Hordeum murinum*
mousetail	genus *Ivesia*
mousetail	genus *Myosurus*
Mud Sedge	*Carex limosa*
mudwort	genus *Limosella*
muhly	genus *Muhlenbergia*
Mule-ears	*Wyethia amplexicaulis*
nailwort	genus *Paronychia*
Nakedstem Sunray	*Enceliopsis nudicaulis*
Narrowleaf Bur-Reed	*Sparganium angustifolium*
Narrowleaf Cattail	*Typha angustifolia*
Narrowleaf Cottonwood, Narrow-leaved Cottonwood	*Populus angustifolia*
Narrowleaf Grapefern, Slender Moonwort	*Botrychium lineare*
Narrowleaf Willow	*Salix exigua*
Near Navarretia	*Navarretia intertexta* ssp. *propinqua*
Nearlyblack Sedge	*Carex subnigricans*
Nebraska Sedge	*Carex nebrascensis*
Neckweed	*Veronica peregrina*

English common name	**Scientific name**
Needle and Thread	*Hesperostipa comata*
Needle Spikerush	*Eleocharis acicularis*
needlegrass	genus *Achnatherum*
Netleaf Hackberry	*Celtis laevigata* var. *reticulata*
Nettleleaf Giant Hyssop, Nettle-leaf Horse-mint, Nettle-leaf Giant-hyssop	*Agastache urticifolia*
Nevada Bluegrass	*Poa secunda* ssp. *juncifolia*
Nevada Bulrush	*Scirpus nevadensis*
Nevada Goldenrod	*Solidago spectabilis*
Nevada Pea	*Lathyrus lanszwertii*
Nevada Rush	*Juncus tiehmii*
Nez Perce Monkeyflower	*Erythranthe ampliata*
ninebark	genus *Physocarpus*
North Africa Grass	*Ventenata dubia*
Northern Bedstraw	*Galium boreale*
Northern Black Currant	*Ribes hudsonianum*
Northern Catalpa	*Catalpa speciosa*
Northern Singlespike Sedge	*Carex scirpoidea*
Northern Water Plantain	*Alisma triviale*
Northwest Territory Sedge	*Carex utriculata*
Northwestern Indian Paintbrush, Desert Paintbrush	*Castilleja angustifolia*
Northwestern Yellowflax, Northwestern Yellow Hard Flax	*Sclerolinon digynum*
Nuttall's Crinklemat	*Tiquilia nuttallii*
Nuttall's Povertyweed	*Monolepis nuttalliana*
oatgrass	genus *Danthonia*
Oblong Bluecurls, Mountain Blue-curls	*Trichostema oblongum*
Oceanspray	*Holodiscus discolor*
Old Man's Whiskers, Prairie Smoke	*Geum triflorum*
Oneflower Helianthella	*Helianthella uniflora*
Oneflower Kelseya	*Kelseya uniflora*
Onespike Danthonia	*Danthonia unispicata*
onion	genus *Allium*
Orchardgrass	*Dactylis glomerata*
Oregon Boxleaf	*Paxistima myrsinites*
Oregon Checkerbloom	*Sidalcea oregana*
Orthotrichum Moss, Elegant Bristle Moss	*Orthotrichum pulchellum*
Owyhee River Stickseed	*Hackelia ophiobia*
Owyhee Sage, Owyhee Sagebrush	*Artemisia papposa*
Oxeye Daisy	*Leucanthemum vulgare*
Pacific Hulsea	*Hulsea algida*
Pacific Ninebark	*Physocarpus capitatus*
Pacific Trillium	*Trillium ovatum*
Pacific Yew	*Taxus brevifolia*
Packard's Milkvetch	*Astragalus packardiae*
Packard's Wormwood	*Artemisia packardiae*
Pale Evening Primrose	*Oenothera pallida*
Paleyellow Iris	*Iris pseudacorus*
Paleyellow Touch-me-not	*Impatiens aurella*
Panicled Bulrush, Small-fruit Bulrush	*Scirpus microcarpus*
Paper Birch	*Betula papyrifera*
Parish's Snowberry	*Symphoricarpos rotundifolius*
Parry's Sedge	*Carex parryana*
Parry's Clover	*Trifolium parryi*
Parsnipflower Buckwheat, Wyeth Buckwheat, Parsnip-flowered Buckwheat	*Eriogonum heracleoides*
Partridgefoot	*Luetkea pectinata*
Payson's sedge	*Carex paysonis*
Peachleaf Willow	*Salix amygdaloides*
pear	genus *Pyrus*
pepperweed	genus *Lepidium*
phlox	genus *Phlox*
pincushionplant, navarretia	genus *Navarretia*
Pinegrass	*Calamagrostis rubescens*
Pink Alumroot	*Heuchera rubescens*

