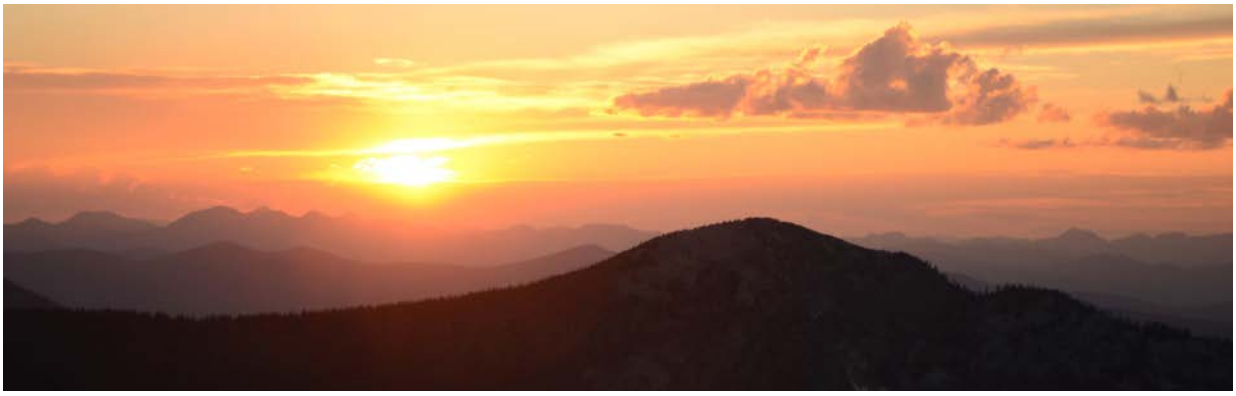
1. Okanogan Highlands Section

Section Description

The Okanogan Highlands Section is part of the Canadian Rocky Mountains Ecoregion. The Idaho portion of the Okanogan Highlands includes the northwest portion of the Idaho Panhandle from the Selkirk Mountains along the Idaho–Washington border to the west and the Purcell Trench to the northeast, south through Rathdrum Prairie with the Spokane River serving as the southern boundary (Fig. 1.1, Fig. 1.2). The Okanogan Highlands spans from 529 to 2,351 m (1,736 to 7,709 ft.) in elevation. This region is influenced by a maritime climate with annual precipitation amounts of 51 to 197 cm (20 to 77 in; PRISM 30-year annual precipitation) and generally cool temperatures (average annual temperature = 1.7–8.7 °C [35.1–47.6 °F]; PRISM 30-year annual temperature) (PRISM Climate Group 2012). Precipitation occurs mostly as snow from November to March, although rain on snow is common at lower elevations. Rain on snow events are expected to increase in the future due to predicted warmer air temperatures.



Parker Ridge, Selkirk Mountains © 2012 Scott Rulander

Communities within Okanogan Highlands are generally small and rural. Although there has been moderate population growth within towns such as Sandpoint and in areas surrounding Lake Pend Oreille, Pend Oreille River, and Priest Lake as tourism increases and more families are purchasing second homes. Other communities include Bonner's Ferry, Hayden, Rathdrum, Priest River, and Post Falls. The Okanogan Highlands provides recreational opportunities such as angling, hunting, boating, hiking, camping, horseback riding, wildlife watching and winter activities such as skiing and snowmobiling. Participation in recreational activities has been increasing in the region as larger population centers such as Coeur d'Alene and nearby Spokane, Washington are increasing in size. The Okanogan Highlands has a historical and continuing relationship with logging and the wood products industry with several lumber mills in the area. Local agriculture and the production of hops for the beer industry are prevalent in the valleys. Cattle ranching for beef and limited mining also occur.

The Okanogan Highlands is a mountainous region carved by relatively recent glaciation and is climatically dominated by the maritime westerlies that carry moisture-laden air currents from the

northern Pacific Ocean. The Selkirk Mountains comprise the principal mountain range within this section, extending from the northwest border to Mica Peak, which is southwest of Coeur d'Alene. The northern portion of the Idaho Selkirks is characterized by glacially–carved peaks with steep, narrow watersheds. In the Priest Lake area, the Selkirks surround the lake on 3 sides with a narrow valley near the Pend Oreille River that forms a topographical bowl. At lower elevations, this bowl traps cold air in the winter and cool moist air in the summer, leading to environmental conditions favorable for dense forests and understories dominated by grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.), western hemlock (*Tsuga heterophylla* [Raf.] Sarg.), and western redcedar (*Thuja plicata* Donn ex D. Don)). On the Priest Lake side of the Selkirks, large continuous tracts of old-growth grand fir, western hemlock and western redcedar remain with a high concentration of ancient cedar groves. On the east side of the Selkirks, in addition to the continental glacier, mountain glaciers carved steep, prominent drainages that channel water and cool moist air into the valley below. The combination of recent glaciation, cool temperatures, and abundant precipitation have led to the northern portion of the Selkirks supporting diverse assemblages of plant and animal species including those found commonly in coastal and boreal habitats. For example, the area hosts the highest concentration of fen wetlands (peatlands) in north Idaho. Overall, the forest habitat is diverse with Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), western larch (*Larix occidentalis* Nutt.), grand fir, and lodgepole pine (*Pinus contorta* Douglas ex Loudon) at mid-elevations and mountain hemlock (*Tsuga mertensiana* [Bong.] Carrière), subalpine fir (*Abies lasiocarpa* [Hook.] Nutt.), and whitebark pine (*Pinus albicaulis* Engelm.) at high elevations. These dense and diverse forests support a diversity of wildlife, including Grizzly Bear (*Ursus arctos*), Northern Bog Lemming (*Synaptomys borealis*), and Hoary Marmot (*Marmota caligata*).

Numerous glacial lakes, rivers, and streams populate the Okanogan Highlands. Alpine lakes and ponds are abundant along the Selkirk Crest and provide breeding habitat for amphibians such as Western Toad (*Anaxyrus boreas*). *Sphagnum* rich peatlands, willow (*Salix* L.), rose spirea (*Spiraea douglasii* Hook.) shrublands, and western redcedar–Engelmann spruce swamps occur around the numerous valley lakes, ponds, and wetlands filling glacial carved depressions. Steep drainages, lined by alder (*Alnus* Mill.) and other riparian shrubs, deliver water into the Kootenai, Upper Pack, Upper Priest, and Priest rivers. Although most of the land in the Kootenai River Valley has been converted to agriculture or rangelands, remnant sedge (*Carex* L.) wet meadows, cattail-bulrush (*Typha latifolia* L. – *Schoenoplectus* [Rchb.] Palla) marshes, riparian habitats, and dry-conifer forests provide important wildlife corridors between the Selkirk, Purcell, and Cabinet mountain ranges. River and stream valleys provide important breeding habitat for fish, amphibians, neotropical migratory birds, and several bat species.

The most prominent waterbody in the Okanogan Highlands is Lake Pend Oreille—the largest lake in Idaho and the 5th deepest lake in the US. Part of the Pend Oreille drainage, which includes the Pend Oreille River and this lake, encompasses a 383 km^2 (94,720 acres) area and is fed by the Clark Fork, Flathead, Bitterroot, Blackfoot, and St. Regis rivers in Montana and Lightning Creek, Pack River, and Priest River in Idaho. Historical overharvest, logging, farming, residential development, roads, the construction of hydroelectric dams, and introduced nonnative plant and animal species have all taken a toll on the native fish populations and habitat.

Outwash from the Clark Fork and Pack rivers into Lake Pend Oreille produce large deltas that support extensive and diverse riparian habitat, as well as waterfowl, fish, amphibians, bats, and upland wildlife. The Clark Fork delta supports extensive black cottonwood (*Populus balsamifera* L. ssp. *trichocarpa* [Torr. & A. Gray ex Hook.] Brayshaw) riparian forests with a wide variety of riparian shrubs intermixed. The deltas also provide nutrients and sediments to the lake and purify the water. However, the Pack River Delta and the Clark Fork Delta have both undergone severe losses and degradation through the construction of several hydroelectric dams within the Pend Oreille drainage. Although producing power for the Inland Northwest, dams such as the Albeni Falls dam on the Pend Oreille River cause shoreline and island erosion by raising and lowering water levels within the lake. Dams upstream of the Clark Fork River (Cabinet Gorge dams) reduce the amount of sediment and large wood necessary in the formation of the delta. However, restoration efforts on both deltas (Pack River, 2008–2009 and Clark Fork River 2014–2015) have improved the deltas' functionality by stabilizing shorelines and reconstructing delta islands while removing nonnative species such as purple loosestrife (*Lythrum salicaria*) and planting native riparian species.

Conservation efforts in this section should strive to maximize the collaborative opportunities in Washington, British Columbia, and Montana, given their close proximity and ecological connections.

