10. Palouse Prairie Section

Section Description

The Palouse Prairie Section, part of the Columbia Plateau Ecoregion, is located along the western border of northern Idaho, extending west into Washington (Fig. 10.1, Fig. 10.2). This section is characterized by dissected loess-covered basalt plains, undulating plateaus, and river breaks. Elevation ranges from 220 to 1,700 m (722 to 5,577 ft). Soils are generally deep, loamy to silty, and have formed in loess, alluvium, or glacial outwash. The lower reaches and confluence of the Snake and Clearwater rivers are major waterbodies. Climate is maritime influenced. Precipitation ranges from 25 to 76 cm (10 to 30 in) annually, falling primarily during the fall, winter, and spring, and winter precipitation falls mostly as snow. Summers are relatively dry. Average annual temperature ranges from 7 to 12 °C (45 to 54 °F). The growing season varies with elevation and lasts 100 to 170 days.

Palouse Prairie grassland remnant on Gormsen Butte, south of Moscow, Idaho with cropland surrounding © 2008 Janice Hill

Population centers within the Idaho portion of the section are Lewiston and Moscow, and small agricultural communities are dispersed throughout. Outdoor recreational opportunities include hunting, angling, hiking, biking, and wildlife viewing. The largest Idaho Department of Fish and Game (IDFG) Wildlife Management Area (WMA) in Idaho, Craig Mountain WMA, is partially located within this section.

The deep and highly-productive soils of the Palouse Prairie have made dryland farming the primary land use in this section. Approximately 44% of the land is used for agriculture with most farming operations occurring on private land. The majority (83%) of the land in the Palouse Prairie is in private ownership. In addition, timber harvest has been another important land use, and private and corporate timber companies are responsible for most of the logging operations within this section.

The rural rolling hills of farmland dominate the Palouse Prairie Section. Scattered among the farmland lie patches of some of the last remaining Palouse Prairie grasslands in the world. Palouse Prairie grasslands are characterized by a mixture of perennial bunchgrasses, forbs, and low shrubs with a particularly high cover and diversity of forbs. Forb cover is commonly higher than grass cover. Dominant native bunchgrasses include Idaho fescue (*Festuca idahoensis*

Elmer), bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] Á. Löve), and prairie Junegrass (*Koeleria macrantha* [Ledeb.] Schult.). However, nonnative species have spread to many of the remaining Palouse Prairie grasslands. These include such aggressive weeds as North Africa grass (syn. ventenata; *Ventenata dubia* [Leers] Coss.), tall oatgrass (*Arrhenatherum elatius* [L.] P. Beauv. ex J. Presl & C. Presl), and rush skeletonweed (*Chondrilla juncea* L.). Palouse Prairie grasslands are home to such grassland-reliant species as the Giant Palouse Earthworm (*Driloleirus americanus*), Short-eared Owl (*Asio flammeus*), and Common Nighthawk (*Chordeiles minor*). Since many of these Palouse Prairie grassland remnants are small remnants in a fragmented landscape, and privately owned, management and conservation of these remnants remains a challenge. Accordingly, landowners seeking out technical support and/or financial assistance for voluntary conservation efforts should contact local jurisdictions (e.g., Soil and Water Conservation Districts [Conservation Districts], county agencies) and state (e.g., IDFG, Idaho Department of Lands [IDL]) and federal (US Fish and Wildlife Service [FWS], Natural Resources Conservation Service [US] [NRCS], and USDA Farm Service Agency [FSA]) agencies for assistance.

Below the undulating topography of the Palouse, tributaries to the Clearwater River have cut steep gorges into the plateau. Slopes support the same bunchgrasses and the vegetation in general is similar to that of the Palouse Prairie grasslands, however slopes are steeper, soils shallower and often more well drained, and aspects more severe. These grasslands have traditionally been considered "canyon grasslands." Deciduous shrublands occur on many north facing canyon slopes. Along streams and rivers, canyon grasslands extend beyond the riparian areas often transitioning into mixed-conifer forest as elevation increases. The treeless terrain of canyon grasslands provides important wildlife habitat for species such as Short-eared Owl and Common Nighthawk. Soils in the canyon grasslands are shallower than the deep loessial soils found in Palouse Prairie grasslands. Canyon grasslands are also drier than the Palouse Prairie grasslands. Much of the canyon grasslands in this section are grazed by livestock as most are privately owned. Some canyon grasslands remain intact and in good condition, but much of this habitat has been invaded by nonnative plants such as cheatgrass (*Bromus tectorum* L.) and yellow star-thistle (*Centaurea solstitialis* L.).

Currently, forests within the Palouse Prairie Section are a mixture of conifer species and are mostly dominated by Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) and grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.). Western white pine (*Pinus monticola*) was historically more common but blister rust, fire suppression, and timber harvest have vastly reduced the distribution of this species. Ponderosa pine (*Pinus ponderosa*) was also likely more abundant in these forests prior to fire suppression and timber harvesting. Several wildlife species are reliant on this habitat including Fisher (*Pekania pennanti*) and many bird species such as Great Gray Owl (*Strix nebulosa*), Lewis's Woodpecker (*Melanerpes lewis*), White-headed Woodpecker (*Picoides albolarvatus*), and Olive-sided Flycatcher (*Contopus cooperi*).

Similar to Palouse Prairie grasslands, the development of agricultural lands has altered much of the wetland and riverine habitat within the Palouse Prairie Section. Historically, seasonally moist or wet meadows were widespread in the Palouse, occurring in valleys and on flats (Servheen et al. 2002). Meadows were dominated by sedges (e.g. *Carex* L.), tufted hairgrass (*Deschampsia cespitosa* (L.) P. Beauv.), and culturally important small camas (*Camassia quamash* (Pursh)

Greene). Many wetlands, meadows, and riparian areas have been drained and converted to cropland, and as a result the water table has dropped allowing reed canarygrass (*Phalaris arundinacea* L.) or other nonnative species to invade these habitats (Servheen et al. 2002). Relict camas meadows remain near Weippe and Grangeville and sedge meadows occur in forested montane settings. Currently, livestock water reservoirs and farm ponds are the most common Depressional Wetlands present. The remaining aquatic and wetland habitats are important to many terrestrial and aquatic species. Western Toad (*Anaxyrus boreas*) and Great Gray Owl depend on wetland habitats. Several anadromous fish including Pacific Lamprey (*Entosphenus tridentatus*), Steelhead (*Oncorhynchus mykiss*), and Chinook Salmon (*O. tshawytscha*) inhabit the rivers and streams within the Clearwater Basin. There are many other fish and wildlife species that use riparian areas and wetlands since resources such as water, food, and cover are primarily available in these habitats.