English common name	Scientific name
Pink Mountainheath	*Phyllodoce empetriformis*
Plains Cottonwood	*Populus deltoides* ssp. *monilifera* [I]
plantain	genus *Plantago*
Plantainleaf Buttercup	*Ranunculus alismifolius*
Poison Hemlock	*Conium maculatum*
Poke Knotweed	*Polygonum phytolaccifolium*
Ponderosa Pine	*Pinus ponderosa*
pondweed	genus *Potamogeton*
pondweed	genus *Stuckenia*
popcornflower	genus *Plagiobothrys*
povertyweed	*Iva axillaris*
povertyweed	genus *Monolepis*
Prairie Junegrass	*Koeleria macrantha*
Prairie Sagewort, Pasture Sagebrush, Fringed Sagebrush	*Artemisia frigida*
Prickly Currant	*Ribes lacustre*
Prickly Lettuce	*Lactuca serriola*
Prickly Russian Thistle	*Salsola tragus*
Prickly Sandwort	*Arenaria aculeata*
pricklypear	genus *Opuntia*
primrose-willow	genus *Ludwigia*
princesplume	genus *Stanleya*
Prostrate Knotweed	*Polygonum aviculare*
Pullup Muhly	*Muhlenbergia filiformis*
Purple Loosestrife	*Lythrum salicaria*
Purple Marshlocks	*Comarum palustre*
Purple Reedgrass	*Calamagrostis purpurascens*
Purple Sage	*Salvia dorrii*
Purple Threeawn	*Aristida purpurea*
Pursh Seepweed	*Suaeda calceoliformis*
pussytoes	genus *Antennaria*
pygmyweed	genus *Crassula*
Quackgrass	*Elymus repens*
Quaking Aspen	*Populus tremuloides*
rabbitbrush	genus *Chrysothamnus*
Rabbitbush	*Ericameria bloomeri*
rabbitsfoot grass	genus *Polypogon*
ragwort, groundsel, butterweed	genus *Packera*
ragwort, groundsel, butterweed	genus *Senecio*
Rattan’s Phacelia	*Phacelia rattanii*
Rayless Alkali Aster	*Symphyotrichum ciliatum*
Raynolds’ Sedge	*Carex raynoldsii*
Red Alder	*Alnus rubra*
Red Baneberry	*Actaea rubra*
Red Swampfire, Red Glasswort	*Salicornia rubra*
Redosier Dogwood	*Cornus sericea*
Redstem Ceanothus	*Ceanothus sanguineus*
Redstem Stork’s Bill	*Erodium cicutarium*
Redwool Plantain	*Plantago eriopoda*
Reed Canarygrass	*Phalaris arundinacea*
Rice Cutgrass	*Leersia oryzoides*
ricegrass	genus *Oryzopsis*, *Piptatheropsis*, or *Piptatheru*
Richardson’s Pondweed	*Potamogeton richardsonii*
River Hawthorn	*Crataegus rivularis*
Robbins’ Pondweed	*Potamogeton robbinsii*
Robinson’s Starwort	*Pseudostellaria oxyphylla*
Rock Buckwheat	*Eriogonum sphaerocephalum*
rockcress	*genus Arabidopsis or Arabis*
Rockloving Wavewing	*Pteryxia petraea*
Rockspirea	*Holodiscus dumosus*
rockspirea	genus *Petrophytum*
Rocky Mountain Goldenrod	*Solidago multiradiata*
Rocky Mountain Groundsel, Cleft-leaf Groundsel	*Packera streptanthifolia*
Rocky Mountain Iris	*Iris missouriensis*
Rocky Mountain Juniper	*Juniperus scopulorum*

English common name	Scientific name
Rocky Mountain Maple	*Acer glabrum*
Rocky Mountain Pond-lily	*Nuphar lutea* ssp. *polysepala*
rose	genus *Rosa*
Rose Spirea	*Spiraea douglasii*
Ross' Avens	*Geum rossii*
Ross' Sedge	*Carex rossii*
rotala	genus *Rotala*
Rough Bentgrass	*Agrostis scabra*
Rough Bugleweed	*Lycopus asper*
Rough Fescue	*Festuca campestris*
Roughfruit Fairybells	*Prosartes trachycarpa*
Rubber Rabbitbrush	*Ericameria nauseosa*
rush	genus *Juncus*
Rush Skeletonweed	*Chondrilla juncea*
Russet Buffaloberry	*Shepherdia canadensis*
Russian Olive	*Elaeagnus angustifolia*
Rusty Menziesia	*Menziesia ferruginea*
ryegrass	genus *Lolium*
sagebrush	genus *Artemisia*
Sago Pondweed	*Stuckenia pectinata*
sainfoin	*Onobrychis* [L48 I]
Saline Wildrye	*Leymus salinus*
Salmon River Beardtongue	*Penstemon pumilus Nutt.*
saltbush	genus *Atriplex*
Saltgrass	*Distichlis spicata*
Saltlover	*Halogeton glomeratus*
Sand Dropseed	*Sporobolus cryptandrus*
Sandberg Bluegrass	*Poa secunda*
sandwort	genus *Arenaria*
sandwort	genus *Moehringia*
Saskatoon Serviceberry	*Amelanchier alnifolia*
saxifrage	genus *Saxifraga*
Scabland Penstemon	*Penstemon deustus*
Scabland Sagebrush	*Artemisia rigida*
Scotch Broom	*Cytisus scoparius*
Scotch Cottonthistle, Scotch Thistle	*Onopordum acanthium* [L48 I]
Scouler's Willow	*Salix scouleriana*
Scratchgrass, Alkali Muhly	*Muhlenbergia asperifolia*
Sea Milkwort	*Glaux maritima*
Seaside Arrowgrass	*Triglochin maritima*
sedge	genus *Carex*
serviceberry	genus *Amelanchier*
Shadscale Saltbush	*Atriplex confertifolia*
shaggy fleabane	*Erigeron pumilus*
Sharpleaf Penstemon	*Penstemon acuminatus*
Sheep Sedge	*Carex illota*
Sheldon's Sedge	*Carex sheldonii*
Shining Willow	*Salix lucida*
Short Woollyheads	*Psilocarphus brevissimus*
Shortawn Foxtail	*Alopecurus aequalis*
Short-rayed Alkali Aster	*Symphyotrichum frondosum*
Shortspike Watermilfoil	*Myriophyllum sibiricum*
Shortspine Horsebrush	*Tetradymia spinosa*
Showy Milkweed	*Asclepias speciosa*
Showy Townsend Daisy	*Townsendia florifer*
Shrubby Cinquefoil	*Dasiphora fruticosa*
Siberian Elm	*Ulmus pumila*
Siberian Wheatgrass	*Agropyron fragile*
Sickletop Lousewort	*Pedicularis racemosa*
Sierra Hare Sedge	*Carex leporinella*
Sierra Rush	*Juncus nevadensis*
Sierra Shootingstar	*Dodecatheon jeffreyi*
Silver Chickensage	*Sphaeromeria argentea*
Silver Maple	*Acer saccharinum*
Silver Sagebrush	*Artemisia cana*