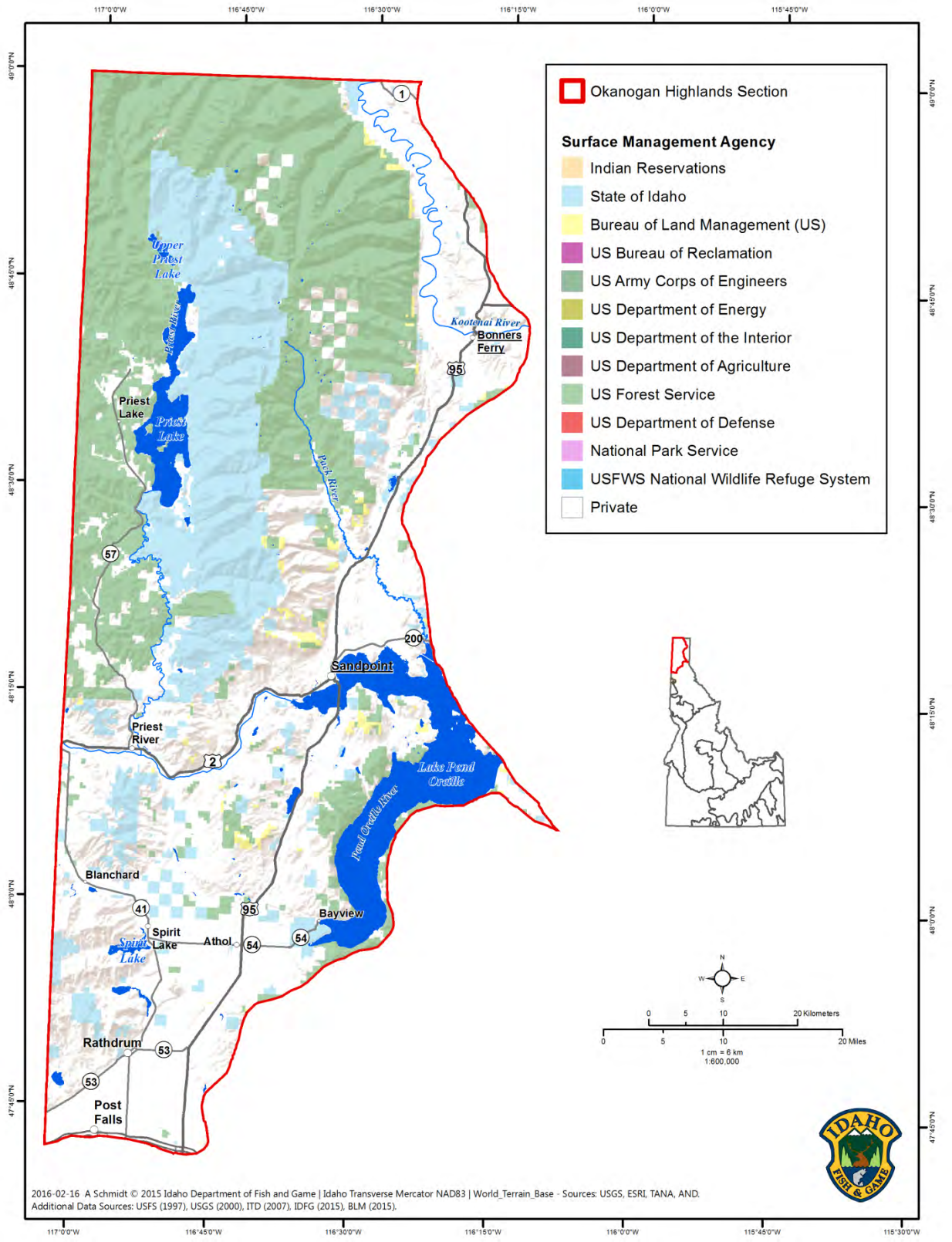


Fig. 1.1 Map of Okanogan Highlands surface management

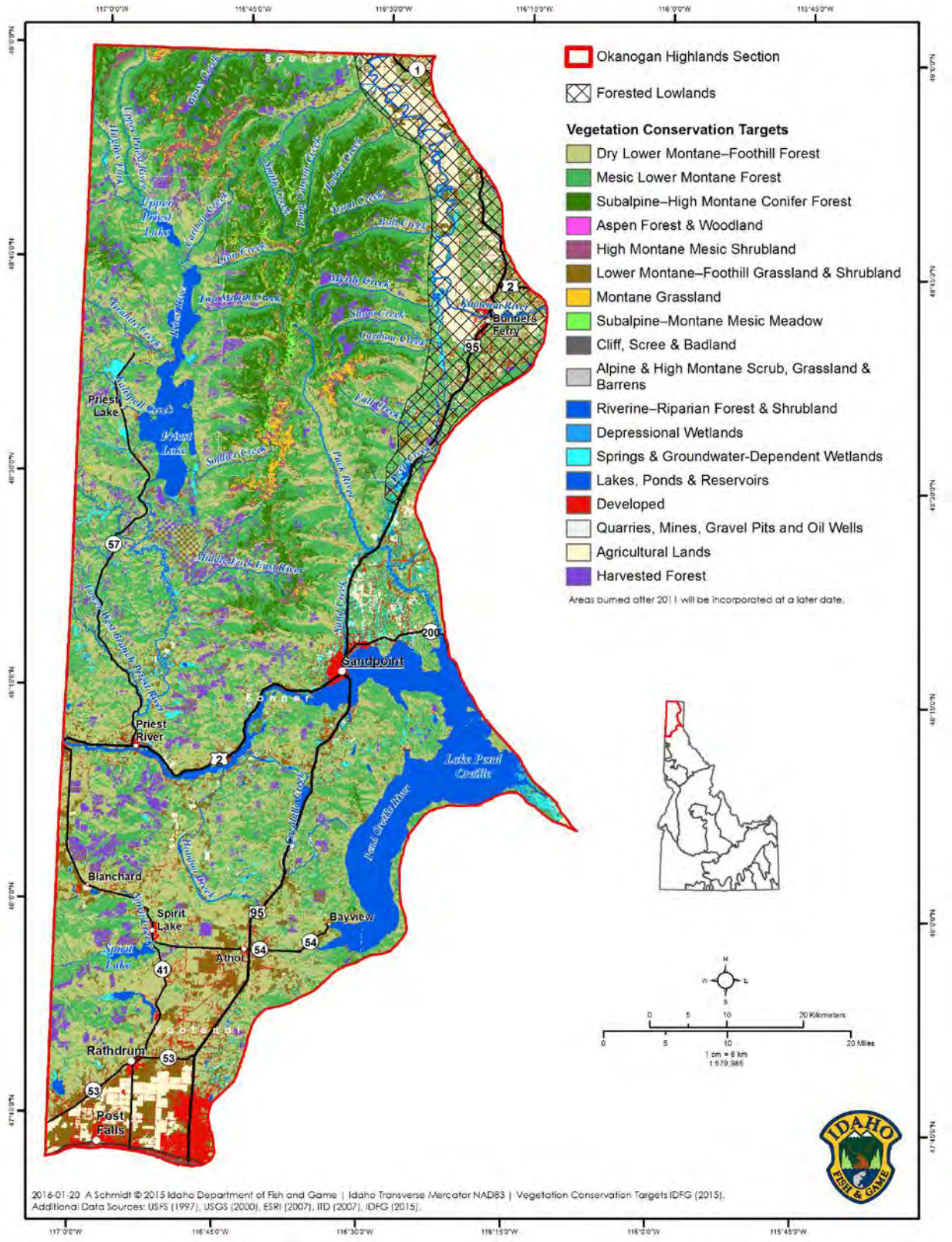


Fig. 1.2 Map of Okanogan Highlands vegetation conservation targets

Conservation Targets in the Okanogan Highlands

We selected 8 habitat targets (5 upland, 3 aquatic) that represent the major ecosystems in the Okanogan Highlands as shown in Table 1.1. Each of these systems provides habitat for key species of greatest conservation need (SGCN), i.e., "nested targets" (Table 1.2). All SGCN management programs in the Okanogan Highlands have a nexus with habitat management programs. Conservation of the habitat targets listed below should conserve most of the nested species within them. However, we determined that 7 taxonomic groups/species (Pond-Breeding Amphibians, Lake-Nesting Birds, Low-Density Forest Carnivores, Grizzly Bear, Caribou, Ground-Dwelling Invertebrates, and Pollinators) have special conservation needs and thus are presented as explicit species targets as shown in Table 1.1.

Table 1.1 At-a-glance table of conservation targets in the Okanogan Highlands

Target	Target description	Target viability	Nested targets (SGCN)	
Forested Lowlands	Forested habitats of Kootenai River basin below 3,000 ft (914 m), which historically experienced frequent flood disturbance cycles.	*Fair* to *Poor.* Most converted to agriculture and natural flood cycles eliminated.	*Tier 1* *Tier 2*	Wolverine Grizzly Bear Northern Leopard Frog Fisher
Dry Lower Montane–Foothill Forest	Northern Rocky Mts. Douglas-fir and ponderosa pine woodland and savannah systems at lower elevation forests in the Selkirk Mountains.	*Fair.* Substantial encroachment by other habitat types due to lack of natural fire cycle.	*Tier 3*	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis
Mesic Lower Montane Forest	Commonly referred to as a "cedar–hemlock" forest but also includes lodgepole pine and aspen-mixed conifer forest at lower elevations in the Selkirk Mountains.	*Fair.* Substantial encroachment by other habitat types due to lack of natural fire cycle and loss of western white pine.	*Tier 2* *Tier 3*	Silver-haired Bat Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis
Subalpine–High Montane Conifer Forest	Dry–mesic Engelmann spruce– subalpine fir forest and whitebark pine woodlands at higher elevations in the Selkirk Mountains.	*Fair* to *Poor.* Subject to altered fire regimes, forest insects, disease, and climate change; reduction in whitebark pine woodlands.	*Tier 1* *Tier 3*	Wolverine Grizzly Bear Clark's Nutcracker Mountain Goat Hoary Marmot
Cool Air Refugia	Microsites with lower air temperature regimes compared to adjacent habitat.	*Fair.* Climate change expected to reduce habitat.	*Tier 1* *Tier 2* *Tier 3*	Magnum Mantleslug A Roundback Slug (*Hemphillia* sp. 1) Northern Bog Lemming Hoary Marmot Pale Jumping-slug Shiny Tightcoil

Target	Target description	Target viability	Nested targets (SGCN)	
Riverine–Riparian Forest & Shrubland	Rivers and streams, including aquatic habitats and their associated terrestrial riparian habitats. Includes Kootenai, Upper Pack, Priest and Pend Oreille rivers and their tributaries.	*Fair.* Riverine systems in the lower valleys impacted by hydroelectric operations and invasive species. Higher elevation headwaters threatened by climate change.	*Tier 1* *Tier 2* *Tier 3*	White Sturgeon (Kootenai River DPS) Burbot Harlequin Duck Black Swift A Mayfly (*Ephemerella alleni*) Western Ridged Mussel
Depressional Wetlands	Surface-water-fed systems ranging from infrequent to semipermanently or permanently flooded. Typically pond sized or smaller. Includes vernal pools and most marshes.	*Fair.* Lower elevations experiencing altered hydrologic regimes and invasive species/disease. Higher elevations threatened by climate change.	*Tier 2* *Tier 3*	Western Toad Northern Leopard Frog American Bittern Black Tern Silver-haired Bat Townsend's Big-eared Bat Little Brown Myotis
Springs & Groundwater-Dependent Wetlands	Groundwater-dependent wetlands including fens, most wet meadows, and headwater springs.	*Good.* Threatened by climate change.	*Tier 2* *Tier 3*	Western Toad Northern Bog Lemming
Pond-Breeding Amphibians	Amphibians that primarily breed in lentic wetlands.	*Poor.* Northern Leopard Frogs extirpated from section. Extant species face invasive species and disease threats.	*Tier 2*	Western Toad Northern Leopard Frog
Lake-Nesting Birds	Common Loon and Western Grebe are listed as Intermountain West Waterbird Conservation Plan priority species due to habitat concerns and impacts from recreational boating.	*Poor.* No successfully nesting Common Loons detected in region. One Western Grebe colony in the Okanogan Highlands with no reproduction.	*Tier 2*	Common Loon Western Grebe
Low-Density Forest Carnivores	Wide-ranging mammalian mesocarnivores.	*Poor.* Only a few individuals known to occur in section.	*Tier 1* *Tier 2*	Wolverine Fisher
Grizzly Bear	Grizzly Bear is listed as Federally threatened. Population within the Selkirks is thought to be 50–60 bears.	*Fair.* Population appears to be expanding in both size and distribution.	*Tier 1*	Grizzly Bear
Caribou			*Tier 1*	Caribou
Ground-Dwelling Invertebrates	Assemblage of terrestrial invertebrates found on forest and other habitat floors.	*Unknown.* Habitat and threat data deficient. Many species taxonomically and	*Tier 1* *Tier 2*	Magnum Mantleslug A Roundback Slug (*Hemphillia* sp. 1)

Target	Target description	Target viability	Nested targets (SGCN)	
		distributionally data deficient.	*Tier 3*	Pale Jumping-slug Salmon Coil Coeur d'Alene Oregonian Western Flat-whorl Shiny Tightcoil Spur-throated Grasshopper (*Melanoplus*) Species Group
Pollinators	Species delivering pollination ecosystem service.	*Fair.* Many pollinators declining rangewide.	*Tier 1*	Western Bumble Bee Suckley's Cuckoo Bumble Bee
			Tier 3	Monarch

Table 1.2 Species of greatest conservation need (SGCN) and associated conservation targets in the Okanogan Highlands

Taxon	Conservation targets														
	Forested Lowlands	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Conifer Forest	Cool Air Refugia	Riverine–Riparian Forest & Shrubland	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Pond-Breeding Amphibians	Lake-Nesting Birds	Low-Density Forest Carnivores	Grizzly Bear	Caribou	Ground-Dwelling Invertebrates	Pollinators
RAY-FINNED FISHES															
White Sturgeon (Kootenai River DPS) (*Acipenser transmontanus*)[1]						X									
Burbot (*Lota lota*)[1]						X									
AMPHIBIANS															
Western Toad *(Anaxyrus boreas*)[2]	X						X	X	X						
Northern Leopard Frog (*Lithobates pipiens*)[2]	X						X		X						
BIRDS															
Harlequin Duck (*Histrionicus histrionicus*)[2]						X									
Common Loon (*Gavia immer*)[2]										X					
Western Grebe (*Aechmophorus occidentalis*)[2]										X					
American Bittern (*Botaurus lentiginosus*)[2]							X								
Black Tern (*Chlidonias niger*)[2]							X								
Common Nighthawk (*Chordeiles minor*)[3]		X													
Black Swift (*Cypseloides niger*)[2]						X									
Olive-sided Flycatcher (*Contopus cooperi*)[3]		X	X												
Clark's Nutcracker (*Nucifraga columbiana*)[3]				X											
MAMMALS															
Townsend's Big-eared Bat (*Corynorhinus townsendii*)[3]		X	X				X								
Silver-haired Bat (*Lasionycteris noctivagans*)[2]			X				X								
Little Brown Myotis (*Myotis lucifugus*)[3]		X	X				X								
Wolverine (*Gulo gulo*)[1]	X			X							X				
Fisher (*Pekania pennanti*)[2]	X										X				
Grizzly Bear (*Ursus arctos*)[1]	X			X								X			
Mountain Goat (*Oreamnos americanus*)[3]				X											
Caribou (*Rangifer tarandus*)[1]													X		
Northern Bog Lemming (*Synaptomys*					X			X							

Taxon	Conservation targets														
	Forested Lowlands	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Subalpine–High Montane Conifer Forest	Cool Air Refugia	Riverine–Riparian Forest & Shrubland	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Pond-Breeding Amphibians	Lake-Nesting Birds	Low-Density Forest Carnivores	Grizzly Bear	Caribou	Ground-Dwelling Invertebrates	Pollinators
borealis)[3]															
Hoary Marmot (*Marmota caligata*)[3]				X	X										
BIVALVES															
Western Ridged Mussel (*Gonidea angulata*)[3]						X									
TERRESTRIAL GASTROPODS															
Pale Jumping-slug (*Hemphillia camelus*)[3]					X									X	
A Roundback Slug (*Hemphillia* sp. 1)[2]					X									X	
Magnum Mantleslug (*Magnipelta mycophaga*)[1]					X									X	
Salmon Coil (*Helicodiscus salmonaceus*)[3]														X	
Coeur d'Alene Oregonian (*Cryptomastix mullani*)[3]														X	
Western Flat-whorl (*Planogyra clappi*)[3]														X	
Shiny Tightcoil (*Pristiloma wascoense*)[3]					X									X	
INSECTS															
A Mayfly (*Ephemerella alleni*)[2]						X									
Western Bumble Bee (*Bombus occidentalis*)[1]															X
Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*)[1]															X
Monarch (*Danaus plexippus*)[3]															X
Spur-throated Grasshopper (*Melanoplus*) Species Group[3]														X	

Target: Forested Lowlands

Forested lowlands are the habitats found below 3,000 ft (914 m) that serve as important wildlife corridors between and within the Selkirk, Purcell, and Cabinet mountain ranges (i.e., Kootenai River Valley). The valley between the mountain ranges was a mosaic of forested lowlands, large emergent marshes, black cottonwood riparian forest, oxbow lakes, and numerous ponds prior to European settlement (KTOI 2009). It was considered the largest and richest riparian and wetland complexes in the Pacific Northwest (KTOI 2009). This habitat not only provided movement

corridors for more mobile species but also important year-round habitat for many species with more limited movements. However, much of the forested and wetland landscape within the Kootenai River sub-basin was converted to agriculture and pastureland with nearly 22,000 acres of wetlands and 50,000 acres of floodplain altered since the late 1800s (KTOI 2009). With grassland and farmland as the predominant habitat types, wildlife movements are likely now more relegated to narrow corridors where forests still provide cover and link the three mountain ranges. Wildlife corridors are increasing in importance as habitat fragmentation disrupts species movements and thus gene flow in wildlife populations (Beier and Gregory 2012). The movement of individuals across the species' range is essential for population persistence and for a species' ability to shift their range in response to climate change (Cushman et al. 2013*a*). In the Idaho Panhandle, genetic assignment tests and radiotelemetry have determined that species such as Grizzly Bear (Proctor et al. 2012) move between the three mountain ranges. Additionally, the three mountain ranges and the associated valleys have been included in continent-wide dispersal routes for Wolverine (*Gulo gulo*, Schwartz et al. 2009) and Grizzly Bear (Proctor et al. 2012). In an increasingly fragmented landscape, especially within the valley bottoms, identifying, restoring, and maintaining forested lowlands will be critical in establishing corridors for the movement of numerous wildlife species.

Kootenai River Valley © 2015 Michael Lucid

Target Viability

Fair to Poor. Historically, the valley between the Selkirk, Purcell, and Cabinet mountain ranges was a large and diverse riparian and wetland complex. Since the late 1800s, most of the land has been converted to agriculture with little forest and wetland remaining. The installation of Libby Dam and levee systems have changed the natural flooding cycles in the Kootenai River Valley. Rail, highway, and local road systems, utility corridors, forest practices, and housing development have further fragmented forested lowlands.

Prioritized Threats and Strategies for Forested Lowlands

Very High rated threats in the Forested Lowlands in the Okanogan Highlands

Loss of genetic connectivity

The forested lowlands of this section are well recognized as being of major importance to gene flow between the Selkirk, Cabinet, and Purcell Mountains (Schwartz et al. 2009, Cushman et al.

2014). Habitat fragmentation has likely disrupted gene flow in some species. Research is necessary to assess historic and current levels of gene flow across the Kootenai Valley within the context of the Flathead, Bitterroot, and Okanogan Highlands sections to identify priority land parcels for conservation or habitat restoration actions that are most appropriate for conservation or restoration of multiple species genetic connectivity.