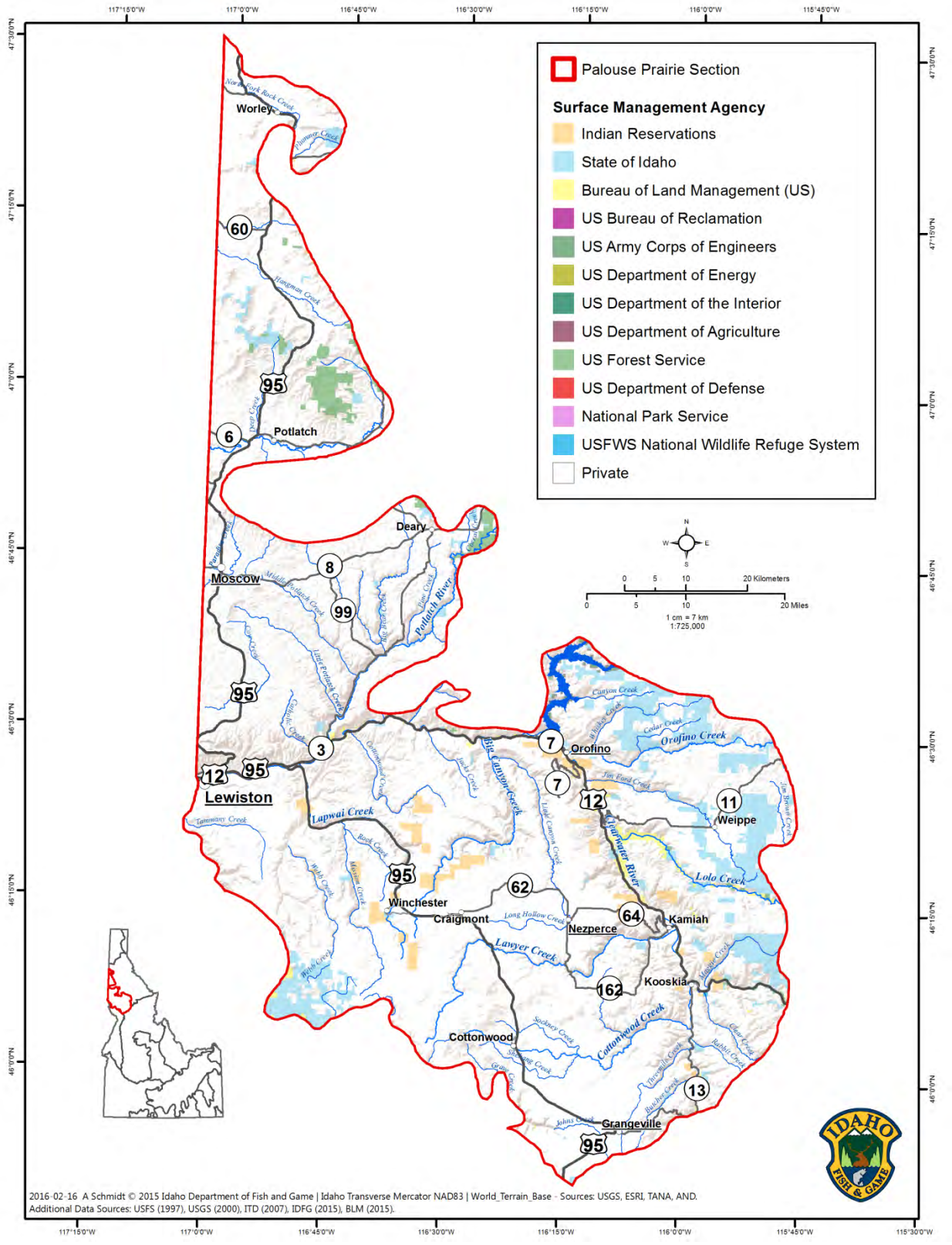

Fig. 10.1 Map of Palouse Prairie surface management

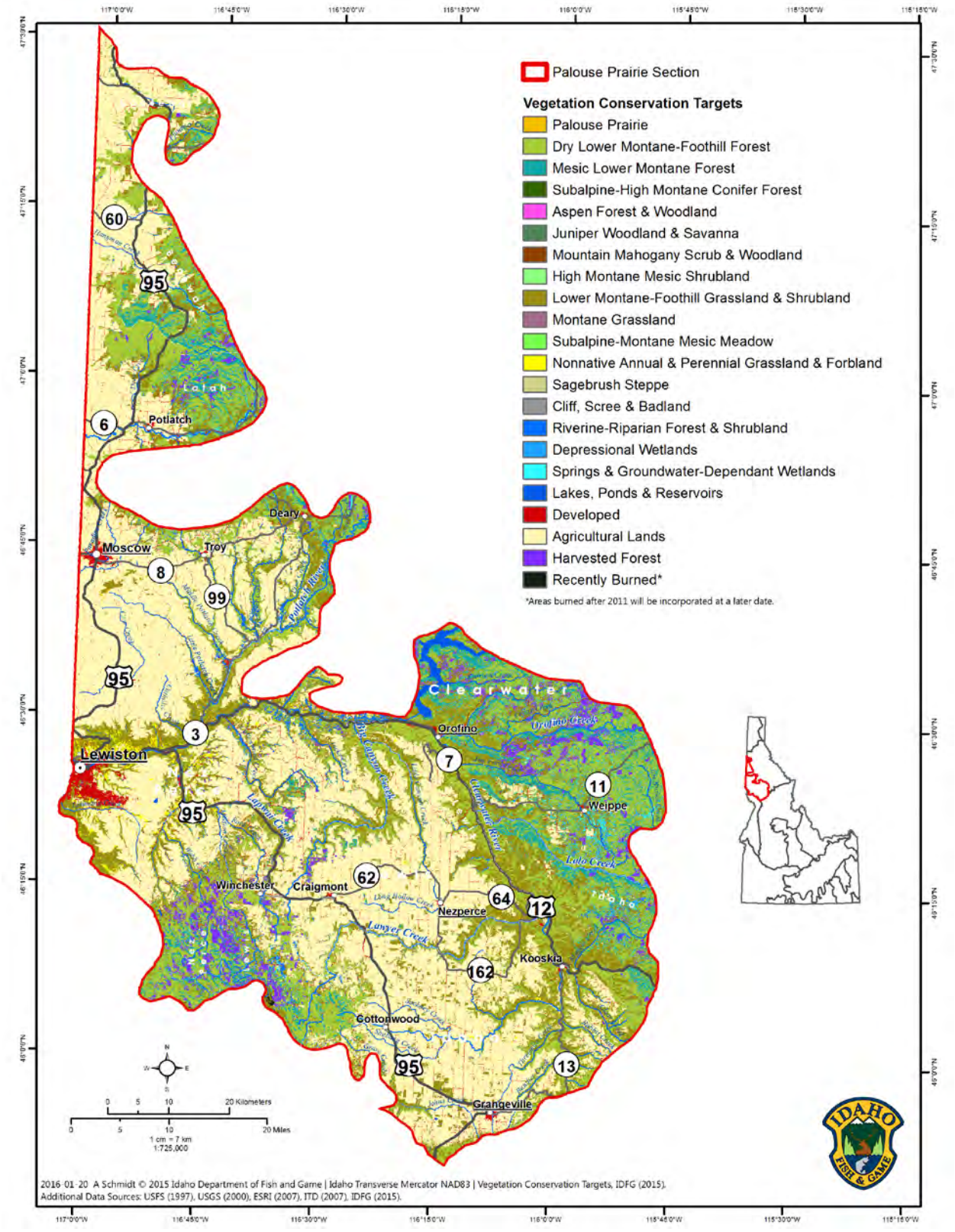

Fig. 10.2 Map of Palouse Prairie vegetation conservation targets

Conservation Targets in the Palouse Prairie

We selected 7 habitat targets (4 upland, 3 aquatic) that represent the major ecosystems in the Palouse Prairie as shown in Table 10.1. Each of these systems provides habitat for key species of greatest conservation need (SGCN), i.e., "nested targets" (Table 10.2) associated with each target. All SGCN management programs in the Palouse Prairie have a nexus with habitat management programs. We provide a high-level summary of current viability status for each target. Conservation of the habitat targets listed below should conserve most of the nested species within them.

Table 10.1 At-a-glance table of conservation targets in the Palouse Prairie

Target	Target description	Target viability	Nested targets (SGCN)	
Dry Lower Montane–Foothill Forest	Mostly dominated by Douglas-fir and ponderosa pine. Adjoins canyon grasslands, Palouse Prairie Grasslands, Mesic Lower Montane Forest, or the boundary of the Bitterroot Mountains Section.	*Poor* to *Good.* Variable condition depending on past management and landownership. Largely modified and fragmented by timber harvest, roads, fire suppression, shorter timber rotations reducing abundance of late-seral forests, snags, and coarse woody debris.	*Tier 2* *Tier 3*	Lewis's Woodpecker Fisher Great Gray Owl Olive-sided Flycatcher White-headed Woodpecker Spur-throated Grasshopper (*Melanoplus*) Species Group
Mesic Lower Montane Forest	Mixed conifer forest dominated by grand fir and western red cedar. Typically occurs on north aspects and borders Dry Lower Montane–Foothill Forest and riparian areas.	*Poor* to *Good.* Variable condition depending on past management and landownership. Largely modified and fragmented by timber harvest, roads, fire suppression, shorter timber rotations reducing abundance of late-seral forests, snags coarse woody debris, and loss of western white pine.	*Tier 2* *Tier 3*	Fisher Great Gray Owl Olive-sided Flycatcher
Lower Montane–Foothill Grassland & Shrubland	Occurring within river breaks and steep canyons. Characterized by a mixture of bunchgrasses and forbs with shrubs scattered throughout. Floristically similar to Palouse Prairie Grasslands but are generally warmer and drier and have shallower soils.	*Fair.* Invasive weeds and improper grazing have degraded the habitat.	*Tier 1* *Tier 3*	Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Mission Creek Oregonian Short-eared Owl Grasshopper Sparrow Common Nighthawk A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Yellow Bumble Bee
Palouse Prairie	Usually found on	*Very Poor.* Various	*Tier 1*	Morrison's Bumble Bee