English common name	Scientific name
Silverleaf Phacelia	*Phacelia hastata*
Silverweed Cinquefoil	*Argentina anserina*
Silvery Lupine	*Lupinus argenteus*
Simple Bog Sedge	*Kobresia simpliciuscula*
Singlehead Goldenbush	*Ericameria suffruticosa*
Singleleaf Pinyon	*Pinus monophylla*
Sitka Alder	*Alnus viridis* ssp. *sinuata*
Sitka Willow	*Salix sitchensis*
skeletonweed	genus *Chaetadelpha* or *Pleiacanthus*
skullcap	genus *Scutellaria*
Skunkbush Sumac	*Rhus trilobata*
skunkcabbage	genus *Lysichiton*
Slender Buckwheat	*Eriogonum microthecum*
Slender Cinquefoil	*Potentilla gracilis*
Slender Mountain Sandwort	*Arenaria capillaris*
Slender Wheatgrass	*Elymus trachycaulus*
Slenderbeak Sedge	*Carex athrostachya*
Slimstem Reedgrass	*Calamagrostis stricta*
Small Bur-reed	*Sparganium natans*
Small Camas	*Camassia quamash*
Small Enchanter's Nightshade	*Circaea alpina*
Smallwing Sedge	*Carex microptera*
Smooth Brome	*Bromus inermis*
Smooth Desertdandelion	*Malacothrix glabrata*
Smooth Spike-primrose	*Epilobium pygmaeum*
Smooth Sumac	*Rhus glabra*
Snake River Wheatgrass	*Elymus wawawaiensis*
Snow Willow	*Salix nivalis*
snowberry	*Symphoricarpos*
Snowbrush Ceanothus	*Ceanothus velutinus*
Softleaf Sedge	*Carex disperma*
Softstem Bulrush	*Schoenoplectus tabernaemontani*
Sowthistle, Sow-thistle	genus *Sonchus*
Spalding's Silene, Spalding's Catchfly	*Silene spaldingii*
Spear Saltbush	*Atriplex patula*
speedwell	genus *Veronica*
sphagnum	genus *Sphagnum*
spiderflower	genus *Cleome*
Spike Fescue	*Leucopoa kingii*
spikemoss	genus *Selaginella*
spikerush	genus *Eleocharis*
Spiny Greasebush, Spiny Green-bush, Nevada Greasewood	*Glossopetalon spinescens*
Spiny Hopsage	*Grayia spinosa*
Spiny Phlox, Hood's Phlox	*Phlox hoodii*
spirea	genus *Spiraea*
Spokane False Goldenaster	*Heterotheca barbata*
Spotted Knapweed	*Centaurea stoebe* [L48 I]
Spreading Dogbane	*Apocynum androsaemifolium*
springbeauty	genus *Claytonia*
springparsley	genus *Cymopterus*
Squirreltail	*Elymus elymoides*
St. Anthony Dunes Evening Primrose	*Oenothera psammophila*
Starry False Lily of the Valley	*Maianthemum stellatum*
Stemless Mock Goldenweed	*Stenotus acaulis*
stickseed	genus *Hackelia* or *Lappula*
Sticky Polemonium	*Polemonium viscosum*
Sticky Purple Geranium	*Geranium viscosissimum*
Sticky Tofieldia	*Triantha occidentalis* ssp. *brevistyla*
Sticky Tofieldia	*Triantha occidentalis* ssp. *montana*
Stinging Nettle	*Urtica dioica*
stonecrop	genus *Hylotelephium*, *Rhodiola*, or *Sedum*
stoneseed	genus *Lithospermum*
Subalpine Fir	*Abies lasiocarpa*
Subalpine Fleabane	*Erigeron peregrinus*

English common name	Scientific name
Subalpine Larch	*Larix lyallii*
Sulphur Cinquefoil	*Potentilla recta*
suncup	genus *Camissonia*
Swallen's Needlegrass	*Achnatherum swallenii*
Swamp Milkweed	*Asclepias incarnata*
Sweet Vernalgrass	*Anthoxanthum odoratum*
Sweetberry Honeysuckle	*Lonicera caerulea*
Sweetbriar Rose	*Rosa rubiginosa*
Sweetcicely	*Osmorhiza berteroi*
Sweetclover	*Melilotus officinalis*
Sweetflag	*Acorus americanu.*
sweetroot	genus *Osmorhiza*
Swinger's Biscuitroot	*Lomatium swingerae*
Switchgrass	*Panicum virgatum*
Tall Cottongrass	*Eriophorum angustifolium*
Tall Ragwort	*Senecio serra*
Tall Tumblemustard	*Sisymbrium altissimum*
Tall Wheatgrass	*Thinopyrum ponticum*
tamarisk, saltcedar	genus *Tamarix* [L48 I]
Tapertip Hawksbeard	*Crepis acuminata*
Tapertip Onion	*Allium acuminatum*
Thickspike Wheatgrass	*Elymus lanceolatus*
Thimbleberry	*Rubus parviflorus*
Thinleaf Huckleberry	*Vaccinium membranaceum*
Thorn Skeletonweed	*Pleiacanthus spinosus*
Threeleaf Foamflower	*Tiarella trifoliata*
Threetip Sagebrush	*Artemisia tripartita*
Thurber's Needlegrass	*Achnatherum thurberianum*
Thymeleaf Buckwheat	*Eriogonum thymoides*
Timber Milkvetch	*Astragalus miser*
Timber Oatgrass	*Danthonia intermedia*
Timothy	*Phleum pratense*
Tinker's Penny	*Hypericum anagalloides*
Torrey's Rush	*Juncus torreyi*
Truckee Rabbitbrush	*Chrysothamnus humilis*
True mosses	genus *Bryopsida*
Tufted Bulrush	*Trichophorum cespitosum*
Tufted Hairgrass	*Deschampsia cespitosa*
Tundra Aster	*Oreostemma alpigenum*
Twinberry Honeysuckle	*Lonicera involucrata*
Twinflower	*Linnaea borealis*
Twinflower Sandwort	*Minuartia obtusiloba*
Utah Juniper	*Juniperus osteosperma*
Utah serviceberry	*Amelanchier utahensis*
Ute Lady's Tresses, Ute Ladies-tresses	*Spiranthes diluvialis*
valerian	genus *Valeriana*
Variableleaf Pondweed	*Potamogeton gramineus*
Varileaf Cinquefoil	*Potentilla diversifolia*
Veiny Dock	*Rumex venosus*
violet	genus *Viola*
Virginia Strawberry	*Fragaria virginiana*
Wasatch Desertparsley	*Lomatium bicolor*
Water Birch	*Betula occidentalis*
water hemlock	genus *Cicuta*
Water Horsetail	*Equisetum fluviatile*
Water Howellia	*Howellia aquatilis*
Water Knotweed	*Polygonum amphibium*
Water Sedge	*Carex aquatilis*
Watercress	*Nasturtium officinale*
waterhorehound, bugleweed, water-horehound	genus *Lycopus*
waternymph	genus *Najas*
Watershield	*Brasenia schreberi*
water-starwort	genus *Callitriche*
waterwort	genus *Elatine*
Wax Currant	*Ribes cereum*