Objective	Strategy	Action(s)	Target SGCNs
Assess genetic connectivity between mountain ranges.	Assess genetic connectivity for SGCN with varying vagility levels to assess current and historic areas of gene flow in order to prioritize land parcels for habitat conservation, acquisition and/or restoration.	Assemble genetic samples from current collections. When necessary, conduct field work to collect necessary genetic samples. Conduct genetic studies to determine valley locations that have been or are currently important for multiple species gene flow.	Western Toad Common Nighthawk Clark's Nutcracker Silver-haired Bat Wolverine Fisher Grizzly Bear Pale Jumping-slug A Roundback Slug (*Hemphillia* sp. 1) Magnum Mantleslug Coeur d'Alene Oregonian Shiny Tightcoil Western Bumble Bee Suckley's Cuckoo Bumble Bee Spur-throated Grasshopper (Melanoplus) Species Group
Restore genetic connectivity.	Work toward long-term restoration and conservation of parcels identified as important for genetic connectivity.	Conserve, acquire, and/or restore land parcels identified as important for genetic connectivity.	
Monitor genetic connectivity between mountain ranges.	Monitor genetic connectivity over time.	Develop and implement long-term multitaxa monitoring program.	

Climate change

Global climate change is expected to have widespread effects on temperature and precipitation regimes worldwide and mean annual global air temperatures are predicted to rise within the 2 to 4.5 °C range by the end of the century (Meehl et al. 2007). Conditions in the Pacific Northwest are expected to trend toward hotter drier summers and warmer wetter winters (Karl et al. 2009). Snowpack depth and duration are predicted to decrease, reducing summer soil moisture, impacting species dependent on mesic conditions. Climate change is expected to further alter fire extent and severity while allowing for larger scale and more persistent mountain pine beetle infestations. As a result, whitebark pine is expected to decrease in extent.

Delineating temperature refugia for cool water or air temperature dependent species is a relatively new idea (e.g., Isaak et al. 2015). Recent microclimate monitoring work in the Idaho Panhandle identified a portion of the Okanogan Highlands as the largest area of annually cool air relative to other portions of the Idaho Panhandle (Lucid et al. 2016). Continued monitoring of microclimate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Action(s)	Target SGCNs
Improve landscape	Manage for diverse, healthy,	Create or reengineer wetlands to hold water ephemerally and maintain relatively cool air	Western Toad Northern Leopard

Objective	Strategy	Action(s)	Target SGCNs
climate resiliency for SGCN.	habitats that favor SGCN ecological needs.	and water temperatures (M-A. Beaucher, Creston Valley Wildlife Management Area, pers. comm). Implement American Bullfrog control program. Treat nonnative vegetation and revegetate with locally collected pollinator food sources. (Mader et al. 2011, KTOI 2009). Provide areas and structures for pollinator nesting and overwintering. Identify deforested land parcels and reforest to provide cover for animal movement and relatively cool air temperatures. Implement public education and/or participatory science programs that include climate change, habitat restoration, pesticides, and invasive species elements. Develop incentive programs for private and nonprivate landowners to conduct habitat work in rural and urban areas.	Frog Wolverine Fisher Grizzly Bear Western Ridged Mussel Pale Jumping-slug A Roundback Slug (*Hemphillia* sp. 1) Magnum Mantleslug Coeur d'Alene Oregonian Western Flat-whorl Shiny Tightcoil A Mayfly (*Ephemerella alleni*) Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch

High rated threats in the Forested Lowlands in the Okanogan Highlands

Transportation corridors

Highway 95 and the railroad that runs parallel to the highway are prominent transportation corridors within the forested lowlands target. Mortality records for the section of Highway 95 that runs through the Kootenai River Valley regularly document hundreds of animals colliding with high-speed vehicles each year (IDFG Roadkill and Salvage database, accessed on Nov 8, 2015). However, mortality due to vehicle collision is not thought to profoundly affect wildlife populations, except in the case of some threatened or endangered species (Forman and Alexander 1998). Rather the avoidance of transportation corridors prevents the dispersal of individuals across the landscape (Forman and Alexander 1998) and possibly prevents gene flow within a population (Cushman et al. 2013*b*).

Objective	Strategy	Action(s)	Target SGCNs
Reduce risk along roadways.	Highway signage at areas of high wildlife use. Construction of over- and underpasses.	Determine high risk areas for wildlife crossings. Construct over- and underpasses. Construct noise buffers at crossing areas. Work with legislators, ITD, and other relevant organizations to include wildlife considerations in road construction/maintenance project or road related legislation.	Western Toad Northern Leopard Frog Wolverine Fisher Grizzly Bear Coeur d'Alene Oregonian

Invasive & noxious weeds

One of the limiting factors impacting the restoration of riparian areas in the Kootenai River Valley is the prevalence of invasive and noxious weeds in disturbed or developed areas (KTOI 2009). Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys conducted in Boundary Creek WMA, 52 of the 56 study sites detected noxious weeds at varying densities (Cousins and Antonelli 2008*a*). Additionally, reed canarygrass (*Phalaris arundinacea* L.) was the dominant species found in 5 of the 17 marsh communities and it had doubled in coverage from previous surveys conducted in meadow communities (Cousins and Antonelli 2008*a*). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat.

Objective	Strategy	Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Implement the Idaho Invasive Species Council Strategic Plan.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Use Global Positioning Systems (GPS), remote sensing, and Geographic Information Systems (GIS) technologies to efficiently collect, store, retrieve, analyze, and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Northern Leopard Frog Wolverine Fisher Grizzly Bear Suckley's Cuckoo Bumble Bee Monarch
Contain and reduce widespread weeds in areas that are already infested (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Identify and treat dispersal vectors to prevent further spread of invasive and noxious weeds. Restore treated areas with native species.	Treat weeds in high impact areas and along roads (USFS 2013). Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USFS 2013, IDL 2015). Revegetate treatment areas with native species and monitor restoration (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Northern Leopard Frog Wolverine Fisher Grizzly Bear Suckley's Cuckoo Bumble Bee Monarch

Loss of farm field diversity

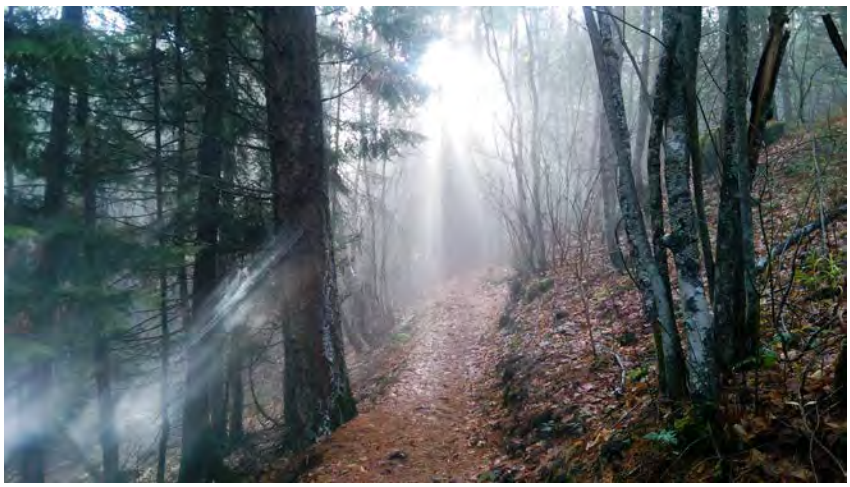
Agricultural monocultures are prevalent in the Kootenai River Valley. The primary crops of wheat, alfalfa, and canola are generally rotated on the hundreds of acres scale in the most northern portion of the valley. This confounds connectivity issues, reduces ephemeral wetland availability,

and results in a dearth of pollinator habitat. Wheat does not provide pollen and although pollinators do receive some benefit from canola and alfalfa, the benefit does not extend across the breeding season because the crops bloom in synchrony. Fortunately, simple steps could be taken to add habitat mosaic patches to cropland, which would benefit multiple SGCN (Mader et al. 2011).

Objective	Strategy	Action(s)	Target SGCNs
Increase farm field diversity.	Work with farmers to improve farm field diversity.	Work with NRCS and other organizations to assess current incentive programs and, if necessary, create new incentive programs. Communicate with farmers to determine their level of interest in participating in a habitat diversity program. Work with interested farmers to develop and implement farm field diversity management plans.	Western Toad Northern Leopard Frog Common Nighthawk Silver-haired Bat Little Brown Myotis Grizzly Bear Coeur d'Alene Oregonian Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch

Target: Dry Lower Montane–Foothill Forest

In the Okanogan Highlands, nearly 28% of the land cover is classified as Dry Lower Montane–Foothill Forest. Although this habitat group can be located at all aspects and slopes, it is predominantly found on warm–dry, south–southwest, moderately steep slopes within the Selkirk Mountains (Cooper et al. 1991). However, it also extends into the valleys and floodplains that surround the mountain range, including the floodplain of the Kootenai, Priest, and Pend Oreille rivers and is the predominant habitat type that surrounds Rathdrum Prairie. Elevation ranges from 529 to 1,920 m in the Okanogan Highlands but there are numerous occurrences above 1,920 m. In the Dry Lower Montane–Foothill Forest, Douglas-fir is a codominant climax species with ponderosa pine (*Pinus ponderosa* Lawson & C. Lawson) in mixed or single species stands (Rocchio 2011). Species such as lodgepole pine, western larch, and grand fir only occasionally occur and are found in the wetter microsites within the habitat group (Cooper et al. 1991). Ponderosa pine woodlands are dominant on the driest sites and where fires are frequent and of low severity (Cooper et al. 1991). Historically, fires were thought to be frequent and moderate to low severity, which maintained open stands of fire-resistant



Coeur d'Alene Mountains © 2015 Michael Lucid

species. Low fire frequency has resulted in a dominance of shrub and tree species such as grand fir and Douglas-fir in the understory. Currently, the habitat group contains a variable understory physiognomy ranging from shrub-dominated and dense with mallow ninebark (*Physocarpus malvaceus* [Greene] Kuntze) and ocean spray (*Holodiscus discolor* [Pursh] Maxim.), to bunchgrass-dominated and open with Idaho fescue (*Festuca idahoensis* Elmer) and bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] Á. Löve).

Target Viability

Fair. There has been substantial encroachment in the habitat type by more shade-tolerant overstory species due to the lack of normal fire intervals. Forest management and development (e.g., housing, roads) have also altered stands.

Prioritized Threats and Strategies for Dry Lower Montane–Foothill Forest

Very High Threats for Dry Lower Montane–Foothill Forest in the Okanogan Highlands

Altered fire regimes (fire suppression & stand-replacing wildfires)

Historically, moderate- to low-severity fires that burned on average every 10 to 30 years maintained the open understory and predominance of shade-intolerant species such as ponderosa pine in the overstory (Smith and Fischer 1997). However, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade-intolerant species to establish (USFS 2013). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and reestablish the vegetative composition of regular fire patterns, but is hampered by policy that does not allow natural fires to burn. In addition, human population increases have increased the Wildland–Urban Interface (WUI) that often prevents the use of fire as a management tool.

Objective	Strategy	Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USFS 2013 [monitoring and evaluation program]).	Use prescribed and natural fires to maintain desired conditions (USFS 2015).	Reduce fuels through mechanical removal or controlled burns on lands within the WUI (USFS 2015). Leave fire-killed trees standing as wildlife habitat if they pose no safety hazard (USFS 2015). Remove perceived barriers to allow more prescribed natural fire on state and private forest lands. Promote/facilitate the use of	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis

Objective	Strategy	Action(s)	Target SGCNs
		prescribed fire as a habitat restoration tool, on both public and private lands where appropriate. Increase membership and participation in Idaho Forest Stewardship Programs, American Tree Farm System, and NRCS.	
Simulate natural fire regimes.	Design and implement silvicultural prescriptions that simulate natural disturbance regimes.	Actively remove shade-tolerant species. Increase markets to pay for ecological forest management activities, e.g., explore markets to thin trees so that they can ward off fire and insect threats.	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis

High Threats for Dry Lower Montane–Foothill Forest in the Okanogan Highlands

Invasive & noxious weeds

In the drier habitat types such as the Dry Lower Montane–Foothill Forest, invasive/noxious weeds have migrated from disturbed areas such as roads, railroads, and utility right-of-ways to undisturbed habitats. Across the Idaho Panhandle National Forest (IPNF), nearly 82% of the warm/dry habitat type is at high risk for invasion by nonnative weeds (USFS 2013). Additionally, surveys done in the Okanogan Highlands found 14% of sites in the Dry Lower Montane–Foothill Forest type (n=115) had spotted knapweed or tansy present (Lucid et al. 2016). Species such as spotted knapweed, diffuse knapweed, yellow star-thistle, leafy spurge, and dyer's woad are particularly invasive within the IPNF and have dispersed into undisturbed areas and displaced native species over large areas (USFS 2013).

Objective	Strategy	Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Implement the Idaho Invasive Species Council Strategic Plan.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Use GPS, remote sensing, and GIS technologies to efficiently collect, store, retrieve, analyze, and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis
Contain and reduce widespread weeds in areas that are already infested (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies.	Treat weeds in high impact areas and along roads (USFS 2013). Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USFS 2013, IDL 2015).	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Little Brown Myotis

Objective	Strategy	Action(s)	Target SGCNs
	Identify and treat dispersal vectors to prevent further spread of invasive and noxious weeds. Restore treated areas with native species.	Revegetate treatment areas with native species and monitor restoration (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012). Incorporate noxious weeds into a multitaxa monitoring program.	

Species designation, planning & monitoring

Two species identified as SGCN found in the Dry Lower Montane–Foothill Forest are declining as a result of unknown causes. The priority for many of these species in the coming years is to identify the root causes and to develop strategies to address them.