Target	Target description	Target viability	Nested targets (SGCN)	
Grasslands	uncultivated ridges surrounded by cropland. Comprised of a mixture of perennial bunchgrasses, forbs, and low shrubs. The north slopes tend to have higher forb diversity, and south slopes tend to have a higher cover of nonnative plants.	assessments suggest that the vast majority (>99%) has been fragmented and converted to arable lands, dominated by nonnative invasive plant species. Remnant patches are small and isolated, making it one of the most imperiled habitat types in the US.		Western Bumble Bee Suckley's Cuckoo Bumble Bee
			Tier 2	Giant Palouse Earthworm
			Tier 3	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Monarch
Depressional Wetlands	Depressional Wetlands occur in depressions and old stream meander scars with closed topographic contours. Includes wetlands associated with agricultural land uses.	*Very Poor*. Many have been lost to agricultural conversion. Others have been created where associated with livestock water reservoirs and farm ponds.	*Tier 2*	Western Toad
Springs & Groundwater-Dependent Wetlands	Includes most wet meadows and groundwater fed wetlands that have a downhill drainage point.	*Very Poor*. Many have been lost to agricultural conversion. Remaining meadows are often degraded by invasive species and improper livestock grazing.	*Tier 2*	Western Toad
Riverine–Riparian Forest & Shrubland	Rivers and streams, including aquatic habitats and their associated terrestrial riparian habitats. Includes the Clearwater, Potlatch, and Palouse River systems.	*Poor*. Many have been heavily altered to accommodate anthropogenic uses including but not limited to human development and agricultural production. Water quality and hydrologic processes are often impaired due to human land uses in the watershed.	*Tier 1*	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU)
			Tier 2	Western Toad Western Pearlshell
			Tier 3	Nez Perce Pebblesnail A Mayfly (*Paraleptophlebia traverae*) A Mayfly (*Paraleptophlebia falcula*) A Mayfly (*Parameletus columbiae*) Cascades Needle Fly Idaho Snowfly Palouse Snowfly Straight Snowfly Umatilla Willowfly

Table 10.2 Species of greatest conservation need (SGCN) and associated conservation targets in the Palouse Prairie

Taxon	Conservation targets						
	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Lower Montane–Foothill Grassland & Shrubland	Palouse Prairie Grasslands	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Riverine–Riparian Forest & Shrubland
LAMPREYS							
Pacific Lamprey (*Entosphenus tridentatus*)[1]							X
RAY-FINNED FISHES							
Steelhead (Snake River Basin DPS) (*Oncorhynchus mykiss*)[1]							X
Chinook Salmon (Snake River fall-run ESU) (*Oncorhynchus tshawytscha*)[1]							X
Chinook Salmon (Snake River spring/summer-run ESU) (*Oncorhynchus tshawytscha*)[1]							X
AMPHIBIANS							
Western Toad (*Anaxyrus boreas*)[2]					X	X	X
BIRDS							
Great Gray Owl (*Strix nebulosa*)[3]	X	X				X	
Short-eared Owl (*Asio flammeus*)[3]			X	X			
Common Nighthawk (*Chordeiles minor*)[3]			X	X			
Lewis's Woodpecker (*Melanerpes lewis*)[2]	X						
White-headed Woodpecker (*Picoides albolarvatus*)[3]	X						
Olive-sided Flycatcher (*Contopus cooperi*)[3]	X	X					
Grasshopper Sparrow (*Ammodramus savannarum*)[3]			X	X			
MAMMALS							
Townsend's Big-eared Bat (*Corynorhinus townsendii*)[3]							
Silver-haired Bat (*Lasionycteris noctivagans*)[2]							
Hoary Bat (*Lasiurus cinereus*)[2]							
Little Brown Myotis (*Myotis lucifugus*)[3]							
Fisher (*Pekania pennanti*)[2]	X	X					
BIVALVES							
Western Pearlshell (*Margaritifera falcata*)[2]							X
GASTROPODS							
Nez Perce Pebblesnail (*Fluminicola gustafsoni*)[3]							X
Mission Creek Oregonian (*Cryptomastix magnidentata*)[1]			X				
INSECTS							
A Mayfly (*Paraleptophlebia falcula*)[3]							X

Taxon	Conservation targets						
	Dry Lower Montane–Foothill Forest	Mesic Lower Montane Forest	Lower Montane–Foothill Grassland & Shrubland	Palouse Prairie Grasslands	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Riverine–Riparian Forest & Shrubland
A Mayfly (*Paraleptophlebia traverae*)[3]							X
A Mayfly (*Parameletus columbiae*)[3]							X
A Miner Bee (*Andrena aculeata*)[3]			X	X			
A Miner Bee (*Perdita salicis euxantha*)[3]			X	X			
Yellow Bumble Bee (*Bombus fervidus*)[3]			X	X			
Hunt's Bumble Bee (*Bombus huntii*)[3]			X	X			
Morrison's Bumble Bee (*Bombus morrisoni*)[1]			X	X			
Western Bumble Bee (*Bombus occidentalis*)[1]			X	X			
Suckley's Cuckoo Bumble Bee (*Bombus suckleyi*)[1]			X	X			
Monarch (*Danaus plexippus*)[3]			X	X			
Spur-throated Grasshopper (*Melanoplus*) Species Group[3]	X						
Straight Snowfly (*Capnia lineata*)[3]							X
Idaho Snowfly (*Capnia zukeli*)[3]							X
Palouse Snowfly (*Isocapnia palousa*)[3]							X
Cascades Needlefly (*Megaleuctra kincaidi*)[3]							X
Umatilla Willowfly (*Taenionema umatilla*)[3]							X
WORMS							
Giant Palouse Earthworm (*Driloleirus americanus*)[2]				X			

Target: Dry Lower Montane–Foothill Forest

Dry Lower Montane–Foothill Forest accounts for 22% of the land cover in this section. These forests are currently dominated by Douglas-fir with grand fir occurring in moist microsites. Ponderosa pine was also likely more abundant in these forests prior to fire suppression and timber harvesting. In places where canyon grasslands do not border on Palouse Prairie grasslands, they are bordered by these forests as elevation increases. These dry forests may also adjoin mesic forests and Palouse Prairie grasslands on ridges surrounded by cropland and often occur as inclusions within the grasslands. The boundary of the Palouse Prairie Section is occupied by these forests as they adjoin the Bitterroot Mountains Section. Forest habitat in this section is predominantly privately owned, but some areas are publicly owned. A portion of these forests is managed by the Nez Perce–Clearwater National Forests, Palouse Ranger District. McCroskey

State Park, managed by the Idaho Department of Parks and Recreation, contains some of this forest type. Stands at higher elevations on Craig Mountain WMA are publicly owned and managed by the IDFG. Several corporate and private timber companies, such as Potlatch Corporation and Bennett Lumber Products, Inc., own large portions of forests in this section.

Target Viability

Poor to *Good.* Dry forests of the Palouse Prairie have been largely modified by forest management practices. Timber harvest and fire suppression acitivities have contributed to the reduction of ponderosa pine and have changed the composition of the forests, making them less diverse, more dominated by shade tolerant species, and more prone to stand-replacing wildfire. More specifically, timber harvest practices, such as shorter timber rotations, larger cut units, and reseeding with different species have reduced the abundance of late-seral ponderosa pine forest, snags, and coarse woody debris; in addition, these practices have also fragmented the landscape and altered forest species composition. These changes likely affect at-risk species that live in this habitat type, including Great Gray Owl, Lewis's Woodpecker, White-headed Woodpecker, and Fisher. Condition of these forests vary from poor to good, dependent on past management and landownership. In general, forests that have been largely modified and fragmented by timber harvest, fire suppression, and road development are in poor to fair condition.

Prioritized Threats and Strategies for Dry Lower Montane–Foothill Forest

Very High rated threats to Dry Lower Montane–Foothill Forest in the Palouse Prairie

Altered fire regimes (decreased frequency of low intensity fire & increased severity of wildfire)

Fires throughout the West are now more severe than historically. In dry mixed-conifer forests, decades of fire suppression have resulted in an increase in fuel loading, shifts in species composition toward shade tolerant species less resistent to fire, and increases in fire severity. Many legacy stands of ponderosa pine are at risk of being lost to fire. Because of fire suppression, these stands often have an understory of Douglas-fir, grand fir, or lodgepole pine (*Pinus contorta*), which serve as ladder fuels when fire does occur, making them more severe.