English common name	**Scientific name**
Western Columbine	*Aquilegia formosa*
Western Coneflower	*Rudbeckia occidentalis*
Western False Asphodel	*Triantha occidentalis*
Western Hemlock	*Tsuga heterophylla*
Western Juniper	*Juniperus occidentalis*
Western Labrador Tea	*Ledum glandulosum*
Western Larch	*Larix occidentalis*
Western Meadow-rue	*Thalictrum occidentale*
Western Moss Heather	*Cassiope mertensiana*
Western Oakfern	*Gymnocarpium dryopteris*
Western Pearly Everlasting	*Anaphalis margaritacea*
Western Poison Ivy	*Toxicodendron rydbergii*
Western Redcedar	*Thuja plicata*
Western Stoneseed	*Lithospermum ruderale*
Western Sweetroot	*Osmorhiza occidentalis*
Western Swordfern	*Polystichum munitum*
Western Valerian	*Valeriana occidentalis*
Western Waterweed, Nuttall's Waterweed	*Elodea nuttallii*
Western Wheatgrass	*Pascopyrum smithii*
Western White Clematis	*Clematis ligusticifolia*
Western White Pine	*Pinus monticola*
wheatgrass	genus *Agropyron*, *Pascopyrum*, *Pseudoroegneria*, or *Thinopyrum*
Wheeler's Bluegrass	*Poa wheeleri*
White Alder	*Alnus rhombifolia*
White Bryony	*Bryonia alba*
White Marsh Marigold	*Caltha leptosepala*
White Mulberry	*Morus alba*
White Pine Blister Rust	*Cronartium ribicola*
White Poplar	*Populus alba* [L48 I]
White Sagebrush	*Artemisia ludoviciana*
White Sand Verbena	*Abronia mellifera*
White Spirea	*Spiraea betulifolia*
White Water Crowfoot	*Ranunculus aquatilis*
White Willow	*Salix alba*
Whitebark Pine	*Pinus albicaulis*
Whitestem Blazingstar	*Mentzelia albicaulis*
Whitestem Gooseberry	*Ribes inerme*
Widefruit Sedge	*Carex angustata*
Wild Mint	*Mentha arvensis*
Wild Sarsaparilla	*Aralia nudicaulis*
wildrice	genus *Zizania*
wildrye	genus *Elymus*
wildrye	genus *Leymus*
willow	genus *Salix*
Willow Dock	*Rumex salicifolius*
willowherb	genus *Epilobium*
Winterfat	*Krascheninnikovia lanata*
Winward's Whitestem Goldenbush, Winward's Goldenbush	*Ericameria winwardii*
Wolf's Willow	*Salix wolfii*
Wolf's trisetum	*Trisetum wolfii*
woodfern	genus *Dryopteris*
Woodland Strawberry	*Fragaria vesca*
woodrush	genus *Luzula*
Woodrush Sedge	*Carex luzulina*
Woods' Rose	*Rosa woodsii*
Woodyroot Milkvetch, Piper's Milk-vetch	*Astragalus riparius*
Woolgrass	*Scirpus cyperinus*
Woolly Plantain, Indian-wheat	*Plantago patagonica*
Woolly Princesplume, Woolly Stanleya	*Stanleya tomentosa* var. *runcinata*
Woolly Pussytoes	*Antennaria lanata*
Woolly Sedge	*Carex pellita*
Woollyfruit Sedge	*Carex lasiocarpa*
Woollypod Milkvetch	*Astragalus purshii*

English common name	**Scientific name**
Wyeth Biscuitroot	*Lomatium ambiguum*
Wyoming Big Sagebrush	*Artemisia tridentata* ssp. *wyomingensis*
Xanthoparmelia Lichen	*Xanthoparmelia norchlorochroa*
yampah	genus *Perideridia*
yarrow	genus *Achillea*
Yellow Phacelia	*Phacelia lutea*
Yellow Rabbitbrush	*Chrysothamnus viscidiflorus*
Yellow Salsify	*Tragopogon dubius*
Yellow Star-thistle	*Centaurea solstitialis*
Yellow Wildrye	*Leymus flavescens*
Yellow Willow	*Salix lutea*
yellowcress	genus *Nasturtium* or *Rorippa*
yew	genus *Taxus*

Appendix 3: 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 4: Species of greatest conservation need (SGCN; *n* = 133) and species of greatest information need (SGIN; *n* = 133) considered obligate (O), near-obligate (N), dependent (D), or associated (A) with one or more habitats. See footnote for definition of species–habitat relationships[x].

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
Amphibians																																								
Rocky Mountain Tailed Frog		A	A				A			A	A																								D		D			
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				A		
Northern Leopard Frog															D		D	D																				D		

[x] 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
Columbia Spotted Frog (Great Basin population)															A		A	A	A																A	A	A	D	D	
Great Basin Spadefoot																A			D			A		D	D	A														
Idaho Giant Salamander		D					A																													A	D	A	A	
Coeur d'Alene Salamander							A	A									A																			A	D	A	D	
Birds																																								
Northern Pintail												A			D	A	D			A	A										A		D	A				A		
Cinnamon Teal									A			A			D	A	D			A	D										A		D							
Trumpeter Swan								A							D		D	D													A		D	A				D		
Harlequin Duck							D																											A	D		D	A		
Black Swift		O																												O							O			
Common Nighthawk	A																		A					D	D															
Migratory shorebird assemblage[y]																	O																							