Objective	Strategy	Action(s)	Target SGCNs
Determine causes of decline for nightjar species in Idaho.	Work with WWG PIF and the Pacific Flyway Nongame Technical Committee (PFNTC) to assess causes(s) of decline.	Assist WWG PIF with adjusting current Nightjar Survey Network protocols to collect data that will inform potential cause(s) of decline, including assessments of insect prey populations and their habitats. Work with WWG PIF and PFNTC to identify opportunities for research on contaminant impacts.	Common Nighthawk
Determine causes of decline in Olive-sided Flycatcher.	Determine relative importance of known and suspected threats to Olive-sided Flycatcher, its prey, and its habitats (see Canada's recovery plan, Appendix B; Environment Canada 2015*b*). Investigate factors that affect reproductive output, survival, and fidelity to breeding sites.	Promote cooperation and collaboration with Western Working Group Partners in Flight (WWG PIF) to fill knowledge gaps and to mitigate threats.	Olive-sided Flycatcher
Assess future changes to species status.	Monitor population status.	Incorporate species into multitaxa monitoring program.	Common Nighthawk Olive-sided Flycatcher

Target: Mesic Lower Montane Forest

Selkirk Mountains © 2013 Michael Lucid

In the Okanogan Highlands, 30% of the land cover is classified as Mesic Lower Montane Forest. Within the Selkirk Mountains, this habitat group is located on the slopes and benches, and in valley bottoms, ravines, and canyons with high soil moisture and cool summer temperatures. Elevations typically range from 532–1,800 m. Commonly referred to as a cedar/hemlock forest, western hemlock and western redcedar are common in the overstory, with grand fir, Douglas-fir, Engelmann spruce, western white pine (*Pinus monticola* Douglas ex D. Don), and western larch as frequently present within the canopy (Cooper et al. 1991) and lodgepole pine on drier and cooler microsites (Crawford 2011). The understory is composed of short and tall shrubs, perennial graminoids, forbs, ferns and mosses, often at levels of in-stand diversity approaching or equal to the diversity found in some eastern deciduous forests (Reid 2013). Forests within this habitat group are often centuries old with fire only passing through every 500 years. The fire interval is long with stand-replacing fires occurring 150–500 years and moderate fires 50–100 years (Crawford 2011). Suppression of what would be moderate-intensity fires on drier sites has created mixed aged stands that form fuel ladders which make the forest more susceptible to high intensity and stand-replacing fires. Disturbance in the form of insect, disease, windfall and ice generally produce canopy openings for the regeneration of forest types. Western white pine was once a predominant canopy species within this habitat group; however logging, fire and the introduction of the white pine blister rust (*Cronartium ribicola*) has decimated this species to below 90% of its historical prevalence (Cooper et al. 1991).

Target Viability

Fair. Substantial encroachment by other habitat types due to lack of natural fires cycle and loss of western white pine. Forest practices and roads have also altered stands.

Prioritized Threats and Strategies for Mesic Lower Montane Forest

Very High Threats for Mesic Lower Montane Forest in the Okanogan Highlands

Altered fire regimes (fire suppression and stand-replacing wildfires)

Historically, fires were as variable as the tree species in the forest stand, with an average mean interval of 200–250 years but some drier stands burning with a mean of 18 years (Smith and Fischer 1997). Stands with fire intervals shorter than 140 years were often dominated by western white pine, western larch, Douglas-fir and grand fir (Smith and Fischer 1997). However, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade and fire-intolerant species to establish and heavy fuel loads to build (USFS 2013). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and reestablish the vegetative composition of regular fire patterns but is hampered by policy that does not allow natural fires to burn. Additionally, population increases in neighboring towns has increased the WUI that often prevents the use of fire as a management tool.

Objective	Strategy	Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USFS 2013 [monitoring and evaluation program]).	Use prescribed and natural fires to maintain desired conditions (USFS 2015).	Reduce fuels through mechanical removal or controlled burns on lands within the WUI (USFS 2015). Leave fire-killed trees standing as wildlife habitat if they pose no safety hazard (USFS 2015). Remove perceived barriers to allow more prescribed natural fire on state and private forest lands. Promote/facilitate the use of prescribed fire as a habitat restoration tool, on both public and private lands where appropriate. Increase membership and participation in Idaho Forest Stewardship Programs, American Tree Farm System, and NRCS.	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis
Simulate natural fire regimes.	Design and implement silvicultural prescriptions that simulate natural disturbance regimes.	Actively remove shade-tolerant species. Increase markets to pay for ecological forest management activities, e.g., explore markets to thin trees so that they can ward off fire and insect threats.	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis
Assess species response to	Monitor species occurrence prior	Incorporate species into multitaxa monitoring program.	Common Nighthawk Olive-sided Flycatcher

Objective	Strategy	Action(s)	Target SGCNs
changes in fire regimes.	to and after fire events.		Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis

High Threats for Mesic Lower Montane Forest in the Okanogan Highlands

Forest insect pests & disease epidemics

When at endemic population levels, native forest insects and disease play a critical role in maintaining the health of the forest ecosystem by removing individuals or small groups weakened by drought, injury, or fire (USFS 2010). However, when large stands of trees are stressed by prolonged drought and/or dense stocking, outbreaks of forest insects and disease can impact tree growth, forest composition, and cause extensive tree mortality (USFS 2010). Severe outbreaks of forest insects and pathogens can even cause the conversion of forest to shrublands or grasslands. The impact on forest composition from large scale outbreaks is predicted to increase as climate change decreases summer precipitation and increases temperatures (USFS 2010). Currently, 15–20% of lodgepole pine stands in the IPNF are at high risk for attack by the Mountain Pine Beetle, whereas 25–30% of Douglas-fir stands are at high risk for attack by the Douglas-fir Beetle, with each beetle predicted to kill 80% and 60%, respectively of the basal area in high-risk stands (USFS 2010). The introduction of the nonnative white pine blister rust has reduced western white pine to 5% of its original distribution across the interior Pacific Northwest. This caused changes in forest composition from a relatively stable, fire- and disease-tolerant western white pine forests to early seral forests dominated by the fire and disease-intolerant species such as Douglas-fir, grand fir, and subalpine fir (USFS 2013).

Objective	Strategy	Action(s)	Target SGCNs
Reduce risk of stand-replacing pine beetle or root fungus infestations	Use integrated pest management strategies. Increase diversity of stand ages, size classes and tree species (KPNZ Climate, 2010). Promote responsible firewood harvest/transport.	Use pheromones to protect stands (beetle whispering) (Kegley and Gibson 2004). Target removal of diseased and appropriate size class trees. Remove debris that attracts pine beetles.	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis
Increase number of rust-resistant western white pine in the ecosystem (USFS 2013)	Continue to develop genetics of disease resistant trees. Plant rust-resistant western white pine during restoration efforts.	Conserve and protect any old-growth western white pine on the landscape. Determine if trees are rust-resistant (Neuenschwander et al. 1999). Plant rust-resistant trees in openings that are also *Ribes* free (Neuenschwander et al. 1999). Monitor and remove any signs of the rust on planted trees (USFS 2013).	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis

Objective	Strategy	Action(s)	Target SGCNs
Assess changes in insect numbers over time.	Monitor insect populations and disease.	Incorporate insect and disease threats into a multitaxa monitoring program.	Common Nighthawk Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis

Species designation, planning and monitoring

Two species identified as SGCN found in the Mesic Lower Montane Forest are declining as a result of unknown causes. The priority for many of these species in the coming years is to identify the root causes and to develop strategies to address them.

Objective	Strategy	Action(s)	Target SGCNs
Determine causes of decline for nightjar species in Idaho.	Work with WWG PIF and the PFNTC to assess causes of decline.	Assist WWG PIF with adjusting current Nightjar Survey Network protocols to collect data that will inform potential cause(s) of decline, including assessments of insect prey populations and their habitats. Work with WWG PIF and PFNTC to identify opportunities for research on contaminant impacts.	Common Nighthawk
Determine causes of decline in Olive-sided Flycatcher.	Determine relative importance of known and suspected threats to Olive-sided Flycatcher, its prey, and its habitats (see Canada's recovery plan, Appendix B; Environment Canada 2015*b*). Investigate factors that affect reproductive output, survival, and fidelity to breeding sites.	Promote cooperation and collaboration with WWG PIF to fill knowledge gaps and to mitigate threats.	Olive-sided Flycatcher
Assess future changes to species status.	Monitor population status.	Incorporate species into multitaxa monitoring program.	Common Nighthawk Olive-sided Flycatcher

Target: Subalpine–High Montane Conifer Forest

At the higher elevations within the Selkirk Mountains, the Subalpine–High Montane Conifer Forest is the prevalent habitat group. It is predominantly found at elevations between 900–2,338 m in the Selkirk Mountains. Engelmann spruce, lodgepole pine, and subalpine fir are the most frequent overstory trees. At lower elevations or on warmer sites, Douglas-fir, western larch, and western white pine also occur. Lodgepole pine forms woodlands within this habitat group on drier and cooler sites, sometimes at lower elevations (Crawford 2011). Thinleaf huckleberry (*Vaccinium membranaceum* Douglas ex Torr.) and grouse whortleberry (*Vaccinium scoparium*

Leiberg ex Coville) are common species in the understory and provide important wildlife forage (Smith and Fischer 1997). Mountain hemlock is often a co-climax species in this habitat group; however, like subalpine larch (*Larix lyallii* Parl.), it has a limited distribution in the Selkirk Mountains (Smith and Fischer 1997). Whitebark pine replaces lodgepole pine at higher elevations and becomes dominant as the elevation and climate severity increases. At timberline, the transition zone between continuous forest and the limited alpine, only Engelmann spruce, subalpine fir, subalpine larch and whitebark pine persist. The timberline zone is impacted by drying winds, heavy snow accumulation and subsurface rockiness that lead to stunted growth and a clustered distribution (Cooper et al. 1991, Smith and Fischer 1997). At timberline, whitebark pine is commonly the species that colonizes sites and provides habitat for less hardy species. Whitebark pine also provides high calorie food resources for numerous wildlife species such as Grizzly Bear, Clark's Nutcracker (*Nucifraga columbiana*), and other small mammals and birds in the form of large seeds (Fryer 2002). Whitebark pine is a long-lived and slow-growing species that is often overtopped by faster-growing, shade-tolerant species such as subalpine fir and Engelmann spruce. 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 forest. However, fire suppression, invasion of white pine blister rust, and Mountain Pine Beetle have all contributed to the recent precipitous declines of whitebark pine across its range (Smith and Fischer 1997, Fryer 2002).

Selkirk Mountains-Whitebark Pine © 2015 Michael Lucid

Target Viability

Poor to Fair. Altered fire regimes, insects and disease, and climate change have all caused a reduction in whitebark pine woodlands.

Prioritized Threats and Strategies for Subalpine–High Montane Conifer Forest

Very High Threats for Subalpine–High Montane Conifer Forest in the Okanogan Highlands

Altered fire regimes (fire suppression & stand-replacing wildfires)

Historically, mixed severity fires burned between 60–300 years with nonlethal burns in the understory of whitebark pine stands at an average interval of 56 years (Smith and Fischer 1997). However, tree regeneration in the upper elevation is dependent on soil moisture, temperature, and whitebark pine seed cache and may be slow in some areas. For example, the lack of whitebark pine regeneration after the Sundance Fire (a 56,000-acre wildfire that started in Sundance Mountain in Bonner County in 1967) is thought to be due to a lack of seed cache after mature trees were killed by Mountain Pine Beetle or infected with blister rust (Smith and Fischer 1997). As with the other habitat types, decades of fire suppression activities aided by a cool period in the Pacific decadal oscillation were effective in preventing most moderate fires in the ecosystem while also preventing stand-replacing fires that often enable shade-intolerant species to establish (USFS 2013). This resulted in the encroachment of shade-tolerant species into the habitat group as well as a decrease in fire-tolerant species, increased vertical stand structure, increased canopy closure, increased vertical fuel ladders, greater biomass, greater fire intensities and severities, and increased insect and disease epidemics (Keane et al. 2002). Fire management over the past 15 years has attempted to simulate and reestablish the vegetative composition of regular fire patterns, but is hampered by policy that does not allow natural fires to burn.

Objective	Strategy	Action(s)	Target SGCNs
Restore a natural fire interval that promotes historical forest conditions (USFS 2013 [monitoring and evaluation program]).	Use prescribed and natural fires to maintain desired conditions (USFS, 2015).	Reduce fuels through mechanical removal or controlled burns on lands within the WUI (USFS 2015). Leave fire-killed trees standing as wildlife habitat if they pose no safety hazard (USFS 2015). Remove perceived barriers to allow more prescribed natural fire on state and private forest lands. Promote/facilitate the use of prescribed fire as a habitat restoration tool, on both public and private lands where appropriate.	Clark's Nutcracker Wolverine Grizzly Bear Mountain Goat Hoary Marmot
Simulate natural fire regimes.	Design and implement silvicultural prescriptions that simulate natural disturbance regimes.	Actively remove shade-tolerant species where impacts to fragile subalpine soils can be minimized.	Clark's Nutcracker Wolverine Grizzly Bear Mountain Goat Hoary Marmot
Assess species response to changes in fire	Monitor species occurrence prior to and after fire events.	Incorporate species into multitaxa monitoring program.	Clark's Nutcracker Wolverine Grizzly Bear

Objective	Strategy	Action(s)	Target SGCNs
regimes.			Mountain Goat Hoary Marmot Magnum Mantleslug Spur-throated Grasshopper (*Melanoplus*) Species Group

High Threats for Subalpine–High Montane Conifer Forest in the Okanogan Highlands

Climate change

Global climate change is expected to have widespread effects on temperature and precipitation regimes worldwide and mean annual global air temperatures are predicted to rise within the 2 to 4.5 °C range by the end of the century (Meehl et al. 2007). Conditions in the Pacific Northwest are expected to trend toward hotter drier summers and warmer wetter winters (Karl et al. 2009). Snowpack depth and duration are predicted to decrease, reducing summer soil moisture, impacting species dependent on mesic conditions. Climate change is expected to further alter fire extent and severity while allowing for larger-scale and more persistent Mountain Pine Beetle infestations. As a result, whitebark pine is expected to decrease in extent.