Objective	Strategy	Action(s)	Target SGCNs
Reintroduce frequent, low-intensity fire to the landscape.	Reduce fuel loading and increase fuel continuity.	Use various thinning techniques and/or slashing to broaden the burn window. Use dry season prescribed fire to replicate the effects of natural fires pattern, resulting in shrub rejuvenation and recruitment of new shrubs from seed bank.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
Trend the landscape toward its historic natural	Allow natural fires to burn.	Use a combination of mechanical treatments and prescribed fire to redistribute age classes.	Great Gray Owl Lewis's Woodpecker White-headed

Objective	Strategy	Action(s)	Target SGCNs
range of variability.	Use timber harvest and prescribed burns to create desired fuel conditions across larger landscapes.	Work with Conservation Districts, NRCS, IDL, and other federal, state, and local agencies to develop forest management plans.	Woodpecker Olive-sided Flycatcher Fisher

High rated threats to Dry Lower Montane–Foothill Forest in the Palouse Prairie

Timber harvest management

Much of this forest type within the Palouse Prairie is managed in such a way that trends the landscape away from the natural range of varitability in terms of age structure, patch size, and species composition. These forests are fragmented by high road densities and varying land ownership and accompanying management. Many are on short rotations, and there is often little incentive to restore an appropriate species composition and to restore long-lived seral species such as ponderosa pine.

Objective	Strategy	Action(s)	Target SGCNs
Reestablish appropriate tree species distribution and composition.	Where appropriate, use timber harvest to target shade-tolerant species.	Use thinning and selective harvest techniques to restructure forest species community to historically-present species.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
	Protect legacy seral trees.	Inventory legacy stands of seral tree species Take proactive steps to protect legacy stands from uncharacteristic wildfire. Activities may include removal of second-growth shade-tolerant subcanopy, fuel reduction, slashing, thinning, prescribed fire, etc.	
	Restore long-lived, early seral, fire-dependent tree species to the landscape.	After timber harvest or stand-replacing fire, and on appropriate sites, restock with early long-lived seral species (e.g., ponderosa pine). Encourage appropriate re-entry interval for forest treatments.	
Trend age class and patch size toward Natural Range of Variability.	Manage timber on a landscape level.	Use management activities (e.g., harvest and prescribed fire) to move the landscape toward its natural range of variability in terms of patch size and distribution. Consider age and patch size in adjacent stands to accomplish this at a landscape level. Work with Conservation Districts, NRCS, IDL, and other federal, state, and local agencies to develop forest management plans.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
	Move forest fragmentation pattern toward Natural Range of Variability.	Identify and decommission unneeded roads.	

Noxious weeds & invasive plant species

Nonnative, invasive, and noxious plants are a pervasive problem in the Palouse Prairie Section. The highly-modified nature of the landscape allows for many mechanisms of invasion. Many of the dry mixed-conifer forests , especially the forest margins, are threatened with invasion by spotted knapweed (*Centaurea maculosa*), oxeye daisy (*Leucanthemum vulgare*), orange hawkweed (*Pilosella aurantiaca*), and meadow hawkweed (*Hieracium caespitosum*). Portions of these forests with open canopies and forest margins can be invaded by Japanese brome (*Bromus japonicus*), ventenata, orchard grass (*Dactylis glomerata*), and tall oatgrass. In general noxious weed and invasive species are most problematic in disturbed, open-canopy sites. These nonnative invasive species simplify habitats, displace native species, as well as decrease forage and nesting resources for wildlife.

Objective	Strategy	Action(s)	Target SGCNs
Limit the spread of existing noxious weed and invasive plant species populations.	Inventory populations, improve record-keeping and coordination among stakeholders.	Implement *The Idaho Invasive Species Strategic Plan 2012–2016* ([ISDA] Idaho State Department of Agriculture 2012). Work with County Weed Departments to organize effective weed management programs at the local level. Conduct inventory efforts throughout the area. Coordinate data collection, management and analysis through local working groups. Ensure consistency in data across partners and stakeholders. Implement Early Detection and Rapid Response (EDRR).	Great Gray Owl Olive-sided Flycatcher Spur-throated Grasshopper (*Melanoplus*) Species Group
Restore areas dominated by invasive species.	Implement large-scale activities to remove invasive species.	Coordinate and implement integrated pest management programs that include chemical, mechanical, biological, newly registered biocides, and subsequent restoration practices (DOI 2015).	Great Gray Owl Olive-sided Flycatcher Spur-throated Grasshopper (*Melanoplus*) Species Group
	Revegetate areas dominated by invasive species.	Work with Conservation Districts and other federal, state, and local agencies as well as local experts to assist with revegetation efforts with an emphasis on the use of native plants. Emphasize weed eradication in travel corridors, campgrounds, and on trails to prevent weed spread.	
Increase public awareness on the effects of noxious weeds and invasive plants on wildlife habitat.	Expand education programs that highlight the importance of weed control.	Promote educational programs that highlight the damage invasive plants cause to wildlife and its habitat. Provide information about the risk of weed transport on clothing and vehicles and instruct on how to limit this.	Great Gray Owl Olive-sided Flycatcher

Road density & motorized recreation

Much of this habiat type exists within the front country where road densities are often high. Much of the area is impacted by historic road systems that are no longer needed for management, but often used for motorized recreation. In addition, OHV use in undesignated areas can lead to degradation of forested areas. Such use can increase erosion, user conflicts, spread of invasive species, damage to cultural sites, disturbance to wildlife, and destruction of wildlife habitat. Considered an important issue on state, industrial, and private lands as well as one of the US Forest Service's (FS)' "four threats" (Idaho Forest Action Plan, June 2010, Revised May 2012)—Note: need to create citation.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the effects of roads and motorized recreation on wildlife.	Ensure that wildlife values are incorporated into travel management plans. Increase effectiveness of road closures where they're in place. Reduce road density across landscape.	Participate in FS travel management planning efforts. Continue to work with other state, federal, and private land managers on travel management issues. Work with private landowners to help prevent trespass on their property, especially by unauthorized motorized vehicles. Work with land managers to identify and address problem areas. Recontour first 100 yards of roads to be placed in long-term storage, which prevents unauthorized motorized vehicle access. Physically decommission unneeded roads.	Fisher

Target: Mesic Lower Montane Forest

Moist areas (mainly found on north slopes) adjoining Dry Lower Montane–Foothill Forest are occupied by Mesic Lower Montane Forest which accounts for approximately 5% of the land cover in this section. Mesic forest may also border riparian areas at lower elevations. Grand fir is dominant in the overstory with western redcedar (*Thuja plicata*) and Douglas-fir as frequent associates within the canopy. Western white pine was historically more common, but white pine blister rust (caused by the fungal pathogen *Cronartium ribicola*), fire suppression, and timber harvest have vastly reduced the distribution of this species. Mesic forests are often centuries old due to long fire return intervals with stand-replacing fires occurring every 150 to 500 years and moderate fires every 50 to 100 years (Crawford 2011). Fire suppression has created mixed-aged stands with increased fuel loads that make the forest more susceptible to high-intensity and stand-replacing fires. Insect, disease, windfall, and ice events are also important disturbances in this forest type.

Target Viability

Poor to *Good.* Forest pests and forest management practices have dramatically altered mesic forests of the Palouse Prairie. The most striking change is the near disappearance of western white pine. This tree used to dominate these forests but multiple factors have contributed to its

decline. White pine blister rust, fire suppression, and timber harvest have effectively eliminated western white pine from northern Idaho forests. These practices not only reduced western white pine but also changed the composition of the forests, making them less diverse and more susceptible to larger stand-replacing fires. These changes have likely affected at-risk species that live in this habitat type, including Great Gray Owl, Olive-sided Flycatcher, and Fisher. The condition of these forests varies from poor to good, dependent on past management and landownership. In general, forests that have been largely modified and fragmented by timber harvest, fire suppression, and road development are in poor to fair condition. Good-condition western redcedar groves exist but these are rare in the Palouse Prairie Section.

High rated threats to Mesic Lower Montane Forest in the Palouse Prairie

Timber harvest management

Much of this forest type within the Palouse Prairie is managed in such a way that trends the landscape away from the natural range of varitability in terms of age structure, patch size, and species composition. These forests are fragmented by high road densities and varying land ownership and accompanying management. Many are on short rotations, and there is often little incentive to restore an appropriate species composition and to restore long-lived seral species such as western larch and western white pine.

Objective	Strategy	Action(s)	Target SGCNs
Reestablish appropriate tree species distribution and composition.	Where appropriate, use timber harvest to target shade-tolerant species.	Use thinning and selective harvest techniques to restructure forest species community to historically-present species.	Great Gray Owl Olive-sided Flycatcher Fisher
	Protect legacy seral trees.	Inventory legacy stands of seral tree species. Take proactive steps to protect legacy stands from uncharacteristic wildfire. Activities may include removal of second-growth shade-tolerant subcanopy, fuel reduction, slashing, thinning, prescribed fire, etc.	
	Restore long lived, early seral, fire dependent tree species to the landscape.	After timber harvest or stand-replacing fire, and on appropriate sites, restock with early long-lived seral species (e.g., western larch and western white pine) where appropriate. Encourage appropriate re-entry interval for forest treatments.	
Trend age class and patch size toward Natural Range of Variability.	Manage timber on a landscape level.	Use management activities (e.g., harvest and prescribed fire) to move the landscape toward its natural range of variability in terms of patch size and distribution. Consider age and patch size in adjacent stands to accomplish this at a landscape level. Work with Conservation Districts, NRCS, IDL, and other federal, state, and local agencies to develop forest management plans.	Great Gray Owl Olive-sided Flycatcher Fisher

Objective	Strategy	Action(s)	Target SGCNs
	Move forest fragmentation pattern toward Natural Range of Variability.	Identify and decommission unneeded roads.	