[y] 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
Black Tern														A	O		A														A		O					O		
Caspian Tern															A																			N				O		
California Gull															A																			A				O		
Ring-billed Gull															A																			A				O		
Franklin's Gull															O																N		O					N		
Long-billed Curlew										A												D						D										D		
American Bittern															O																A		O					N		
White-faced Ibis															O																N		O					N		
Yellow-billed Cuckoo								O	A																															
Golden Eagle	A					A																A		D	D				A											
Ferruginous Hawk						A																A		A	N						A									
Mountain Quail	A									D									D			A			A							A								
Greater Sage-Grouse																A	A		A		A	A		O	O	A		A			A					A	A	A	A	
Spruce Grouse		N	A				N																																	
Sharp-tailed Grouse				A						D		D	D									A			A			A			A							A	A	
Common Loon																																		A				O		
Sandhill Crane															D		D	D		A	A										A		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
Pinyon Jay						O																																		
Clark's Nutcracker	D	D	D	A	D	A																																		
Canada Jay		N	N																																					
Grasshopper Sparrow										D		A										N		A																
Sagebrush Sparrow																									O															
Brewer's Sparrow						A																			N															
Evening Grosbeak	N	A		A																																				
Cassin's Finch		D	D	D		A																																		
Black Rosy-Finch			A			A																			A				O	O										
Gray-crowned Rosy-Finch			A			A																			A				O	O										
Cassia Crossbill			O	O																																				
Bobolink																															O									
Loggerhead Shrike																									D						D									
Sage Thrasher																									O															
American Pipit											N																		O									O		
Wilson's Warbler								A										N	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
Olive-sided Flycatcher		N	A											A																							D			
American White Pelican																																		O	A			O		
Lewis's Woodpecker	D							D																																
White-headed Woodpecker	N			A																																				
Clark's Grebe															N																		O	N				O		
Western Grebe															N																		O	N				O		
Eared Grebe															O																		O							
Boreal Owl			O																																					
Short-eared Owl										A					D		D					N			N						A									
Burrowing Owl												A										D		D	D	D					A									
Great Gray Owl				D			A				A			A																										
Mammals																																								
Pronghorn										A		A										A		N	N	A		A			A									
Mountain Goat			D		D						D																		O	O										
California Bighorn Sheep										D		A										D					O	A												
Rocky Mountain Bighorn Sheep										D	A	A										D						A		O										

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
Moose	A	A	A	A	A		A	A	A	D			D		A		A	A	A	A											A	A	D							
Caribou		D	O		O																																			
Kit Fox										A		A										A	A	A	A	A	A	A												
Canada Lynx (Purcell Mountains)		A	D		D						A		A																											
Wolverine		A	A		D						A																		D											
American Marten		D	D		D		A	A																																
Fisher		D	D				D																																	
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										
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	D
Little Brown Myotis[z]	A	A	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

[z] 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
Long-legged Myotis	A	A				A	A	A											A								A			A				A	A	A	A	A	A	D
Yuma Myotis[aa]	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
Pallid Bat[bb]	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[cc]	A	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[dd]	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	D			D	A			A	A	A	A			
Pygmy Rabbit						A																A		O	O	A		A												
American Pika					A						D																A		D	O										

[aa] 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.
[bb] 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.
[cc] 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.
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Northern Bog Lemming			?				A							N				A																						
Dark Kangaroo Mouse																					A	D		D	D	D	A	A												
Hoary Marmot					A						D																		O	O										
Northern Idaho Ground Squirrel	A									O																														
Merriam's Ground Squirrel										A		A										A		A	A	A					A									
Wyoming Ground Squirrel (ssp. *nevadensis*)																						A			N	N		A												
Southern Idaho Ground Squirrel										D		A										D		D	D			A												
Dwarf Shrew	A		A	A		A				A	A											A					A		A	A										
Reptiles																																								
Northern Alligator Lizard	A	A								A																				A										
Western Groundsnake																						A				A	A	A												
Common Gartersnake	A	A					A	A	A	A		A					A	A	A	A											A	A								
Great Basin Collared Lizard																								A			D	A												
Pygmy Short-horned Lizard	A					A				A		A										A		D	D	A	A	A												

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Desert Horned Lizard																						D			D	D														
Fishes																																								
Mountain Whitefish																																		N	D			A		
Pygmy Whitefish																																						O		
Wood River Sculpin																																		D	D	A?	D			
White Sturgeon																																		O				D		
Bonneville Cisco																																						O		
Slimy Sculpin																																		D?	D	D?	D	D		
Burbot																																		N	D					
Bonneville Whitefish																																						O		
Pacific Lamprey																																		D	N					
Shoshone Sculpin																																					O		O	
Bear Lake Whitefish																																						O		
Green Sucker																																		D?	D	D?	D			
Lake Chub																																						O		
Bull Trout																																		D	D		N	D		
Leopard Dace																																		D?	D	D?	D	A		

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Bear Lake Sculpin																																						O		
Northern Leatherside Chub																																			D	D?	D	A		
Sockeye Salmon (Snake River ESU)																																		D	D			O		
Steelhead (Snake River Basin DPS)																																		D	N	D?	D			
Chinook Salmon (Snake River spring/summer-run ESU)																																		D	N	D?	D			
Yellowstone Cutthroat Trout																																		D	N	D?	D	A		
Bonneville Cutthroat Trout																																		D	N	D	D	A		
Chinook Salmon (Snake River fall-run ESU)																																		O	D					
White Sturgeon (Kootenai River DPS)																																		O						
Cedar Sculpin																																		D	D	D?	D			
Invertebrates																																								
Idaho Point-headed Grasshopper																							D	D																

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Harvestman genus *Acuclavella* species group																																					O			
Selway Forestsnail		O																																						
An ant-like flower beetle (*Amblyderus Owyhee*)																							O																	
A mayfly (*Ameletus tolae*)																																			O					
Nimapuna Disc	A	A																																						
A caddisfly (*Apatania barri*)																																						O		
A caddisfly (*Arctopora salmon*)																																					O	O		
A grasshopper (*Argiacris amissuli*)																									O?															
A grasshopper (*Argiacris keithi*)																														O										
A grasshopper (*Argiacris militaris*)																													O	O										
A leafcutting bee (*Ashmeadiella sculleni*)	A									A																														
A grasshopper (*Barracris petraea*)																														O										