Delineating temperature refugia for cool water or air temperature dependent species is a relatively new idea (e.g., Isaak et al. 2015). Recent microclimate monitoring work in the Idaho Panhandle identified a portion of the Okanogan Highlands as the largest area of annually cool air relative to other portions of the Idaho Panhandle (Lucid et al. 2016). Continued monitoring of microclimate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Action(s)	Target SGCNs
Climate monitoring.	Monitor climate variables and species co-occurrence over time.	Develop climate monitoring program using a variety of microclimate variables along with co-occurrence of associated SGCN.	Clark's Nutcracker Wolverine Grizzly Bear Mountain Goat Hoary Marmot Magnum Mantleslug Spur-throated Grasshopper (*Melanoplus*) Species Group
Implement other state management plans.	Implement *Management Plan for the Conservation of Wolverines in Idaho 2014–2019* (IDFG 2014).	Implement specific actions outlined in climate section of *Management Plan for the Conservation of Wolverines in Idaho 2014–2019* (IDFG 2014).	Wolverine

Forest insect pests & disease

When at endemic population levels, native forest insects and disease play a critical role in maintaining the health of the forest ecosystem by removing individuals or small groups weakened by drought, injury or fire (USFS 2010). However, when large stands of trees are stressed by prolonged drought and/or dense stocking, outbreaks of forest insects and disease can impact tree growth, forest composition and cause extensive tree mortality (USFS 2010). Severe outbreaks of forest insects and pathogens can even cause the conversion of forest to shrublands or grasslands. The impact on forest composition from large scale outbreaks is predicted to increase as climate change decreases precipitation and increases temperatures (USFS 2010). The introduction of the nonnative white pine blister rust has reduced whitebark pine by nearly a quarter to a half in subalpine ecosystems in Northern Idaho and Montana (USFS 2010) by reducing the ability of the species to produce cones. In the Selkirk Mountains, an average of 70% of live whitebark pine is already infected by blister rust (Kegley and Gibson 2004). Additionally, Mountain Pine Beetle often kills whitebark pines that are rust resistant (Schwandt 2006). As a keystone species within subalpine ecosystems, the loss of whitebark pine is predicted to negatively impact forest composition, wildlife communities, soil structure, and alpine hydrology (Schwandt 2006).

Objective	Strategy	Action(s)	Target SGCNs
Reduce risk of stand-replacing pine beetle infestations.	Use integrative pest management strategies. Increase diversity of stand ages, size classes and tree species (KPNZ Climate 2010). Promote responsible firewood harvest/transport.	Use pheromones to protect stands (beetle whispering) (Kegley and Gibson 2004). Target removal of diseased and appropriate size class trees. Remove debris that attracts pine beetles.	Clark's Nutcracker Grizzly Bear
Increase number of rust-resistant whitebark pine in the ecosystem (USFS 2013).	Continue to develop genetics of disease resistant trees for restoration efforts.	Monitor rust and beetle levels in live whitebark pine. Collect rust-resistant seed for testing and restoration (Schwandt 2006). Plant rust-resistant whitebark pine. Monitor and remove any signs of the rust on planted trees (USFS 2013).	Clark's Nutcracker Grizzly Bear
Assess changes in insect numbers over time.	Monitor insect populations and disease.	Incorporate insect and disease threats into a multitaxa monitoring program.	Clark's Nutcracker Grizzly Bear

Target: Cool Air Refugia

Cool Air Refugia are micro- or macrosites where cool and moist-adapted, low dispersal organisms can retreat to and persist under a warming and drying climate regime. These habitats occur where cold air pools at the bottom of slopes in valleys and canyons in combination with topographic shading (e.g., on north-facing slopes). These factors reduce the rate of spring

snowmelt and maintain cooler and moister microclimates in summer. They are preferably spatially linked and of sufficient size to meet life history requirements and maintain genetic diversity of organisms. They have not yet been mapped in Idaho.

Delineating temperature refugia for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent microclimate monitoring work in the Idaho Panhandle identified a portion of the Okanogan Highlands as the largest area of annually cool air in the Idaho Panhandle (Lucid et al. 2016). Continued monitoring of microclimate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Fortunately, the Okanogan Highlands has a substantial database on species co-occurrence with different microclimate regimes (Lucid et al. 2016). This database provides information necessary to begin learning how to help cool air dependent species adapt to climate change. 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.

Target Viability

Fair. Although partially mitigated by topography, climate change (hotter, drier summers, warmer and wetter winters, less snowpack) is expected to reduce the extent and possibly the quality of Cool Air Refugia habitat in northern Idaho. Landscapes fragmented by human development or climate-influenced, large-scale environmental change (e.g., severe wildfire) may decrease the ability of dispersal-limited species to use refugia.

Prioritized Threats and Strategies for Cool Air Refugia

High Threats for Cool Air Refugia in the Okanogan Highlands

Climate change

Global climate change is expected to have widespread effects on temperature and precipitation regimes worldwide and mean annual global air temperatures are predicted to rise within the 2 to 4.5 °C range by the end of the century (Meehl et al. 2007). Conditions in the Pacific Northwest are expected to trend toward hotter drier summers and warmer wetter winters (Karl et al. 2009). These changes will likely increase the temperature and evaporative rates in otherwise inherently protected refugia, thereby reducing the extent and quality of cool-air microsites. How wildlife populations will respond to these changes in localized areas is uncertain. Although sometimes available, empirical data to evaluate even the basic climatic requirements for many species is generally lacking (Mawdsley 2009).

Objective	Strategy	Action(s)	Target SGCNs
Maintain Cool Air Refugia for SGCN.	Improve knowledge of the distribution and status of Cool Air Refugia and associated SGCN.	Monitor microclimate variables and species co-occurrence over time. Determine species habitat requirements. Evaluate and enhance	Western Toad Wolverine Northern Bog Lemming Hoary Marmot Pale Jumping-slug A Roundback Slug (*Hemphillia* sp. 1)

Objective	Strategy	Action(s)	Target SGCNs
		opportunities for SGCN to access Cool Air Refugia. Determine best management practices to maintain cool microsites and benefit cool air associated species.	Magnum Mantleslug Shiny Tightcoil Western Bumble Bee

Target: Riverine–Riparian Forest & Shrubland

In the Okanogan Highlands, the riverine ecosystem includes all rivers, streams, and smaller order waterways (1–3 order; Strahler stream order) and their associated floodplain and riparian vegetation. Riparian habitat of smaller streams is highly diverse, typically dominated by Drummond's willow (*Salix drummondiana* Barratt ex Hook.), alder (*Alnus* Mill.), or redosier dogwood (*Cornus sericea* L.) shrublands. Geyer's willow (*Salix geyeriana* Andersson), Bebb's willow (*Salix bebbiana* Sarg.), thinleaf alder (*Alnus incana* L.) and rose spirea (*Spiraea douglasii* Hook.) shrublands line lower gradient streams. Understory vegetation is a lush mix of mesic forbs and graminoids.

Upper Priest Falls © 2013 Michael Lucid

Major rivers (those designated as 4+ order in Strahler stream order) in the Okanogan Highlands includes the Kootenai, Pend Oreille, and Priest rivers. Prior to agricultural development, flood control, and alteration of the hydrologic regime, the Kootenai River supported black cottonwood-dominated riparian forests. Western redcedar and red alder (*Alnus rubra* Bong.) are other important riparian trees at lower elevations. Engelmann spruce and subalpine fir dominate riparian habitats at higher elevations and in cold-air drainages.

The Kootenai River is the only drainage in Idaho with a native Burbot (ling) population and is home to a genetically distinct population of White Sturgeon. Fisheries for both of these species were closed for conservation purposes in 1984 in response to major declines in these populations. Alteration of the natural flow regime, substrate, temperature, and nutrients are believed to be the primary reasons for the lack of successful reproduction of White Sturgeon and Burbot (IDFG, 2008). Other rivers and streams in the region support numerous fisheries and provide host habitat for several mussel species. High-velocity mountain streams provide important nesting habitat for Harlequin Ducks (*Histrionicus histrionicus*). In the Okanogan Highlands there are numerous waterfalls documented for the region. Waterfalls support aquatic organisms uniquely adapted to extremely high water velocities and plants and animals that require cool, constantly moist rocky habitats. Waterfalls also provide important nesting habitat

for Black Swift (*Cypseloides niger*). Although swifts are commonly detected within the Okanogan Highlands region, a nesting colony has not yet been discovered (Miller et al. 2013).

Target Viability

Fair. Kootenai River is subjected to sometimes very high to more often very low levels of nutrients that influence aquatic invertebrate load and thus fish. An altered seasonal flooding regime and development of riparian zones (e.g., levees, roads, etc.) negatively impacts important habitat for fish and aquatic invertebrates, as well as the health and reproduction of riparian vegetation. Terrestrial and aquatic habitats of other rivers are influenced by changed hydrographic regime. Invasive species are another major stressor.

Prioritized Threats and Strategies for Riverine–Riparian Forest & Shrubland

Very High Threats for Riverine–Riparian Forest & Shrubland in the Okanogan Highlands

Dams & water management

Historically, the natural flood regime of the Kootenai River was dependent on winter snowmelt; with the most severe floods occurring in May or June and water flow remaining steady or low September–March (Hoffman et al. 2002, Burke et al. 2006). Currently, flows are dependent on power production, flood control, recreation, and special operations for the recovery of ESA–listed White Sturgeon and Bull Trout, with consideration for Burbot (SGCN) other focal species (KTOI and Montana Dept. of Fish and Wildlife 2004). Since the construction of Libby Dam, the hydrologic regime of the Kootenai River has shifted dramatically, with the highest flows occurring in the fall and early winter and low flows in the spring (Hoffman et al. 2002). In addition, dam operations also disrupt the delivery of fine sediments and nutrients into aquatic and riparian habitats within the floodplain (Burke et al. 2006). Severe floods have been eliminated entirely with the construction of levees and dikes that effectively disconnected the river from the surrounding floodplain (KTOI 2009).

Objective	Strategy	Action(s)	Target SGCNs
Develop habitat modifications that are compatible within the current hydrologic regime (KTOI 2009). Determine feasibility of restoring historic hydrologic regime. Restore populations of flood-associated	Increase floodplain areas with suitable substrate and elevation relative to the water table that can support riparian vegetation recruitment and establishment (KTOI 2009). Determine if all or a portion of historic hydrologic regime could be restored. Determine which organisms historically altered flood regimes	Implement strategies outlined in the Kootenai Tribe's Kootenai River Habitat Restoration Project Master Plan (KTOI 2009). Conduct review study to determine obstacles and solution to hydrologic regime recovery. Conduct review study to determine best mechanisms to restore natural flood-associated species and implement actions developed in plan.	White Sturgeon (Kootenai River DPS) Burbot Western Toad Northern Leopard Frog Fisher Grizzly Bear Western Ridged Mussel A Mayfly (*Ephemerella alleni*)

Objective	Strategy	Action(s)	Target SGCNs
organisms.	and implement population restoration programs.	Conduct reintroduction programs for organisms that directly influence natural flooding cycles.	

Aquatic invasive invertebrate & plant species

Aquatic invasive species are often the hardest to detect and eradicate. Across the nation, Zebra (*Dreissena polymorpha*) and Quagga Mussels (*Dreissena bugensis*) have disrupted food chains, competed with native species and cost millions of dollars of damage to municipalities by choking water intake pipes and other facilities (Pimentel et al. 2005). Although Zebra and Quagga mussels have not yet been detected in the waterbodies of the Okanogan Highlands, several boat check stations in the region have found the mussels on boats traveling through the area (ISDA 2015 Road Side Inspection Stations, accessed on Nov 2, 2015). It is a goal of the state that neither mussel is ever established in any of the Idaho water ways. Other aquatic invasive species such as Eurasian watermilfoil (*Myriophyllum spicatum* L.), flowering rush (*Butomus umbellatus* L.), and curly pondweed (*Potamogeton crispus* L.) have been detected and established in the Kootenai and Pend Oreille rivers (T. Woolf, pers. comm.). These species easily spread through the movement of boats between the recreational lakes, rivers, and streams in the region. For most of the aquatic plant species, only a fragment of the vegetated matter is necessary to establish the species in a new area. Aquatic invasive plant species, particularly watermilfoil, often form dense mats that prevent the establishment of native aquatic plant species and degrade wildlife and fish habitat (Idaho Invasive Species Counsel and ISDA 2007).

Objective	Strategy	Action(s)	Target SGCNs
Prevent the establishment of aquatic invasive species in noninvaded riverine systems.	Increase monitoring of riverine systems. Increase monitoring and treatment of dispersal vectors for invasive species.	Determine which riverine systems are not impacted by aquatic invasive species. Establish a monitoring schedule to visit un-invaded but high-risk riverine systems. Educate the public about the dangers of associated with spreading an aquatic invasive species. (ID Invasive Species Counsel and ISDA 2007). Maintain boat-check stations for the regular inspection for aquatic invasive species. Incorporate monitoring efforts into a multitaxa monitoring program that includes both invasive species and target SGCNs and their associates.	White Sturgeon (Kootenai River DPS) Burbot Western Ridged Mussel A Mayfly (*Ephemerella alleni*)
Contain and eradicate populations of Eurasian watermilfoil, flowering rush, and curlyleaf pondweed.	Implement actions indicated in the ISDA's 2008 Statewide Strategic Plan For Eurasian Watermilfoil	Survey invaded waters to determine extent of nonnative aquatic species distribution. Develop treatment priorities based on waterbody use. Develop strategies for eradication based	White Sturgeon (Kootenai River DPS) Burbot Western Ridged Mussel A Mayfly (*Ephemerella alleni*)

Objective	Strategy	Action(s)	Target SGCNs
	In Idaho.	on waterbody hydrology and use. Regularly monitor and re-treat areas after initial treatment. (ID Invasive Species Counsel and ISDA 2007).	

Invasive & noxious riparian weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys conducted at several of the creeks within the Pend Oreille WMA, found an overall increase in noxious weed coverage at several of the properties, with a range of 0.46–28.25% coverage (Cousins and Antonelli 2008). Reed canarygrass was also predominant at many of the survey sites with 16.32% coverage of interior riparian areas (Cousins and Antonelli 2008). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decrease plant diversity and degrade wildlife habitat.

Objective	Strategy	Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Implement the Idaho Invasive Species Council Strategic Plan.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Use GPS, remote sensing, and GIS technologies to efficiently collect, store, retrieve, analyze, and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Harlequin Duck Common Nighthawk Olive-sided Flycatcher
Contain and reduce widespread weeds in areas that are already infested (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Identify and treat of dispersal vectors to prevent further spread of invasive and noxious weeds. Restore treated areas with native species.	Treat weeds in high impact areas and along roads (USFS 2013). Treat equipment used during timber harvest or fire suppression activities to be "weed-free" (USFS 2013, IDL 2015). Revegetate treatment areas with native species and monitor restoration (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012). Incorporate noxious weeds into a multitaxa monitoring program.	Harlequin Duck Common Nighthawk Olive-sided Flycatcher

Species designation, planning & monitoring

Multiple species identified as SGCN found in Riverine–Riparian Forest & Shrubland are declining as a result of unknown causes. The priority for many of these species in the coming years is to identify the root causes and develop a strategy to address them.