Forest insect pests & diseases

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 (USDA Forest Service 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 (USDA Forest Service 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 (USDA Forest Service 2010). The introduction of the nonnative white pine blister rust (*Cronartium ribicola*) has reduced western white pine to 5% of its original distribution across the interior Pacific Northwest. This caused changes in forest composition from relatively stable, fire- and disease- tolerant western white pine forests to forests dominated by the fire and disease-intolerant species such as Douglas-fir and grand fir (USDA Forest Service 2013).

Objective	Strategy	Action(s)	Target SGCNs
Reduce risk of stand-replacing pine beetle or root fungus infestations.	Use integrative pest management strategies. Increase diversity of stand ages, size classes and tree species (KPNZ Climate et al. 2010). Promote responsible firewood harvest/transport.	Use pheromones to protect stands (beetle whispering) (Kegley and Gibson 2004). Thin stands to ≤60 basal area. Remove debris that attracts pine beetles. Cut out infected trees (mistletoe) (IDL 2015).	
Increase number of rust-resistant western white pine in the ecosystem (USDA Forest Service 2013).	Continue developing genetics of disease resistant trees. Planting rust–resistant western white pine during restoration efforts.	Conserve and protect any old-growth western white pine on the landscape. Determine if rust-resistant (Neuenschwander et al. 1999). Planting 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 (USDA Forest Service 2013).	Olive-sided Flycatcher Townsend's Big-eared Bat Silver-haired Bat Hoary Bat Little Brown Myotis

Road density & motorized recreation

Much of this habiat type exists within the front country where road densities are often high. Much of the area is impacted by historic road systems that are no longer needed for management, but often used for motorized recreation. In addition, OHV use in undesignated areas can lead to degradation of forested areas. Such use can increase erosion, user conflicts, spread of invasive species, damage to cultural sites, disturbance to wildlife, and destruction of wildlife habitat. Considered an important issue on state, industrial, and private lands as well as one of FS's "four threats" (Idaho Forest Action Plan, June 2010, Revised May 2012).

Objective	Strategy	Action(s)	Target SGCNs
Minimize the effects of roads and motorized recreation on wildlife.	Ensure that wildlife values are incorporated into travel management plans. Increase effectiveness of road closures where they're in place. Reduce road density across landscape.	Participate in FS travel management planning efforts. Continue to work with other state, federal, and private land managers on travel management issues. Work with private landowners to help prevent trespass on their property, especially by unauthorized motorized vehicles. Work with land managers to identify and address problem areas. Recontour first 100 yards of roads to be placed in long-term storage, which prevents unauthorized motorized vehicle access. Physically decommission unneeded roads.	Great Gray Owl Fisher

Target: Lower Montane–Foothill Grassland & Shrubland

In the Palouse Prairie, nearly 18% of the land cover is classified as Lower Montane–Foothill Grassland & Shrubland. This conservation target is characterized by a mixture of bunchgrasses and forbs with shrubs scattered throughout and is similar to Palouse Prairie grasslands floristically. Ecologists have referred to the vegetation of this section as "canyon grasslands." The major difference between these 2 habitats can be attributed to topography and soils—canyon grasslands occur within river breaks and steep canyons and have much shallower soils than Palouse Prairie grasslands. Canyon grasslands and shrublands are also warmer and drier than Palouse Prairie grasslands. Like the Palouse Prairie grasslands, south aspects tend to be more weedy than the northerly aspects. Many of the more mesic grasslands on the cooler, northerly aspects are similar in composition to Palouse Prairie grasslands. As in the Palouse Prairie grasslands, deciduous shrublands dominated by common snowberry (*Symphoricarpos albus* (L.) S.F. Blake), mallow ninebark (*Physocarpus malvaceus* (Greene) Kuntze), rose (*Rosa* L. spp.), and black hawthorn (*Crataegus douglasii* Lindl.) are intermixed on northerly facing slopes.

Large expanses of these grasslands are primarily found along the Palouse, Clearwater, and Snake rivers, but may also be found in tributary canyons. Because the canyons are too steep and soils are more shallow, little has been plowed compared to the Palouse Prairie grasslands. Much of the canyon grasslands have been grazed by sheep and cattle. Livestock grazing has

contributed to nonnative weed invasions, which are widespread throughout these grasslands. Cheatgrass, yellow star-thistle, and other aggressive weeds have invaded and degraded large portions of the canyon grasslands (Gray et al. 2005).

Target Viability

Fair. Unlike the Palouse Prairie grasslands, most canyon grasslands have not been widely converted to other land uses (Weddell and Lichthardt 1998). The soils were too shallow and the slopes were too steep to plow. However, the rugged terrain did not restrict extensive grazing of these grasslands. Grazing has altered much of the canyon grasslands, but there are likely some areas too steep and far from water that did not receive heavy grazing pressure (Weddell and Lichthardt 1998). These areas may be in good condition, but overall condition for this target is fair considering the intractable problem of invasive weeds. Landownership and terrain may present challenges to conserving and protecting this target as most of these grasslands are privately owned and on steep slopes. Landowner cooperation is important to successful conservation and restoration projects. Nevertheless, even if landowners are willing, the steep canyons may be difficult and expensive to restore. The steep slopes may limit the use of machinery for site preparation and seeding and make restoration projects labor intensive. The warm and dry conditions can be problematic for planning seeding and other restoration projects.

Spotlight Species of Greatest Conservation Need: Bumble Bees

Bumble bees are vitally important pollinators of wild and domesticated flowering plants. Nationwide, native pollinators (mostly bees) are estimated to provide >3 billion dollars in free pollination services to agriculture producers (Xerces 2013a). Furthermore, native bees are superior pollinators compared to domesticated honey bees (Xerces 2013b). There are >30 species of bumble bees in the western United States, with 15 of those historically occurring in the Palouse Prairie Section (Hatten et. al 2013). Five bumble bee species have been identified as SGCN: Hunt's, Morrison's, Suckley's Cuckoo, Western, and Yellow bumble bees. These species are at risk principally because of loss of habitat, habitat degradation, and rangewide declines in abundance. The Yellow Bumble Bee is the only known significant pollinator of Spalding's Catchfly (*Silene spaldingii*), an ESA-listed threatened plant species (Tubbesing et al. 2014).

Prioritized Threats and Strategies for Lower Montane–Foothill Grassland & Shrubland

Very High rated threats to Lower Montane–Foothill Grassland & Shrubland in the Palouse Prairie

Noxious weeds & invasive plant species

The invasion of nonnative and noxious plants is a pervasive threat to the canyon grasslands. Much of the grasslands, especially south-facing slopes, have been invaded by nonnative plants such as cheatgrass, yellow star-thistle, bur chervil (*Anthriscus caucalis*), and rush skeletonweed. These nonnatives displace native species and degrade habitat quality. Minimizing the invasion and spread of noxious weeds and other nonnative plants within canyon grasslands is possible but can be an arduous task as the terrain is rugged and steep.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the invasion and spread of nonnative, invasive, or noxious plants.	Use integrated management strategies and grazing plans. Expand educational programs that highlight the importance of noxious weed control.	Use chemical (fertilizers & pesticides), mechanical (mowing, disking, etc.), biological (insects, fungi, etc.), and cultural (e.g., targeted grazing, burning, etc.) techniques to control weeds. Restore native plant communities. Promote educational programs that highlight the damage noxious weeds and invasive plants cause to wildlife and its habitat; include information on how to prevent new invasions.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison's Bumble Bee Suckley's Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

High rated threats to Lower Montane–Foothill Grassland & Shrubland in the Palouse Prairie

Decreased frequency & increased severity of wildfire

As a result of fire suppression and altered fire regimes, wildfires are less frequent in the canyon grasslands. When fires are less frequent, fuels can increase and create more severe fires. Severe fires can likely result in a shift in species composition as aggressive nonnative plants, especially cheatgrass, can outcompete native species for newly available resources.