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A click beetle (*Beckerus barri*)														O																										
Yellow Bumble Bee										A		A					A	A	A	A		A		A	A			A				A								
High Country Bumble Bee					O																								O											
Morrison Bumble Bee																						D			D			D				D								
Western Bumble Bee	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								
Constricted Fairy Shrimp																O																								
Raptor Fairy Shrimp																																						O		
A miner bee (*Calliopsis barri*)																							O																	
Straight Snowfly																																					O			
Idaho Snowfly																																			O		O			
Duckhead Snowfly																																				O	O			
Lolo Mayfly																																					O			
Idaho Dune Tiger Beetle																							O																	
A metallic wood-boring beetle																											O													

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
(*Chrysobothris horningi*)																																								
A metallic wood-boring beetle (*Chrysobothris idahoensis*)																						A		A	A															
Columbia River Tiger Beetle																							O												O					
A tiger beetle (*Cicindela decemnotata montevolans*)																									O															
Bruneau Dune Tiger Beetle																							O																	
Salmon Oregonian																						N					N													
Columbia Oregonian	A	A																				A		A	A														A	
Mission Creek Oregonian								A											A								A													
Cottonwood Oregonian																						N					N													
Monarch Butterfly										A		A					A	A	A	A		A									A	A								
Marbled Disc	D																										D													
Giant Palouse Earthworm	A									D												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
Gillette's Checkerspot		A									A							A	A																					
Wiest's Primrose Sphinx																							O																	
Shortface Lanx																																		O	O					
A cave obligate mite (*Flabellorhagidia pecki*)																																								O
Nez Perce Pebblesnail																																		O						
Pixie Pebblesnail																																							O?	
Utah Sallfly																																			O		O			
Blind Cave Leiodid Beetle																																								O
A caddisfly (*Glossosoma idaho*)																																		O	O?					
A caddisfly (*Goereilla baumanni*)																																					O			
Western Ridged Mussel																																		O						
Skade's Jumping-slug		O																																						
A caddisfly (*Homophylax auricularis*)																																			O?		O?			

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 skiff beetle (*Hydroscapha redfordi*)																																							O	
A yellow-masked bee (*Hylaeus lunicraterius*)																									A?		O?													
Idaho Lava Tube Millipede																																								O
Banbury Springs Limpet																																							O	
Palouse Snowfly																																			N		N			
Shortspire Pondsnail																																		O						
A caddisfly (*Limnephilus challisa*)																																					O			
Beartooth Copper																													O	O										
Tiny Forestfly																																			N		N			
A caddisfly (*Manophylax annulatus*)																																					O			
Western Pearlshell																																		O	O					
Cascades Needlefly																																							O	
Spur-throat grasshopper genus																													O?	O?										

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
Melanoplus species group																																								
Mountainsnail genus *Oreohelix* species group	A									A												A					N			N										
Snake River Pilose Crayfish																																		D	D		D	D		
Pilose Crayfish																																		D	D		D	D		
A mayfly (*Paraleptophlebia jenseni*)																																			N		N			
A mayfly (*Paraleptophlebia traverae*)																																		?	?		?			
Columbia Primitive Minnow Mayfly															?	?																						O		
Rocky Mountain Parnassian																													O											
A miner bee (*Perdita barri*)																															A									
A miner bee (*Perdita wyomingensis sculleni*)	A									A?												A?									A									
A caddisfly (*Philocasca banksi*)																																					O?			
Snake River Physa																																		O						

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
Lined June Beetle																							O																	
Blue-gray Taildropper		O																																						
Papillose Taildropper		N					A																																	
A moth (*Protogygia arena*)																							O																	
A caddisfly (*Psychoglypha smithi*)																																			N?		N?			
Bruneau Hot Springsnail																																							O	
Bear Lake Springsnail																																							O	
A caddisfly (*Rhyacophila oreia*)																																					O			
A caddisfly (*Rhyacophila robusta*)																																					O			
A flower moth (*Schinia edwardsii*)																											O?			O?										
Rocky Mountain Axetail		O																																						
Clearwater Roachfly																																					O			
Idaho Forestfly																																					N		N	

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 cave obligate harvestman (*Speleomaster lexi*)																																								O
A cave obligate harvestman (*Speleomaster pecki*)																																								O
Idaho Amphipod																																					O			
Lolo Sallfly																																					O			
Umatilla Willowfly																																			N		N			
A mud snail (*Taylorconcha insperata*)																																		O						
Bliss Rapids Snail																																		N					N	
Boise Snowfly																																			N		N			
Desert Valvata																																		O						
Plants																																								
Bodin's Milkvetch			A								A							A																						
Packard's Milkvetch																						A					N	A												
Dwarf Milkvetch, Least Bladdery Milk-vetch	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
Woodyroot Milkvetch, Piper's Milk-vetch										N												A																		
a rockcress (*Boechera rollinsiorum*)			A																											N										
Narrowleaf Grapefern, Slender Moonwort		A																												A										
Bryum Moss																		A												A									A	
Indian Valley Sedge								A									A		A	A																				
Christ's Indian Paintbrush											N														N															
Hillman's Stinkweed																						A				A	A													
Dendroalsia Moss		N																																						
Bloom Peak Dwarf-primrose, Bloom Peak Douglasia			A		A																									N										
Winward's Whitestem Goldenbush, Winward's Goldenbush																						A		A			N													
Katie's Fleabane																						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
Spokane False Goldenaster										A?									A?																					
Water Howellia								A							A	N	A		A																					
Midget Quillwort											A							A																						
Idaho Pepperweed, Slickspot Peppergrass																									N			A												
Brunsfeld's Desertparsley, Brunsfeld's Biscuitroot	A	A								A																				A										
Swinger's Biscuitroot	A									N																														
Dwarf Mountain Lupine		A																																						
Nez Perce Monkeyflower	A	A								N																	N													
Disappearing Monkeyflower																	A		A																					
MacFarlane's Four O'clock, Macfarlane's Four-o'clock										A												N						A												
Leslie Gulch Monardella																						A					N													
Orthotrichum Moss, Elegant Bristle Moss		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
Clearwater Phlox		A																N		A																				
Marsh Phlox																					A																			
Whitebark Pine			A		N																									A										
Elusive Jacob's-ladder, Elusive Polemonium	N					A				A								A							A					A										
a liverwort (*Ptilidium ciliare*), Northern Naugahyde Liverwort	A	A																												A										
Northwestern Yellowflax, Northwestern Yellow Hard Flax																A?	A?																							
Idaho Stonecrop	N									A																				N										
Spalding's Silene, Spalding's Catchfly										N												A																		
Nevada Goldenrod																	A				A																		A	
a liverwort (*Sphaerocarpos hians*)	A	A						A											A																	A				
Ute Lady's Tresses, Ute Ladies-tresses								A									A		A	A	A																			
Woolly Princesplume, Woolly Stanleya																								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
Robinson's Starwort		N																																						
Oblong Bluecurls, Mountain Blue-curls	A															A	A																							
Idaho Xanthoparmelia Lichen																						A				A	N													
Xanthoparmelia Lichen																					A	A		A		A	A													