Harlequin Duck

In Idaho, Harlequin Ducks are uncommon and occupy high-quality streams from the Canadian border south to the Selway River and in the Greater Yellowstone Ecosystem. Breeding streams are relatively undisturbed with high elevation gradients, cold, clear, and swift water, rocky substrates, and forested bank vegetation. Harlequin Ducks use different stream reaches over the course of the breeding season depending on environmental conditions (e.g., timing and magnitude of stream runoff, food abundance) and reproductive chronology (i.e., pre-nesting, nesting, early and late brood-rearing), but remain closely tied to rivers and streams for food, security, and escape cover from predators. There are an estimated 50 pairs of Harlequin Ducks that breed in Idaho (IDFG unpublished data). From 1996 to 2007 there was no statistically significant change in the statewide population. However, there were possible declines on several rivers including the Moyie River, Granite Creek (Lake Pend Oreille drainage) and the St. Joe River. Distribution and abundance of Harlequin Duck has not been assessed since 2007.

Objective	Strategy	Action(s)	Target SGCNs
Improve understanding of Harlequin Duck distribution, abundance, and population status.	Design studies that improve understanding of the factors that influence Harlequin Duck stream occupancy, survival, and reproduction.	Mark and track individuals on the breeding grounds to better understand habitat use, survival rates, causes and timing of mortality, patterns and timing of movements, linkages between breeding, molting, and wintering areas, and return rates. Seek partnerships with coastal states and provinces to study wintering ecology and habitat use. Investigate how human disturbance, changes in forest management, and stream flow characteristics (severity, timing, and frequency of peak and low stream flows) affect behavior, occupancy, reproductive success, and survival on breeding streams.	Harlequin Duck
Establish baseline population metrics for Harlequin Duck.	Implement a coordinated Harlequin Duck monitoring program.	Develop partnerships, funding, and capacity to conduct breeding surveys statewide on a regular basis following the protocol established in the Harlequin Duck Conservation Assessment and Strategy for the US Rocky Mountains (Cassirer et al. 1996) or other appropriate techniques. Where local declines are documented, expand surveys upstream of historically occupied stream reaches. Coordinate surveys with MT, WY, OR, BC, and AB to facilitate a northwest regional population assessment. Incorporate Harlequin Duck surveys into riverine multitaxa monitoring programs.	Harlequin Duck Western Ridged Mussel A Mayfly (*Ephemerella alleni*)

Black Swift

Little is known about breeding Black Swifts in Idaho. Black Swifts are not generally detected during breeding bird surveys. Additionally, their cryptic nesting sites and small colony sizes are obstacles when determining distribution or abundance in the state. In 2013, a survey of breeding locations for Black Swift found evidence of nesting at 5 of the 16 waterfalls visited and roosting swifts at two of the waterfalls (Miller et al. 2013).

Objective	Strategy	Action(s)	Target SGCNs
Determine current breeding locations of Black Swifts	Conduct a comprehensive survey of potential nesting locations	Work with partners, including Intermountain Bird Observatory and Washington, Montana, and British Columbia to develop and implement a systematic survey. Incorporate surveys into multitaxa monitoring programs.	Black Swift

Restoration tool: American Beaver

American Beaver populations currently exist at lower than historic levels across the western United States. This results in a host of ecological consequences such as stream downcutting, reduced riparian extent, and desiccation of riparian and wetland habitat. American Beaver restoration efforts have been shown to be an effective tool to restoring habitat and ecological function to riverine systems.

Objective	Strategy	Action(s)	Target SGCNs
Restore hydrologic function and restore riparian habitats.	Use American Beaver to accomplish hydrologic and habitat restoration.	Determine past and current status of American Beaver populations. Determine feasibility of using American Beaver in restoration efforts. Implement actions delineated by above analysis.	Western Toad Northern Leopard Frog Western Ridged Mussel A Mayfly (*Ephemerella alleni*)

Target: Depressional Wetlands

Depressional Wetlands are any wetlands found in a topographic depression. Depressional Wetlands include vernal pools, old oxbows, disconnected river meanders, and constructed wetlands. In the Okanogan Highlands, this includes many of the wetlands found within the Pend Oreille, McArthur Lake, and Boundary Creek WMAs, the Kootenai National Wildlife Refuge, and within the floodplains of the Kootenai, Upper Pack, and Pack rivers. Other Depressional Wetlands are found within the Selkirk Mountains wherever the elevational lines close and surface waters accumulate (e.g., glacial kettles). Small depressional ponds (less than 2 m deep) commonly occur within the Selkirk Mountains and provide breeding habitat for Western Toads. Depressional Wetlands often support emergent marsh or tree or shrub-dominated swamps. Marshes are composed of broad-leaf cattail (*Typha latifolia* L.), tall bulrush species (*Schoenoplectus* (Rchb.) Palla), panicled bulrush (*Scirpus microcarpus* J. Presl & C. Presl), and other emergent marsh species. Swamps are characterized by western redcedar, Engelmann spruce, rose spirea , and thinleaf alder. In swamps with a high water table, devilsclub (*Oplopanax horridus* [Sm.] Miq.) and American skunkcabbage (*Lysichiton americanus* Hultén & H. St. John) are regularly

encountered. In the valley bottoms, reed canarygrass often forms impenetrable monocultures that limit species diversity within the wetlands (K. Cousins, pers. comm.). Amphibians, waterbirds, marshbirds, and waterfowl all use Depressional Wetlands for breeding and foraging habitats.

Target Viability

Fair. Lower elevation wetlands have experienced, or are currently threatened by, filling and draining, altered hydrologic regimes (e.g., disconnection from floodplain due to levees, water diversion), and invasive species or disease. Higher elevation Depressional Wetlands are threatened by climate change, which alters the timing and amount of water entering them.

Prioritized Threats and Strategies for Depressional Wetlands

Very High Threats for Depressional Wetlands in the Okanogan Highlands

Invasive & noxious weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In plant surveys conducted in Boundary Creek WMA and Pend Oreille WMA, 93% and 83% of the study sites, respectively detected noxious weeds at varying densities (Cousins and Antonelli 2008*a*,*b*). Additionally, in the Boundary Creek WMA, reed canarygrass was the dominant species found in 5 of the 17 marsh communities and it had doubled in coverage from previous surveys conducted in meadow communities (Cousins and Antonelli 2008*a*). Reed canarygrass is a native species in the lower 48 but is considered a noxious weed in Washington and highly invasive elsewhere; it is thought to have hybridized with a nonnative invasive reed canarygrass (Lavergne and Molofsky 2007). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat. Additionally, surveys done in the Okanogan Highlands, found 33 of the ponds, small lakes and emergent wetlands (*n* = 176) surveyed had spotted knapweed or tansy present (Lucid et al. 2016).

Objective	Strategy	Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Implement the Idaho Invasive Species Council Strategic Plan.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Use GPS, remote sensing, and GIS technologies to efficiently collect, store, retrieve, analyze, and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Western Toad Northern Leopard Frog American Bittern Black Tern Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis
Contain and reduce widespread weeds in areas that are already infested (USFS	Coordinate invasive and noxious weed monitoring and treatment across	Continue annual noxious weed control program and coordinate weed management activities with Bonner County and the Selkirk Cooperative Weed Management Area. (Cousins and Antonelli 2008*b*).	Western Toad Northern Leopard Frog American Bittern Black Tern Townsend's Big-eared Bat

Objective	Strategy	Action(s)	Target SGCNs
2013).	agencies. Identify and treat dispersal vectors to prevent further spread of invasive and noxious weeds. Restore treated areas with native species.	Treat weeds in high impact areas and along roads (USFS 2013). Revegetate treatment areas with native species and monitor restoration (KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012). Incorporate noxious weeds into a multitaxa monitoring program.	Silver-haired Bat Little Brown Myotis

High Threats for Depressional Wetlands in the Okanogan Highlands

Climate change

In the Pacific Northwest, climate change is expected to trend toward hotter, drier summers and warmer, slightly wetter winters (Karl et al. 2009). This scenario may result in snowpacks that are shallower and earlier melting. Although Depressional Wetlands may fill with water, it may occur earlier in the year. Less snowpack may mean less surface and groundwater being available to sustain wetland hydrology later in summer, resulting in more Depressional Wetlands drying out earlier in summer. How this will affect SGCN dependent on Depressional Wetlands is not known. More information is needed to make appropriate wetland management decisions needed to sustain wetland functions with a changing climate.

Objective	Strategy	Action(s)	Target SGCNs
Climate monitoring.	Monitor climate variables and species co-occurrence over time.	Develop collaborative climate monitoring program using a variety of microclimate variables along with co-occurrence of SGCN and their associates. Collaborate with Washington, British Columbia, and Montana.	Western Toad Northern Leopard Frog American Bittern Black Tern Townsend's Big-eared Bat Silver-haired Bat Little Brown Myotis

Species designation, planning & monitoring

Multiple species identified as SGCN that are dependent on Depressional Wetlands are declining as a result of unknown causes. The priority for many of these species in the coming years is to identify the root causes and develop a strategy for addressing it. For Black Tern (*Chlidonias niger*), there may be many additional nesting sites in Idaho yet to be discovered. This should be a high priority in the next 10 years so that we have a better sense of our baseline breeding population.

Objective	Strategy	Action(s)	Target SGCNs
Determine current distribution and	Participate in coordinated monitoring.	Conduct repeat surveys of effort initiated in early 2000s to determine where species distribution and density	American Bittern

Objective	Strategy	Action(s)	Target SGCNs
abundance of American Bittern.	Identify hot spots for conservation.	has changed.	
Determine statewide breeding populations of Black Tern.	Identify habitat requirements of breeding Black Tern.	Conduct repeat surveys of targeted habitat for tern nesting.	Black Tern
Assess future changes to species status.	Monitor population status.	Incorporate species into multitaxa monitoring program.	Western Toad Northern Leopard Frog American Bittern Black Tern

Target: Springs & Groundwater-Dependent Wetlands

In the Okanogan Highlands, peatlands are one of the most conspicuous types of groundwater-dependent wetlands with over 31 sites identified (Lichthardt 2004) within the ecoregion. Peatlands are found on waterlogged spring-fed soils, in cold microsites, with at least 30 cm of peat accumulation that range from nutrient-poor (poor fens) to nutrient-rich (rich fens and swamps) (Bursik and Mosely 1992). They often host a diversity of boreal plant species that are disjunct from, or at the edge of their core range and species that are unique in their ability to persist in nutrient- and oxygen-poor soils (e.g., *Sphagnum* moss, mud sedge (*Carex limosa* L.), tall cottongrass (*Eriophorum angustifolium* Honck.), sundew (*Drosera* L. spp.), etc.) (Lichthardt 2004). Surveys for Northern Bog Lemming in Montana (Reichel and Corn, 1997) and Idaho (Groves 1994) have found the species most frequently in wetland habitats with a peat component. Cold-water springs and other groundwater-dependent wetlands are also widespread within the Selkirk Mountains, particularly within the glacial carved troughs and in stream headwaters. They often provide a cold-water refugium for invertebrate and vertebrate species (Issak et al. 2015). These include wet meadows dominated by sedges (*Carex* L. spp.), tufted hairgrass (*Deschampsia cespitosa* [L.] P. Beauv.), and bluejoint (*Calamagrostis canadensis* [Michx.] P. Beauv.).

Target Viability

Good. Many groundwater-dependent wetlands in the Okanogan Highlands are relatively secure, being located in minimally developed locations of the Selkirk Mountains. These habitats are primarily threatened by climate change which may increase temperatures (altering soil processes such as peat formation) and decrease the amount of groundwater available to sustain wetlands. However, some valley peatlands (Lichthardt 2004) and wet meadows are also stressed by nutrient pollution from adjacent agricultural and housing development, historic hydrologic alteration (e.g., dams, diversions, ditches, beaver removal), livestock grazing, invasive species, recreation, and forest management.

Prioritized Threats and Strategies for Springs & Groundwater-Dependent Wetlands

Very High Threats for Springs & Groundwater-Dependent Wetlands in the Okanogan Highlands

Smith Creek Peatland © 2014 Michael Lucid

Invasive & noxious weeds

Invasive species often prevent the establishment of native species by forming dense monocultures and in some instances even change the soil chemistry or hydrology of the invaded area (Ricciardi et al. 2013). In wetland surveys conducted in Boundary Creek WMA and Pend Oreille WMA, 52 and 54 of the 56 and 65 study sites, respectively, detected noxious weeds at varying densities (Cousins and Antonelli 2008*a*,*b*). Additionally, in the Boundary Creek WMA, reed canarygrass doubled in coverage from previous surveys conducted in meadow communities (Cousins and Antonelli 2008*a*). Reed canarygrass forms dense monocultures that decreases plant diversity and degrades wildlife habitat. Peatlands in the Okanogan Highlands have been degraded by various invasive plant species (Lichthardt 2004).

Objective	Strategy	Action(s)	Target SGCNs
Identify and eradicate any potential invasive species prior to establishment (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Implement the Idaho Invasive Species Council Strategic Plan.	Train agency staff to document presence/absence of noxious weeds during field/site visits. Develop a noxious weed database for all lands across Idaho. Use GPS, remote sensing, and GIS technologies to efficiently collect, store, retrieve, analyze, and display noxious weed information (ISDA 1999). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012).	Western Toad Northern Bog Lemming
Contain and reduce widespread weeds in areas that are already infested (USFS 2013).	Coordinate invasive and noxious weed monitoring and treatment across agencies. Identify and treat dispersal vectors to prevent further spread of	Continue annual noxious weed control program and coordinate weed management activities with Bonner County and the Selkirk Cooperative Weed Management Area. (Cousins and Antonelli 2008*b*). Treat weeds in high impact areas and along roads (USFS 2013). Revegetate treatment area with native species and monitor restoration	Western Toad Northern Bog Lemming

Objective	Strategy	Action(s)	Target SGCNs
	invasive and noxious weeds. Restore treated areas with native species.	(KTOI 2009). Implement actions described in the 2012–2016 Idaho Invasive Species Strategic Plan (ISDA 2012). Incorporate noxious weeds into a multitaxa monitoring program.	