Objective	Strategy	Action(s)	Target SGCNs
Reintroduce frequent, low-intensity fire to the landscape.	Reduce fuel loading, increase fuel continuity, and reintroduce fire. Allow natural fires to burn in areas at low risk of nonnative species invasion.	Use dry season prescribed fire for desired grass, forb, and shrub response. Use natural and prescribed burns to create desired fuel conditions across larger landscapes.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison's Bumble Bee Suckley's Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee
Restore native species to the landscape.	Reestablish appropriate species distribution and composition.	After fire and on appropriate sites, seed with native grass, forb, and shrub species.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison's Bumble Bee Suckley's Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

Improper livestock grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of wildlife use and the use by livestock. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing and size of pastures can all help decrease loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Restore plant diversity.	Use appropriate grazing techniques to restore plant diversity. Improve outreach and education to livestock producers.	Partner with landowners to develop grazing management plans that minimize negative impacts to canyon grasslands and associated wildlife. Provide information about the use of grazing management tools that increase both species diversity and forage production simultaneously.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison's Bumble Bee Suckley's Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

Species designation, planning & monitoring

In addition to conservation actions to address specific threats, some species require inventory and monitoring to assess their current status and distribution in Idaho. As such, we identify needs for one species in the section below and identify appropriate actions.

Objective	Strategy	Action(s)	Target SGCNs
Increase our current understanding of the status of terrestrial gastropods.	Determine the true distribution and rarity of poorly documented terrestrial gastropods.	Revisit historical sites for species that have not been detected in >20 years in Idaho, to see if the species is still present. Where locally appropriate, expand on existing fieldwork.	Mission Creek Oregonian

Target: Palouse Prairie Grasslands

The Palouse Prairie grasslands lie within the Lower Montane–Foothill Grassland & Shrubland system but have been identified as a separate conservation target due to differences in extent, threats, and conservation strategies required to sustain each of these habitats. The extent of Palouse Prairie grasslands has dramatically decreased as most have been converted to cropland. Agriculture is an important land-use activity within this area, but small and dispersed native grasslands still remain. These remnants, which occupy less than 1% of the land cover, are usually on uncultivated ridges surrounded by cropland that extends throughout the entire Palouse Prairie Section. Native grasslands are found on rolling uplands and are comprised of a mixture of perennial bunchgrasses, forbs, and low deciduous shrubs. Usually the north slopes have higher forb diversity and will have higher cover of Idaho fescue, prairie Junegrass, and

native shrubs. The dominant native bunchgrass on south aspects is bluebunch wheatgrass. South slopes tend to have a higher cover of nonnative plant species.

Of the remaining Palouse Prairie grasslands, many are being invaded by nonnative invasive plants. Ventenata has been documented on these grassland remnants for over a decade and is effectively displacing the native perennial bunchgrasses. In addition to ventenata, invasion by other problematic weeds such as rush skeletonweed, yellow star-thistle, and tall oatgrass are degrading wildlife habitat in Palouse Prairie grasslands. Communities dominated by nonnative species are not as favorable as intact native communities for at-risk species.

Target Viability

Very Poor. By the early 1900s, much of the Palouse Prairie grasslands had been converted to agricultural uses. The rich and deep soils were excellent for growing wheat and legumes. Areas that were too rocky and steep to plow remained but have experienced major degradation by heavy livestock grazing and subsequent invasion by nonnative plant species. It is estimated that only 0.1% of these grasslands remain in a natural state (Noss et al. 1995), and they represent a high conservation priority in this section. The condition of Palouse Prairie grasslands is generally very poor since remnants are small, fragmented, located on private land, and threatened by nonnative plant species. Some good-condition remnants persist on the landscape and are in need of protection if they are to remain viable for future generations. These good-condition grassland remnants are small, but are of conservation value and the value may increase with their proximity to other remnants (Looney 2008). Many Palouse Prairie remnants are on private land surrounded by cropland and usually do not have protection from development and other land use changes that may have negative impacts. However, at some sites, it appears that cropland may serve as protection from roads and other weed corridors.

Spotlight Species of Greatest Conservation Need: Giant Palouse Earthworm

The Giant Palouse Earthworm (*Driloleirus americanus*) is an endemic species of the Inland Northwest. The distribution and ecology of the species is poorly understood, but it has been most consistently found in native Palouse Prairie grasslands and other closely related habitats. In the past 30 years, individuals have been reported from <12 locations from northern Idaho and eastern Washington. Individuals discovered in recent years were around 25 cm (10 inches) in length, far shorter than the historically reported 0.9 m (3 ft) that earned them the moniker "giant." The IDFG, FWS, University of Idaho, and others have partnered to develop appropriate survey protocols to address the scientific challenges associated with Giant Palouse Earthworm surveys. Preservation of Palouse Prairie grassland remnants is important to the conservation of this unique species.

Prioritized Threats and Strategies for Palouse Prairie Grasslands

Very High rated threats to Palouse Prairie Grasslands in the Palouse Prairie

Noxious weeds & invasive plant species

Noxious weeds and invasive plant species represent the most pervasive and serious threat to the viability and diversity of the Palouse Prairie plant community. The highly-modified nature of the landscape allows for many mechanisms of invasion. Ironically, the arable lands matrix that Palouse Prairie remnants are embedded within can serve as a protective barrier for some remnants. Lack of access via roads and trails helps to minimize the spread of some invasive plant species. However, it does not entirely protect against invasion. Ventenata, also known as wiregrass or North Africa grass, is a particulaly problematic invasive plant species in Palouse Prairie grasslands that is displacing native species and seriously degrading habitat quality. Bur chervil and rush skeletonweed also pose serious threats.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the invasion by nonnative, invasive, or noxious plants into Palouse Prairie remnants.	Develop mechanisms for EDRR and reporting of suspected new plants by the general public and a formal network of amateur and professional collectors.	Partner with federal, state, and NGOs to inventory current condition of remnants; revisit each on a rotating basis to monitor for invasive plant species. As necessary, spray or manually remove invasive plants.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch Giant Palouse Earthworm
	Promote planting native buffers surrounding remnants.	Partner with local Conservation Districts, FWS, NRCS, FSA, and other local federal and state agencies to provide local expertise and to find funding sources.	
	Develop educational programs on how to prevent spread of invasive species.	Promote the use of a diverse mix of native species.	
Maintain existing Palouse Prairie remnants and control or prevent the spread of invasive plants.	Use integrated pest management strategies.	Use chemical, mechanical, biological, and cultural techniques for maintaining native plants. Promote educational programs that highlight the damage invasive plants cause to wildlife and its habitat.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch Giant Palouse Earthworm
	Consider Palouse Prairie remnants when making decisions about rural development.	Provide recommendations to local and county planning with respect to rural development decisions. Integrate wildlife and habitat into development decisions. Promote native plant species in conservation programs.	

Conversion to agriculture, residential development & associated infrastructure

With >99% of this habitat type converted to arable lands, each remaining remnant is important. High commodity crop prices, as well as new farming equipment and techniques now make it feasible to farm some of these sites. Furthermore, because remnants are often scenic (and therefore desirable property), they are at risk to rural development, including housing development and the associated infrastructure and roads.

Objective	Strategy	Action(s)	Target SGCNs
Preserve existing Palouse Prairie remnants.	Establish and promote restoration/protection subsidies for landowners and cooperators.	Identify funding sources and willing landowners that are open to easements or sale. Increase the value of remnants to make it profitable to conserve them while considering the overall spatial distribution of remnants. Develop language for farmland lease covenants to protect wildlife habitat (i.e., there might be financial incentive to mitigate perceived lost income). Conduct outreach and education to work with landowners that share similar goals and values as conservation organizations. Take advantage of new landownership through partnerships developed with landowners and conservation organizations by using projects and funding sources that benefit wildlife.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch Giant Palouse Earthworm
	Recommend that local city and county zoning rules promote the preservation of remnants.	Ensure that conservation entities play a role in stakeholder discussions about local zoning rules.	
	Work with landowners to plant native buffers surrounding remnants or convert fields close to remnants to native vegetation.	Partner with FWS, Conservation Districts, NRCS, FSA, and other federal, state, and local agencies to provide professional expertise on this process and to help find funding sources for these projects. Promote the use of a diverse mix of native grasses, forbs, and shrubs to optimize wildlife habitat.	
Preserve rangelands.	Minimize conversion of rangelands to crop fields.	Use FSA and NRCS incentive programs to maintain rangelands. Develop grazing plan to maintain or increase habitat diversity.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita*

Objective	Strategy	Action(s)	Target SGCNs
			salicis euxantha) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch Giant Palouse Earthworm

Medium rated threats to Palouse Prairie Grasslands in the Palouse Prairie

Off-target application of pesticides & herbicides on remnants

Intact Palouse Prairie grasslands are rare. Most of this habitat type (>99%) has been converted into arable land. The remnants of this habitat type are typically small (<2 ha; 5 acres), confined to steep or rocky sites, and privately owned. Remnants are embedded in a farming landscape where pesticides and herbicides are used to improve crop yield. When these chemicals are applied, it is common for overspray to drift onto grassland remnants; pesticides can kill native polinators and other wildlife species, and herbicides can eliminate native plant species, degrading habitat quality.