Appendix 5: 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 Natural Resources Conservation Service
USDA Forest Service, Rocky Mountain Research Station
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 6: Target Stakeholders for Idaho State Wildlife Action Plan Public Participation (Element 8)

Stakeholder
American Heritage Wildlife Foundation (AHWF)
Animals In Distress Association (AIDA)
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
Henrys Fork Chapter Idaho Master Naturalists

Stakeholder
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
Association of Idaho Cities (AIC)
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
AFWA	Association of Fish & Wildlife Agencies
aka	also known as
AM	adaptive management
APHA	American Public Health Association
APLIC	Avian Power Line Interaction Committee
BBS	North American Breeding Bird Survey
BCI	Bat Conservation International
BCMECCS	British Columbia Ministry of Environment and Climate Change Strategy
Bd	*Batrachochytrium dendrobatidis*, the chytrid fungus that causes amphibian chytridiomycosis
BDA	beaver dam analogue
BEA	US Department of Commerce, Bureau of Economic Analysis
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMP	best management practice
BPA	Bonneville Power Administration
BSU	Boise State University
BURP	Beneficial Use Reconnaissance Program (DEQ)
CASC	Climate Adaptation Science Center
CCAA	Candidate Conservation Agreements with Assurances
CDAT	Coeur d'Alene Tribe (Schitsu'umsh)
CDC	Centers for Disease Control and Prevention
CEO	chief executive officer
CIRO	City of Rocks National Reserve
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLLC	Center for Large Landscape Conservation
CMP	Conservation Measures Partnership
CoP	community of practice
CREP	Conservation Reserve Enhancement Program
CRMO	Craters of the Moon National Monument and Preserve
CRP	Conservation Reserve Program
CRU	Cooperative Research Unit
CWA	Clean Water Act, 33 U.S.C. §1251 et seq. (1972)
DEQ	Idaho Department of Environmental Quality
DFM	Idaho Division of Financial Management
DNA	deoxyribonucleic acid
DoD	US Department of Defense

DOE	US Department of Energy
DOE–ID	US Department of Energy–Idaho Operations Office
DOI	US Department of the Interior
DOT	US Department of Transportation
e.g.	for example
eDNA	environmental DNA
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
FLPMA	Federal Land Policy and Management Act of 1976, as amended
FOS	Foundations of Success
FPA	The Idaho Forest Practices Act (Forest Practices Act)
FRESC	USGS Forest and Rangeland Ecosystem Science Center
FRPP	Farm and Ranch Lands Protection Program
FS	USDA Forest Service
FSA	USDA Farm Service Agency
FWP	Farmable Wetlands Program
FWS	US Fish and Wildlife Service
GYE	Greater Yellowstone Ecosystem
i.e.	that is
IAC	Idaho Association of Counties
IASCD	Idaho Association of Soil Conservation Districts
IBCP	Idaho Bird Conservation Partnership
IBL	IDHW Division of Public Health, Idaho Bureau of Laboratories
IBO	Boise State University, Intermountain Bird Observatory
IBWG	Idaho Bat Working Group
ICL	Idaho Conservation League
ID PARC	Idaho Partners in Amphibian and Reptile Conservation
IDARNG	Idaho Army National Guard
IDFG	Idaho Department of Fish and Game
IDHW	Idaho Department of Health and Welfare
IDL	Idaho Department of Lands
IDOC	Idaho Department of Commerce
IDOL	Idaho Department of Labor
IDPR	Idaho Department of Parks and Recreation
IDWR	Idaho Department of Water Resources
IFBF	Idaho Farm Bureau Federation
IFWIS	IDFG Idaho Fish and Wildlife Information System
IGS	Idaho Geological Survey
IISC	Idaho Invasive Species Council

INDNR	Indiana Department of Natural Resources
INL	US Department of Energy, Idaho National Laboratory
INPS	Idaho Native Plant Society
INRMP	Integrated Natural Resources Management Plan
IOEM	Idaho Office of Emergency Management
IPDES	Idaho Pollutant Discharge Elimination System
IRCP	Idaho Rangeland Conservation Partnership
IRP	Idaho Rural Partnership
ISDA	Idaho State Department of Agriculture
ISU	Idaho State University
ISWCC	Idaho Soil and Water Conservation Commission
ITD	Idaho Transportation Department
IWUA	Idaho Water Users Association
KTOI	Kootenai Tribe of Idaho
LWCF	Land and Water Conservation Fund
M&E	monitoring and evaluation
MBTA	Migratory Bird Treaty Act
MOU	memorandum of understanding
Movi	*Mycoplasma ovipneumoniae*
MSHA	Mine Safety and Health Administration
MTFWP	Montana Fish, Wildlife & Parks
NABat	North American Bat Monitoring Program
NASS	USDA National Agricultural Statistics Service
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act
NGO	nongovernmental organization
NIFC	National Interagency Fire Center
NMFS	NOAA Fisheries/National Marine Fisheries Service
NNU	Northwest Nazarene University
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NPT	Nez Perce Tribe (*nimíipu*)
NRCS	USDA Natural Resources Conservation Service
NW CASC	USGS Northwest Climate Adaptation Science Center
NWCOA	National Wildlife Control Operators Association
NWHC	USGS National Wildlife Health Center
NWR	National Wildlife Refuge
ODFW	Oregon Department of Fish and Wildlife
OEMR	Idaho Governor's Office of Energy and Mineral Resources
OGCC	Idaho Oil and Gas Conservation Commission
OHV	off-highway vehicle
OSC	Idaho Governor's Office of Species Conservation