High Threats for Springs & Groundwater-Dependent Wetlands in the Okanogan Highlands

Climate change

In the Pacific Northwest, climate change is expected to trend toward hotter, drier summers and warmer, slightly wetter winters (Karl et al. 2009). This scenario may result in snowpacks that are shallower and earlier melting. Less snowpack may mean less groundwater being available to sustain hydrology later in summer, resulting in reduced wetland extent and conversion to drought tolerant meadow communities. These changes will likely increase the temperature and evaporative rates in peatlands (e.g., cool microsite refugia), potentially reducing the value of these wetlands for species sensitive to warmer temperatures. Management that promotes retention of water in wetlands (e.g., American Beaver reintroduction) may be needed to mitigate hydrologic changes. How climate change will affect SGCN found in groundwater-dependent wetlands is uncertain. Although sometimes available, empirical data to evaluate even the basic climatic requirements for many species is generally lacking (Mawdsley 2009).

Delineating temperature refugia (e.g., peatlands) for cool water or air temperature dependent species is a relatively new idea (Isaak et al. 2015). Recent microclimate monitoring work in the Idaho Panhandle identified a portion of the Okanogan Highlands as the largest area of annually cool air in the Idaho Panhandle (Lucid et al. 2016). Continued monitoring of microclimate along with co-occurrence of cool air dependent organisms will provide bedrock information for research determining best management practices for cool air associated species.

Objective	Strategy	Action(s)	Target SGCNs
Climate monitoring	Monitor climate variables and species co-occurrence over time	Develop collaborative climate monitoring program using a variety of microclimate variables along with co-occurrence of associated SGCN. Collaborate with Washington, Montana, and British Columbia.	Western Toad Northern Bog Lemming

Target: Pond-Breeding Amphibians

Amphibians are a highly vulnerable taxonomic group which, globally, hosts more species in decline than birds or mammals (Stuart et al. 2004). Amphibian populations have been declining worldwide for decades (Houlahan et al. 2000) and sometimes occur rapidly in seemingly pristine environments (Stuart et al. 2004). Amphibians are susceptible to pathogens, climate change, environmental pollution, exposure to ultraviolet-B (UV-B) radiation, and invasive species (Bridges and Semlitsch 2000, Kiesecker et al. 2001, Stuart et al. 2004, Cushman 2006). In addition, they tend to have relatively low vagilities (Bowne and Bowers 2004, Cushman 2006) and often have narrow habitat requirements (Cushman 2006).

One of the last verified Northern Leopard Frog detections in the Okanogan Highlands, 2014 IDFG

Western Toads have experienced rangewide declines in western North America. This species could be experiencing similar declines in the Okanogan Highlands, but recent surveys indicate this species is more abundant in the section than other sections in the Idaho Panhandle (Lucid et al. 2016). This indicates the importance of maintaining quality conditions for this species in the Okanogan Highlands. Northern Leopard Frogs (*Rana pipiens*) are abundant across their range, but have experienced severe declines in portions of their range. Northern Leopard Frogs appear to be extirpated from the Okanogan Highlands (Lucid et al. 2016).

Target Viability

Poor. Northern Leopard Frogs have been extirpated from this section. Extant species face invasive species and disease threats.

Prioritized Threats and Strategies for Pond-Breeding Amphibians

High rated threats to Pond-Breeding Amphibians in the Okanogan Highlands

Amphibian chytridiomycosis & other disease

Recent surveys for amphibian chytridiomycosis, a disease caused by a fungal pathogen, *Batrachochytrium dendrobatidis* (*Bd*), on Columbia Spotted Frogs (*Rana luteiventris*) across the Okanogan Highlands indicated the fungus is widespread, occurring at approximately two-thirds of surveyed sites. *Bd* was found more commonly at low and high-elevation sites than mid-elevation sites. *Bd* is a known threat to Western Toad and has been documented to cause near total egg hatching failure of a Western Toad population in the Pacific Northwest (Blaustein et al. 1994). Further research is needed to assess the threat of *Bd* to Western Toad and Northern Leopard Frog. Local die-offs of Western Toad and other amphibians have been recorded in

recent years. These die-offs may be disease related and sites should be investigated and monitored.

Objective	Strategy	Action(s)	Target SGCNs
Determine level of threat to Western Toad.	Determine status of *Bd* in Western Toad.	Visit known Western Toad sites and swab toads for *Bd*.	Western Toad
Monitor amphibian disease.	Develop amphibian disease monitoring program.	Develop monitoring program that encompasses monitoring *Bd* presence, *Bd* levels, and other potential amphibian disease.	Western Toad Northern Leopard Frog

Extirpation of Northern Leopard Frog

Extensive surveys indicate this species has been extirpated from the Okanogan Highlands (Lucid et al. 2016). The closest known colony of this species occurs at the Creston Valley Wildlife Management Area in British Columbia. This population could potentially serve as a source population for human-assisted reintroduction or natural recolonization efforts. Nonnative American Bullfrog occurs on the US side of the border but has not been detected on the British Columbia side. It is critically important to initiate immediate control and extirpation efforts on the most northern American Bullfrog populations in Idaho to prevent their dispersal to the Creston Valley Wildlife Management Area.

Objective	Strategy	Action(s)	Target SGCNs
Address Northern Leopard Frog extirpation.	Work with transboundary partners in Idaho, Washington, and British Columbia	Conduct a literature review assessing potential recovery options including reintroduction and natural recolonization for this species.	Northern Leopard Frog
American Bullfrog control.	Prevent American Bullfrog expansion to Creston Valley Wildlife Management Area Northern Leopard Frog colony.	Work with partners to conduct American Bullfrog control and eradication actions near the Canadian border. Coordinate efforts with British Columbia and Washington.	Western Toad Northern Leopard Frog

Climate change

In the Pacific Northwest, climate change is expected to trend toward hotter, drier summers and warmer, slightly wetter winters (Karl et al. 2009). This scenario may result in snowpacks that are shallower and earlier melting. Although wetlands may fill with water, it may occur earlier in the year. 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. How this will affect SGCN dependent on wetlands is not known. More information is needed to make appropriate wetland management decisions needed to sustain wetland functions with a changing climate.

Objective	Strategy	Action(s)	Target SGCNs
Climate monitoring.	Monitor climate variables and	Develop climate monitoring program using a variety of microclimate	Western Toad Northern Leopard Frog

Objective	Strategy	Action(s)	Target SGCNs
	species and disease co-occurrence over time.	variables along with co-occurrence of associated SGCN. Monitor *Bd* in relation to microclimate variables.	

Target: Lake-Nesting Birds

Western Grebe (*Aechmophorus occidentalis*) and Common Loon (*Gavia immer*) are 2 lake-nesting species that are found in the Okanogan Highlands. Western Grebes build floating nests that are often hidden among emergent vegetation but are sometimes in the open. They are often found in colonies that can number into the hundreds or thousands. In the Okanogan Highlands, a nesting colony of Western Grebes has been regularly documented on Lake Pend Oreille near Denton Slough although nest numbers have ranged only 2–10 nests per year. Reproductive success of these nests has not been documented. Common Loons build platform nests on lake edges or in shallow water. Nesting has only been documented in a few locations in Idaho but nonflying juvenile loons were observed on the north end of Priest Lake, Upper Priest Lake, and the Clark Fork Delta on Lake Pend Oreille in the 1990s (IDFG 2005); however, there have been no recent sightings.

Target Viability

Poor. The one Western Grebe colony had no reproductive success during the 2015 season. There has been no sign of reproduction in Common Loons in the Okanogan Highlands.

High Threats for Lake-Nesting Birds in the Okanogan Highlands

Water level fluctuations in lakes

Fluctuating water levels are a significant issue for several waterbirds species, including Western Grebe and Clark's Grebe. Most Western and Clark's Grebe colonies are located on lakes, reservoirs, or along rivers susceptible to water fluctuations resulting from dam operations. Rapid increase in water levels results in nest flooding, while rapid releases of water results in nests that are no longer accessible to grebes. Additionally, recreational boat traffic near nests can inadvertently flood nests and cause a disruption of incubation behavior.

Objective	Strategy	Action(s)	Target SGCNs
Reduce nest failure.	Work with US Army Corps of Engineers (USACE) and dam operators to reduce water level fluctuations and boat wake during grebe nesting period. Educate public regarding presence and sensitivity of colonial nesting birds. Increase secure nest site availability	Create boating no-wake zones around nesting colonies, and monitor their effectiveness. Develop Best Management Practices with USACE for water level management around grebe colonies. Create signage at boat launches informing the public of colony presence and recommendations for reducing recreational impacts Install loon and grebe nest platforms in appropriate lakes, and monitor their use	Common Loon Western Grebe

Species designation, planning & monitoring

Lake-nesting species identified as SGCN are declining as a result of unknown causes. The priority for these species in the coming years is to identify the root causes and develop a strategy to address them.

Objective	Strategy	Action(s)	Target SGCNs
Determine causes of low nesting success and recruitment of Common Loon and Western Grebe in Idaho.	Conduct research on existing colonies in Idaho.	Collaborate with FWS on proposed research project.	Common Loon Western Grebe

Target: Low-Density Forest Carnivores

Low-Density Forest Carnivores naturally occur at low densities and can be directly affected by human activities. This presents unique opportunities to directly affect positive conservation outcomes for these species. This group consists of mammals traditionally considered furbearers including American Marten, weasels, and American Mink. Wolverine and Fisher are the 2 forest carnivore SGCN that occur within the Okanogan Highlands. Extensive surveys of this section from 2010 to 2014 detected only one individual male of each species within this section (Lucid et al. 2016). Conservation efforts in this section should focus on maintaining or improving ecosystem integrity conducive to the establishment of resident and reproductive Wolverine and Fisher. Research to determine reasons for recent declines in Fisher numbers (Lucid et al. 2016) and developing and implementing conservation actions to address those issues should be a priority.

Target Viability

Poor. Only a few individuals of Low-Density Forest Carnivores known to occur in this section.

Prioritized Threats and Strategies for Low-Density Forest Carnivores

High rated threats to Low-Density Forest Carnivores in the Okanogan Highlands

Genetic isolation

Wolverine and Fisher were nearly or completely extirpated from the lower 48 states in the early 20th century. A variety of natural (Wolverine) and human-mitigated (Fisher) recolonization events have likely affected the genetic structure of populations of the species (Aubry et al. 2007, Vinkey et al. 2006). Populations of both species likely have low genetic diversity due to founder affects. Proper habitat management and gene flow mitigation may help to reduce genetic isolation and increase species occurrence on the landscape.

Objective	Strategy	Action(s)	Target SGCNs
Monitor genetic isolation.	Determine current levels of genetic isolation.	Conduct genetic analyses to determine current population sizes and levels of gene flow. Maintain transboundary collaborations to assess and monitor Wolverine gene flow with Canadian populations.	Wolverine Fisher
Assess and enhance gene flow.	Manage connectivity habitat and	Conduct analysis to assess the apparent lack of Fisher gene flow from Flathead Valley to the Okanogan Highlands.	Wolverine Fisher

Objective	Strategy	Action(s)	Target SGCNs
	assess potential to enhance gene flow.	Conduct analysis assessing reasons for recent declines in Fisher numbers (Lucid et al 2016). Manage forested lowland habitat to maintain forested connectivity. Improve additional lowland forest to increase connectivity. Conduct analysis and literature review to assess potential recovery options including reintroduction and natural recolonization.	

Winter recreation

The *Management Plan for the Conservation of Wolverines in Idaho 2014–2019* (IDFG 2014) outlines specific actions to minimize potential disturbance of Wolverine by oversnow recreation and ski area infrastructure.

Objective	Strategy	Action(s)	Target SGCNs
Manage winter recreation to minimize disturbance.	Coordinate efforts between public and private entities.	Implement strategies outlined in the *Management Plan for the Conservation of Wolverines in Idaho 2014–2019* (IDFG 2014). Work with winter recreation groups to develop educational materials and programs.	Wolverine

Inadequate understanding of population and distribution status to assess potential effects of incidental capture from trapping on populations of Wolverine and Fisher

Wolverine and Fisher are on occasion incidentally captured in the course of trapping other species with legal harvest seasons. Idaho has a mandatory reporting requirement for incidental capture and mortality of any nontarget species such as Wolverine and Fisher. Based on IDFG records, some individuals are found dead in the trap while others are released alive. Information gaps regarding ecology and population dynamics of these species limit ability to draw conclusions about whether incidental capture has any population effects (e.g., whether patterns in capture numbers reflect cyclic changes in populations, greater exposure to trapping, or population increase and expansion).

Objective	Strategy	Action(s)	Target SGCNs
Narrow information gaps about ecology and population dynamics to evaluate threats, including the potential effect of incidental	Gather the necessary information to understand conservation priority related to incidental capture.	Implement strategies and actions outlined in the *Management Plan for the Conservation of Wolverines in Idaho 2014–2019* (IDFG 2014), particularly Objective 6 (and related strategies): Continue to minimize injury and mortality of Wolverines from incidental trapping and shooting. As part of educating trappers about techniques to minimize incidental capture, conduct interviews with trappers to obtain	Wolverine Fisher

capture to local populations of Wolverine and Fisher.		information about the condition and demographics of captured individuals, and the locations, habitats, and trap sets involved in incidental captures of Wolverine or Fisher.	

Target: Grizzly Bear

Grizzly Bears in this section occupy the Selkirk Mountains ecosystem, which is approximately 2,200 square miles in size distributed equally between the United States and Canada. The Idaho Selkirks currently contain at least 25–30 Grizzly Bears. Research has been conducted on the Grizzly Bear population since the early 1980s, primarily in the form of trapping and radiocollaring. More recently, researchers have added camera trap and DNA collection to the research effort. Grizzly Bears typically den at high elevations in the Selkirks but move to lower elevations or south-facing slopes following den emergence, taking advantage of early spring green-up. As the season progresses, bears move to higher elevations, relying on a variety of berries with huckleberry (*Vaccinium* sp.) as the most important forage. Domestic livestock grazing is limited in this section and is not an important consideration in Grizzly Bear management. The population appears to be expanding both in size and distribution. Although included in the original threatened Grizzly Bear listing, the Selkirk population was subsequently petitioned for reclassification from threatened to endangered. After 2014, the FWS determined that the Selkirk population had recovered to the point that it was no longer warranted but precluded from listing as endangered and the Grizzly Bear remains listed as threatened under ESA.