Objective	Strategy	Action(s)	Target SGCNs
Increase floral and faunal diversity on Palouse Prairie remnants.	Minimize and mitigate the effects of overspray of pesticides and herbicides applied to adjacent farmlands.	Assist agricultural producers in obtaining and implementing precision agricultural technology to apply pesticides and herbicides only at targeted locations and only in amounts needed. Use GPS mapping technology to map remnants for use in precision agricultural applications. Revegetate areas where accidental herbicide overspray occurs with an emphasis on the use of native plants. Plant native buffers surrounding remnant vegetation to protect remnants from future overspray and expand ecological function of remnants for pollinators and wildlife.	A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch
	Promote pollinator-friendly chemicals and application methods.	Work with NRCS, FSA, Conservation Districts, and other federal, state, and local agencies to limit the use of pesticides and herbicides that are shown to have a severe negative effect on diverse ecosystems by limiting available farm incentives.	A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison's Bumble Bee Western Bumble Bee Suckley's Cuckoo Bumble Bee Monarch

Target: Depressional Wetlands

Depressional Wetlands within the Palouse Prairie primarily occur in topographic depressions and old meander scars and occupy less than 1% of the land cover. Surface water accumulates in these depressions with water sources being a combination of precipitation, groundwater discharge, lateral subsurface flow, seasonally-high water tables, overland flow from adjacent uplands, or canals or ditches. The direction of flow is normally from the surrounding uplands toward the center of the depression. These wetlands lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, or infiltration to ground water. By and large, Depressional Wetlands on the Palouse Prairie have been drained and converted to agriculture. However, some old meander scars that retain water have become wetlands. These meander scars occur along floodplains of rivers that have migrated or have been channelized. Wetlands associated with meander scars can be found in the Hangman Creek, Palouse River, and Potlatch River drainages. Old meander scars that are usuallly disconnected from river floodplains become inundated during spring flooding events. Currently, created and enhanced wetlands associated with livestock water reservoirs and farm ponds are the most common depressional habitats present. Some of these wetland ponds dry out seasonally (e.g., analagous to vernal pools) while others remain wet year-round. Wildlife species that roam the Palouse Prairie may seek refuge in these wetlands as they can be a reliable source of food, water, and cover. They also provide important breeding areas for amphibians, such as the Western Toad.

Target Viability

Very Poor. Depressional Wetlands within the Palouse Prairie have nearly disappeared as many wetlands were drained to improve crop production. The few natural Depressional Wetlands that still exist are primarliy old meader scars along the Hangman Creek, Palouse River, and Potlatch River drainages and are usually surrounded by cropland, often hayfields. In general, Depressional Wetlands are in poor condition on the Palouse Prairie. When wetlands were drained and dried up, this effectively lowered the water table to a level suitable for reed canarygrass to thrive (Servheen et al. 2002). Many of these wetlands are in some stage of conversion to reed canarygrass. However, depressions that retain water into the summer months are still occupied by native aquatic-emergent plant communities.

Prioritized Threats and Strategies for Depressional Wetlands

Very High rated threats to Depressional Wetlands in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality Inventory, reported that agricultural nonpoint source (NPS) pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides, and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides.	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse. Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands.	Western Toad
	Create buffers to capture agricultural runoff and leaching.	Use Conservation Districts, NRCS, and FSA programs to create natural buffers around wetlands and linked water sources. Use Conservation Districts and US Department of Agriculture (USDA) programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	

Hydrologic alterations & habitat loss/degradation

Currently, natural Depressional Wetlands are rare due to modern day land management techniques, including drain tiling and ditching, which results in the rapid release of water storage, loss of native vegetation, and expansion of nonnative species such as reed canarygrass and meadow foxtail (*Alopecurus pratensis* L.; Servheen et al. 2002). The functions provided by created agricultural Depressional Wetlands can be enhanced with sometimes relatively minor modifications to adjacent land uses.

Objective	Strategy	Action(s)	Target SGCNs
Reduce wetland degradation.	Promote responsible grazing through fencing and rest/rotation plans.	Create riparian pasture areas that will be grazed on a 3–5 year rotation. As appropriate, use high-intensity, short-duration grazing strategies. Create buffers around remaining wetlands using voluntary programs available through Conservation Districts, NRCS, and FSA programs. Aid in the development of water sources for livestock, so livestock can be excluded from wetland areas. Work with corporate timber, FS, IDL, and others to identify wetland systems that would benefit from protection from grazing.	Western Toad
	Incentivize voluntary retirement of grazing in strategic areas.	Educate schools, and other public forums in wetland ecology, restoration, and mitigation.	
	Implement an environmental	Provide education and outreach relating to	

Objective	Strategy	Action(s)	Target SGCNs
	education program. Reduce the extent of pesticide, herbicide, and/or fungicide overspray.	proper pesticide, herbicide, and/or fungicide application.	
Restore and build wetlands.	Promote voluntary conservation programs.	Restore and create wetlands using voluntary programs available through Conservation Districts, NRCS, and FSA programs. Remove drain tiles that drain lowland agricultural areas that were historically wetlands. Work with Conservation Districts, NRCS, and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

High rated rated threats to Depressional Wetlands in the Palouse Prairie

Changes in temperature & precipitation regimes

Warmer temperatures, resulting in less snowfall in the winter and more precipitation falling as rain, have a direct ramification on the extent and duration of flooding in Depressional Wetlands. This also leads to a drier spring and summer because of reduced snowpack groundwater storage, resulting in less water availability for wetlands and drought conditions for native plants (N. Decrappeo, DOI Northwest Climate Science Center, pers. comm.). The resulting trend away from semipermanently flooded marshes toward seasonally flooded Depressional Wetlands will likely result in less available amphibian breeding habitat. The overall loss of available Depressional Wetlands increases spring runoff flows and decreases summer flows in streams and rivers due to a loss of water storage and infiltration in all watersheds within the Palouse.

Objective	Strategy	Action(s)	Target SGCNs
Increase capacity for water storage to combat the effects of climate change.	Promote voluntary conservation programs.	Use Conservation Districts, NRCS, and FSA programs to build sediment basins and wetlands in low-gradient areas that meet land use requirements for a wetland. Work with Conservation Districts, NRCS, and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

Noxious weeds & invasive plant & animal species

Due to the loss of hydrologic conditions in and around Depressional Wetlands, nonnative, invasive, and noxious plant species are able to colonize areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to aquatic systems.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of invasive plant and animal species.	Improve education about invasive species, how they are spread, and what is at risk. Continue to expand monitoring and control of aquatic invasive plant and animal species.	Partner with the Idaho Department of Agriculture (ISDA) on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing educational programs. Continue boat wash stations.	Western Toad

Improper livestock grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing, and size of pastures can all help to decrease the loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Maintain or restore functionality of depressional wetland areas.	Develop grazing and farm management plans; assist in identifying potential funding sources.	Work with NRCS and FSA to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) to wetlands.	Western Toad

Target: Springs & Groundwater-Dependent Wetlands

Springs & Groundwater-Dependent Wetlands within the Palouse Prairie Section occur on sloping land with gradients that range from steep hillsides to nearly imperceptible slopes. Less than 1% of the land cover is this section are classified as slope wetlands. These wetlands differ from Depressional Wetlands by the lack of closed contours. Seasonal seeps and wet and mesic meadows are also considered groundwater-dependent wetlands. Historically, seasonally moist or wet meadows within the Palouse Prairie were often dominated by culturally important small camas (*Camassia quamash* [Pursh] Greene), sedges (e.g. *Carex* L.), tufted hairgrass (*Deschampsia cespitosa* (L.) P. Beauv.), Rocky Mountain iris (*Iris missouriensis* Nutt.), American bistort (*Polygonum bistortoides* Pursh), mule-ears (*Wyethia amplexicaulis* [Nutt.] Nutt.), and other forbs (Servheen et al. 2002). These meadows and wetlands were common prior to Euro-American settlement in valleys and on flats, but most were lost when areas were drained for cropland. Relict camas meadows remain near Weippe and Grangeville and sedge-dominated wet meadows occur in forested montane settings, such as on Craig Mountain. In these wetlands, groundwater discharges at the ground surface, often through complex subsurface flow paths (Stevens and Meretsky 2008). Groundwater sources can be from localized infiltration

of surface water (e.g., precipitation, seasonal flooding). Water flow is downslope and unidirectional. Groundwater-dependent wetlands lose water primarily by subsurface outflow, surface flows, and evapotranspiration. Groundwater-dependent wetlands may develop channels, but these serve only to convey water away from the wetland. Wetlands are important habitat for a variety of wildlife species and provide breeding and foraging habitat for Western Toad.