PARC	Partners in Amphibian and Reptile Conservation
Pd	*Pseudogymnoascus destructans*
RAWA	Recovering America's Wildlife Act
RCPP	Regional Conservation Partnership Program
RMRS	USDA Forest Service, Rocky Mountain Research Station
RRT	Regional Review Team
SAFE	State Acres for Wildlife Enhancement
SBT	Shoshone–Bannock Tribes of the Fort Hall Reservation
SFI®	Sustainable Forestry Initiative® Inc.
SGCN	species of greatest conservation need
SGIN	species of greatest information need
Sho–Pai	Shoshone–Paiute Tribes of the Duck Valley Reservation, Nevada
ssp.	subspecies
STWG	State and Tribal Wildlife Grants Program
SWAP	State Wildlife Action Plan
SWCD	Soil & Water Conservation District
TNC	The Nature Conservancy
U of I	University of Idaho
US	United States
USACE	US Army Corps of Engineers
USAF	US Air Force
USBR	Bureau of Reclamation
USDA	US Department of Agriculture
USGS	US Geological Survey
Utah DNR	Utah Department of Natural Resources
Utah DWR	Utah Division of Wildlife Resources
UW	University of Washington
WAFWA	Western Association of Fish and Wildlife Agencies
WCO	wildlife control operator
WCRP	Wildlife Conservation and Restoration Program
WDFW	Washington Department of Fish and Wildlife
WGA	Western Governors' Association
WGFD	Wyoming Game and Fish Department
WHA	Idaho Department of Fish and Game Wildlife Habitat Area
WMA	Idaho Department of Fish and Game Wildlife Management Area
WMI	Wildlife Management Institute
WNS	bat white-nose syndrome
Wrangle	World Rangeland Learning Experience
WRE	Wetland Reserve Easement
WRP	Wetlands Reserve Program
WSFR	Wildlife and Sport Fish Restoration
WUI	wildland urban interface
YELL	Yellowstone National Park

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.

citizen 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.

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.

cyanobacteria: A division of microorganisms that are related to the bacteria but are capable of photosynthesis.

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.

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).

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.

hypolimnetic: Of or relating to a hypolimnion (the part of a lake below the thermocline made up of water that is stagnant and of essentially uniform temperature except during the period of overturn).

hyporheic: Shallow groundwater flow beneath a river and in the surrounding floodplain. The hyporheic zone delineates a volume of saturated sediment that surrounds a river, where mixing of river water and shallow groundwater occurs, and constitutes a transitional area (ecotone) between the surface and groundwater hydrologic systems and between aquatic and terrestrial habitats in the riparian zone.

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.

lentic: Still water/related to slow-moving or standing water systems; usually refers to lake (lacustrine) and stagnant swamp systems.

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.

lotic: Pertaining to running water (i.e., rivers and streams).

mesic: Having or characterized by a moderate amount of moisture: neither hydric nor xeric.

mesocarnivore: An animal whose diet consists of 50 to 70% meat with the balance consisting of nonvertebrate foods, which may include insects, fungi, fruits, or other plant material. Example species include Wolverine, Fisher, marten, fox, and weasels.

metapopulation: A set of spatially-distinct local populations of the same species that are linked by movements and dispersal.

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.

neonicotinoid: Any of a class of systemic water-soluble insecticides chemically related to nicotine that are used especially in agriculture to control destructive pests (such as aphids and mites) and that selectively bind to the postsynaptic nicotinic receptors of insects to produce paralysis and death.

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.

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.

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.

rock glacier: A thick lobate or tongue-shaped mass of debris moving downslope through the deformation of subsurface ice and/or ice-rich sediments.

rodenticide: A poison used to kill rodents.

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.

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.

sylvatic plague: A bacterial disease transmitted by fleas that afflicts many mammalian species, including humans.

thermal. Warm water.

timberland: Forest land that is available to harvest and capable of productivity over a long period of time. These are Idaho's working forests that provide the wood and paper products we all use. Timberland is forest land that can produce 20 cubic feet of wood per acre, per year where timber harvest is allowed.

underserved communities (or historically underserved communities): Groups of individuals who face barriers in accessing and using wildlife-related education or recreation because of geographic location, religion, sexual orientation, gender identity, race or ethnicity, or other special needs.

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

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:

Cornell Lab of Ornithology, Birds of the World
Fishes of Idaho: A Natural History Survey, John Sigler and Don Zaroban, 2018
International Union for Conservation of Nature (IUCN)
Native Fishes of Idaho, Richard L. Wallace and Donald W. Zaroban 2013
NatureServe
United Stated Geological Survey, Gap Analysis Project (GAP)
United Stated Geological Survey, Northwest Gap Analysis Project (PNW ReGAP)
Aquila Environmental
Biota of North America Program (BONAP)
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
ERO Resources
Global Biodiversity Information Facility (GBIF)
Idaho Department of Environmental Quality - Beneficial Use Reconnaissance Project (BURP)
Idaho Department of Fish and Game
Idaho Department of Lands
Idaho Department of Transportation
Idaho Power Company
Idaho State University
Illinois Natural History Survey
iNaturalist
Integrated Digitized Biocollections (iDigBio)

Intermountain Bird Observatory
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)
Nez Perce Tribe (nimíipu)
Odonata Central
Pacific Northwest Moths Database
PotlatchDeltic
Red Willow Research, Inc.
Science Applications International Corporation, Environmental Programs Division
Shoshone–Paiute Tribes of the Duck Valley Reservation, Nevada
Shoshone–Bannock Tribes of the Fort Hall Reservation
StreamNet
Symbiota Collections of Arthropods Network (SCAN)
TetraTech
The Nature Conservancy of Idaho
The Xerces Society for Invertebrate Conservation
Trec, Inc.
US Department of Agriculture (USDA)
US Fish and Wildlife Service (FWS)
US Forest Service (FS)
US Forest Service, Natural Resource Manager Database
US Geological Survey (USGS)
US Geological Survey, North American Breeding Bird Survey (BBS)
US Geological Survey, North American Bat Monitoring Program (NABat)
US National Park Service (NPS)
University of California, Berkeley, Essig Museum of Entomology
University of Idaho
University of Montana
Utah State University
Western EcoSystems Technology, Inc. (WEST)

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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