Target Viability

Fair. Population appears to be expanding in both size and distribution.

Prioritized Threats and Strategies for Grizzly Bear

High rated threats to Grizzly Bear in the Okanogan Highlands

Anthropogenic attractants, roads, and the resulting potential for excessive human-caused mortality pose high threats to the Grizzly Bear.

Anthropogenic attractants

Data collected during the 1980s indicated human-caused mortality to be the most important factor affecting population recovery (Knick and Kasworm 1989). Illegal mortality has been reduced through enforcement and education efforts and access restrictions in the form of road closures. The reduced human-caused mortality resulted in an expanding Grizzly Bear population, both in distribution and number. As a result, more human–bear interactions are now taking place in low-elevation areas where humans have established year-round or seasonal residences. Anthropogenic attractants such as garbage, compost piles, sunflower bird feeders, small domestic livestock such as pigs, and corn deer feeders attract Grizzly Bears and can result in food-conditioned or habituated bears. Such bears require management actions including trapping and relocating animals, management removal (killing), or are killed by landowners and can increase the likelihood of mistaken identity kills during the Black Bear hunting season.

Objective	Strategy	Action(s)	Target SGCNs
Reduce human-caused mortalities to allow for population growth.	Reduce anthropogenic attractants.	Work with FS on education and enforcement of food storage orders on FS land. Public education about consequences of feeding and habituating bears.	Grizzly Bear

Roads

Roads can allow relatively easy access to areas that contain Grizzly Bears, thereby allowing more opportunities for mistaken identity kills, intentional poaching, or displacement of bears. Road management on federal lands, primarily US Forest Service ownership, has significantly improved conditions for Grizzly Bears and contributed to the reduction of human-caused mortalities. Access restrictions must be continued and evaluated to address mortality concerns.

Objective	Strategy	Action(s)	Target SGCNs
Reduce human-caused mortalities to allow for population growth.	Maintain access restrictions within the Bear Management Units.	Continue actions described in the Grizzly Bear Access Amendments within the 2015 Forest Service Management Plan (USFS 2015).	Grizzly Bear

Genetic isolation

Genetic isolation of any small population is of long-term conservation concern. Recent radiotelemetry and DNA data suggest that some interchange with adjacent Grizzly Bear populations is either occurring or possible; however, human populations continue to increase. Long-term conservation of Grizzly Bears must accommodate movement between adjacent ecosystems to ensure genetic interchange.

Objective	Strategy	Action(s)	Target SGCNs
Monitor genetic isolation.	Determine current levels of genetic isolation.	Conduct genetic analyses to determine current population sizes and levels of gene flow. Maintain transboundary collaborations to assess and monitor Grizzly Bear gene flow with Canadian populations.	Grizzly Bear
Assess and enhance gene flow.	Manage connectivity habitat and assess potential to enhance gene flow.	Manage forested lowland habitat to maintain forested connectivity. Improve additional lowland forest to increase connectivity.	Grizzly Bear

Target: Caribou

We added Caribou (*Rangifer tarandus*) after our public review and will be developing this narrative as a revision.

Target: Ground-Dwelling Invertebrates

Ground-Dwelling Invertebrates provide essential ecosystem services including decomposition, nutrient cycling, food for vertebrates, plant pollination, seed dispersal, and disease vectoring. They can also serve as effective indicators of environmental health (Jordan and Black 2012). This group encompasses a wide array of taxa. However, Okanogan Highland SGCN in this group are limited to terrestrial gastropods and the Spur-throated Grasshopper (*Melanoplus*) Species Group.

Target Viability

Unknown. Many species lack information on taxonomy, distribution, habitat, and threats.

Species designation, planning & monitoring

Basic knowledge of ecological requirements, habitat needs, systematics, and distribution is lacking for most Ground-Dwelling Invertebrates. Spur-throated Grasshoppers are in need of basic taxonomic work. Although substantial knowledge of terrestrial gastropod distribution and microclimate requirements was obtained during work conducted from 2010 to 2014 (Lucid et al. 2016), much work remains to be done to gain an adequate understanding of basic conservation needs for these species. Four terrestrial gastropods are known to be associated with cooler than average mean annual air temperatures (Lucid et al. 2016). Managing microsites for these species for cool air temperatures and minimal disturbance is recommended until a better ecological understanding is developed through research and monitoring.

Objective	Strategy	Action(s)	Target SGCNs
Determine appropriate taxonomic status of species within the Harvestman Species Group.	Investigate and validate taxonomic status.	Conduct field surveys to collect specimens. Conduct morphological and genetics work to determine species status.	A Harvestman (*Acuclavella*) Species Group
Conduct research and habitat conservation activities for cool air temperature associated gastropods (Lucid et al. 2016).	Develop a better understanding of requirements for these species.	Conduct research to assess ecological requirements for these species. Manage forest structure near microsites to maintain cool air temperatures. Manage these sites for minimal disturbance. Implement long-term monitoring of species and associated microclimate and other habitat requirements. Coordinate with Washington, Montana, and British Columbia.	Pale Jumping-slug A Roundback Slug (*Hemphillia* sp. 1) Magnum Mantleslug Shiny Tightcoil
Confirmation and site protection.	Implement actions to sites where Salmon Coil and Western Flat-whorl are known to occur.	Conduct genetics work to confirm taxonomic identity of specimens currently in possession of IDFG. Work with public or private landowners to minimize disturbance to sites.	Salmon Coil Western Flat-whorl
Determine appropriate	Investigate and validate	Conduct field surveys to collect specimens.	Coeur d'Alene Oregonian

Objective	Strategy	Action(s)	Target SGCNs
taxonomic status of subspecies within the Coeur d'Alene Oregonian species complex.	taxonomic status.	Conduct morphological and genetics work to determine species status.	
Determine appropriate taxonomic status of species within the Spur-throated Grasshopper Species Group).	Investigate and validate taxonomic status.	Conduct field surveys to collect specimens. Conduct morphological and genetics work to determine species status.	Spur-throated Grasshopper (*Melanoplus*) Species Group
Determine if range of Bitterroot Mountain invertebrate SGCN extends to Okanogan Highlands.	Implement actions to assess range of Bitterroot Mountain invertebrates.	Conduct targeted field surveys to collect specimens. Encourage incidental collection of invertebrates by other field workers or recreationists by developing protocols, providing equipment/supplies, providing educational opportunities such as training sessions.	Western Pearlshell Straight Snowfly Idaho Snowfly Palouse Snowfly Cascades Needlefly Idaho Forestfly Clearwater Roachfly Umatilla Willowfly A Click Beetle (*Beckerus barri*) A Riffle Beetle (*Bryelmis idahoensis*) A Mayfly (*Ameletus tolae*) Lolo Mayfly A Mayfly (*Paraleptophlebia falcula*) A Mayfly (*Paraleptophlebia jenseni*) A Mayfly (*Paraleptophlebia traverae*) A Mayfly (*Parameletus columbiae*) A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita wyomingensis sculleni*) Hunt's Bumble Bee A Mason Bee (*Hoplitis orthognathus*) A Caddisfly (*Apatania barri*) A Caddisfly (*Manophylax annulatus*) A Caddisfly (*Eocosmoecus schmidi*)

Objective	Strategy	Action(s)	Target SGCNs
			A Caddisfly (*Homophylax acutus*) A Caddisfly (*Philocasca antennata*) A Caddisfly (*Philocasca banksi*) A Caddisfly (*Rhyacophila oreia*) A Caddisfly (*Rhyacophila robusta*) A Caddisfly (*Goereilla baumanni*) A Caddisfly (*Sericostriata surdickae*)

Target: Pollinators

Pollinators provide an essential ecosystem service that benefits agricultural producers, agricultural consumers, and gardeners (Mader et al. 2011) in the Okanogan Highlands. A wide range of taxa includes birds and an array of insects that provide pollination activities. Western Bumble Bee (*Bombus occidentalis*), Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*), and Monarch (*Danaus plexippus*) are SGCN pollinators known to occur within this section.

Many pollinators, but particularly bees, are known to be experiencing population declines throughout North America (Mader et al. 2011) and those declines may be occurring within the Okanogan Highlands as well. Population declines and local die-offs occur for a variety of reasons including habitat loss, pesticide exposure, and climate change (Mader et al. 2011). The Okanogan Highlands is ripe with opportunity to address these threats and increase the status of SGCN pollinators. Farmers, habitat managers, roadway authorities, municipalities, and homeowners can all contribute to pollinator conservation in clear and productive ways.

Target Viability

Fair. Many pollinators declining rangewide.

Prioritized Threats and Strategies for Pollinators

Very High rated threats to Pollinators in the Okanogan Highlands

Pesticides

Pollinators are negatively affected by pesticides by absorbing pesticides through the exoskeleton, drinking nectar containing pesticides, and carrying pollen laced with pesticides back to colonies (Mader et al. 2011). Neonicotinoids are particularly harmful to bee populations and can cause dramatic die-offs (Hopwood et al. 2012). Although the most effective strategy

benefitting pollinators is to eliminate pesticide use, significant benefit for pollinators can still be achieved through reducing the use of and pollinator exposure to pesticides (Mader et al. 2011).

Objective	Strategy	Action(s)	Target SGCNs
Reduce native pollinator exposure to pesticides (Mader et al. 2011).	Educate habitat managers, farmers, municipalities, and small property owners in methods to eliminate pesticide use (Mader et al. 2011).	Conduct educational activities that encourage potential pesticide applicators to eliminate the use of pesticides where practical. Where pesticides must be used, encourage applicators to apply the minimum amount of chemical necessary and apply when pollinators are least active (i.e., nighttime and when flowers are not blooming) (Mader et al. 2011). Specifically target urban homeowners in educational efforts in the elimination of or proper application of pesticides (Mader et al. 2011). Conduct workshops that discuss pesticides in relation to other pollinator habitat management concerns (Mader et al. 2011).	Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch
Reduce native pollinator exposure to pesticides on IDFG administered property (Mader et al. 2011).	Implement measures to reduce or eliminate pesticide use on IDFG WMAs and other properties (Mader et al. 2011).	Use the minimum recommended amount of pesticide (Mader et al. 2011). Apply pesticides at times when pollinators are least active such as nighttime, cool periods, low wind activity, and when flowers are not blooming (Mader et al. 2011). Mow or otherwise remove flowering weeds before applying pesticides (Mader et al. 2011).	Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch
Eliminate use of neonicotinoid insecticides (Hopwood et al. 2012).	Education measures on the detrimental effects of neonicotinoids on bees (Hopwood et al. 2012).	Develop and distribute educational material. Distribute to municipalities, counties, agriculture producers, habitat managers, and other property owners (Hopwood et al. 2012). Do not employ the use of neonicotinoids on IDFG administered lands (Hopwood et al. 2012).	Western Bumble Bee Suckley's Cuckoo Bumble Bee

Habitat loss

Pollinators require foraging and nesting habitat. Providing both types of habitat within close proximity to each other is the best way to ensure pollinator success. Protecting, enhancing, and creating pollinator habitat can be a fun and rewarding way to engage with local communities. Educating land managers about techniques to reduce land management impacts to pollinators is an essential component to pollinator habitat management.

Objective	Strategy	Action(s)	Target SGCNs
Reduce impact of land management	Educate about and implement practices	Reduce grazing impacts by limiting grazing to one-third to one-fourth of management areas per season (Mader et al. 2011).	Western Bumble Bee Suckley's Cuckoo

Objective	Strategy	Action(s)	Target SGCNs
practices on pollinators (Mader et al. 2011).	that benefit pollinators. (Mader et al. 2011).	Implement pollinator beneficial mowing techniques including use of flushing bar, cutting at ≤8 mph, maintaining a high minimum cutting height of ≥12–16 inches, mowing only in daylight hours, mowing in a mosaic instead of an entire site (Mader et al. 2011). Where prescribed fire is used, implement pollinator-friendly burning protocols including rotational burning of ≤30% of each site every few years, leave small unburned patches intact, avoid burning too frequently (no more than every 5–10 years), avoid high-intensity fires unless the burn goal is tree removal. Work with Idaho Transportation Department to implement proper roadside pollinator habitat management (Mader et al. 2011).	Bumble Bee Monarch
Conserve existing pollinator habitat.		Map existing major known pollinator habitat. Identify and recognize landowners providing pollinator habitat and provide habitat management educational opportunity (Mader et al. 2011). Conduct surveys for native milkweed. Initiate seed saving program (Mader et al. 2011).	Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch
Create new urban and rural pollinator habitat.	Develop programs to encourage urban landowners to create pollinator habitat.	Provide pollinator habitat workshops for homeowners and rural land owners. Provide other educational materials for homeowners. Provide an incentive program for homeowners to create pollinator habitat in urban yards. Convert most of lawn at IDFG Panhandle Regional Office to pollinator habitat. Work with municipalities and businesses to create urban pollinator habitat. Provide bee nest boxes for purchase at the IDFG Panhandle Regional Office.	Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch

Species designation, planning & monitoring

Actions to enhance pollinator habitat will be most effective with knowledge of the current status of SGCN populations. Initiation of long-term monitoring will allow a continuous data stream to assess conservation activities.

Objective	Strategy	Action(s)	Target SGCNs
Determine pollinator population status.	Conduct surveys and implement a long-term pollinator monitoring program.	Conduct surveys to identify colonies and breeding locations of bee SGCN. Protect known breeding sites. Develop monitoring program that includes consideration for climate change impacts.	Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch

Okanogan Highlands Section Team

An initial summary version of the Okanogan Highlands Section project plan was completed for the 2005 Idaho State Wildlife Action Plan. A small working group developed an initial draft of the Section Plan (Miradi v 0.13 which was then reviewed by a much wider group of stakeholders at a 2-day meeting held at the Idaho Department of Fish and Game in February 201; this input captured in Miradi v 0.14). This draft was then subsequently cleaned up and polished. Materials in this document are based on Miradi v. 0.19. Individuals and organizations/agencies involved in this plan are shown in Table 1.3.

Table 1.3 Individuals, agencies, and organizations involved in developing this plan [a]

First name	Last name	Affiliation
Rita	Dixon	Idaho Department of Fish and Game, Headquarters
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[a] Apologies for any inadvertent omissions.
[b] An asterisk "*" denotes team leader(s) and contact point if you would like to become involved in this work.