Target Viability

Very Poor. Groundwater-dependent wetlands are more abundant than Depressional Wetlands within the Palouse Prairie Section, but are still considered sparse. The camas meadows that used to dominate portions of the Palouse Prairie have largely been drained and converted to cropland. Many seeps and springs have been appropriated for livestock water supply. Many meadows within the Palouse Prairie are generally in poor condition. Livestock grazing has degraded these meadow communities. There are some good-condition meadows at Craig Mountain WMA. Although these meadows have historically been grazed, cattle no longer use these meadows regularly, and their condition is improving.

Prioritized Threats and Strategies for Springs & Groundwater-Dependent Wetlands

Very High rated threats to Springs & Groundwater-Dependent Wetlands in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality Inventory, reported that NPS pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA, 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides, and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides.	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse.	Western Toad
	Create buffers to capture agricultural runoff and leaching.	Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands. Use Conservation Districts, NRCS, and FSA programs to create natural buffers around wetlands and linked water sources.	

Objective	Strategy	Action(s)	Target SGCNs
		Use Conservation Districts and USDA programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	

Hydrologic alterations & habitat loss/degradation

The seasonally moist or wet meadows are a type of palustrine, emergent wetland (Cowardin et al. 1979, Smith et al. 1995) that was once widespread in the Palouse. Euro-American missionaries and settlers dramatically altered these areas for farming purposes. Currently, wet meadows are rare due to modern day land management techniques, including drain tiling and ditching, which results in the rapid release of water storage, loss of native vegetation, and expansion of nonnative species such as reed canarygrass and meadow foxtail (Servheen et al. 2002). Historic and current road and railway beds also alter surface flow patterns. Streams through meadows have been straightened and become incised, lowering the water table and drying out wetland habitat.

Objective	Strategy	Action(s)	Target SGCNs
Reduce wetland degradation.	Promote responsible grazing through fencing and rest/rotation plans.	Create riparian pasture areas that will be grazed on a 3–5 year rotation. As appropriate, use high-intensity, short-duration grazing strategies. Create buffers around remaining wetlands using voluntary programs available through Conservation Districts, NRCS, and FSA programs. Aid in the development of water sources for livestock, so that livestock can be excluded from wetland areas.	Western Toad Great Gray Owl
	Incentivize voluntary retirement of grazing in strategic areas.	Work with corporate timber, FS, IDL, and others to identify wetland systems that would benefit from protection from grazing.	
	Implement an environmental education program.	Conduct educational programs at schools, and other public forums in wetland ecology, restoration, and mitigation.	
	Reduce the extent of pesticide, herbicide, and/or fungicide overspray.		
Restore and build wetlands.	Promote voluntary conservation programs to	Restore and create wetlands using voluntary programs available through Conservation Districts, NRCS, and FSA programs. Plug or fill ditches (e.g., as in Weippe Prairie restoration).	Western Toad Great Gray Owl

Objective	Strategy	Action(s)	Target SGCNs
	restore hydrologic processes supporting groundwater-dependent wetlands.	Remove historic unused road and rail beds from meadows. Reroute current roads away from meadows. Restore natural stream meander patterns and channel morphology on straightened and incised meadow streams. Remove drain tiles that drain lowland agricultural areas that were historically wetlands. Work with Conservation Districts, NRCS, and FSA to create incentives to encourage increases in water holding capacity of farm fields.	

High rated threats to Springs & Groundwater-Dependent Wetlands in the Palouse Prairie

Changes in temperature & precipitation regimes

Groundwater dependent wetlands are dependent on both aquifer recharge from precipitation infiltration. Warmer temperatures, resulting in less snowfall in the winter and more precipitation falling as rain, have a direct ramification on the extent and wetness of groundwater dependent wetlands. These conditions result in deeper water tables during the summer which allows upland native and nonnative plants (including trees) to invade meadows. This also leads to a drier spring and summer because of reduced snowpack water storage, creating drought conditions for native plants (N. Decrappeo, DOI Northwest Climate Science Center, pers. comm.). The overall loss of spring and groundwater-dependent wetlands increases spring runoff flows and decreases summer flows in streams and rivers due to a loss of water infiltration and storage in all watersheds within the Palouse.

Objective	Strategy	Action(s)	Target SGCNs
Increase capacity for water storage to combat the effects of climate change.	Promote voluntary conservation programs.	Use Conservation Districts, NRCS, and FSA programs to build sediment basins and wetlands in low-gradient areas that meet land use requirements for a wetland. Work with Conservation Districts, NRCS, and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

Noxious weeds & invasive plant species

Due to the loss of hydrologic conditions in and around Springs & Groundwater-Dependent Wetlands, nonnative, invasive, and noxious plant species are able to move into areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of

minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to wetland systems.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of invasive plants.	Improve education about invasive species, how they are spread, and what is at risk. Continue and expand monitoring and control of aquatic invasives.	Partner with ISDA on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing educational programs. Continue boat wash stations.	Western Toad Great Gray Owl

Improper grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing and size of pastures can all help to decrease the loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Reduce the impacts of grazing on wetland systems.	Develop grazing and farm management plans; assist in identifying potential funding sources.	Work with partnering agencies and landowners to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) to wetlands. Encourage the use of Best Management Practices that benefit wildlife.	Western Toad Great Gray Owl

Conifer encroachment

Meadow systems embedded within forested ecosystems are highly influenced by disturbance, or lack thereof. Fire suppression and altered hydrology has often led to conifer encroachment into meadows, threatening the open structure, plant diversity, and other unique characteristics of these important habitats.

Objective	Strategy	Action(s)	Target SGCNs
Maintain and restore meadow systems.	Reduce conifer encroachment.	Restore historical fire regime to meadow systems. Raise the water table of meadows affected by stream incisement. Encourage native plant establishment. Maintain open meadows through active conifer removal.	Western Toad Great Gray Owl

Target: Riverine–Riparian Forest & Shrubland

Riverine wetlands and riparian habitat within the Palouse Prairie primarily occur within river and stream channels of the Clearwater, Potlatch, and Palouse River systems and their tributaries, and occupy nearly 3% of the land cover. The dominant water sources in these systems are overbank flooding from the channel and subsurface shallow water table connections between the stream channel and wetlands (Smith et al. 1995). Other water sources include overland runoff from adjacent uplands, tributary flow, and precipitation. Flow may be perennial to intermittent. In the Palouse Prairie, the riverine ecosystem is comprised of a variety of important aquatic habitat types including headwaters and small streams (1st- to 3rd-order streams) and larger rivers (4th+ order streams and rivers). Examples of small streams within the Palouse Prairie are the headwater streams of the Palouse and Potlatch rivers. These streams tend to have high gradients and water velocities where scouring and erosion exports much of the fine material in the watershed during brief snowmelt runoff periods or large thunderstorm precipitation events (i.e., flash floods). Floodplains and valley bottoms tend to be narrow. These streams can provide important spawning habitat for Steelhead. Western redcedar Engelmann spruce (*Picea engelmannii* Parry ex Engelm.), alder (*Alnus* Mill.), Drummond's willow (*Salix drummondiana* Barratt ex Hook.), other shrubs, and a variety of herbs line higher elevation streams, providing bank stability, woody debris, and shade to aquatic communities. Many small streams within the Palouse Prairie have been impacted by tiling and draining of riparian areas for agricultural production. Larger rivers (4th+ order river), which include the Lower Snake and Clearwater rivers, provide habitat for anadromous fish species such as Pacific Lamprey, Steelhead, and Chinook Salmon. These rivers have lower gradients and water velocities than low-order streams, and also naturally have higher sinuosity. Originally, this geomorphology allowed for the deposition of sediment on alluvial bars and the formation of floodplains in wider valleys. These riverine alluvial substrates support riparian vegetation dominated by willow (e.g., *Salix exigua* Nutt., *S. melanopsis* Nutt.), black cottonwood (*Populus balsamifera* L. ssp. *trichocarpa* (Torr. & A. Gray ex Hook.) Brayshaw), and alder. However, major upstream dams on both of these rivers have reduced peak flows and prevented these rivers from forming new alluvial bars necessary for sustaining native riparian vegetation, especially black cottonwood forests. Combined with flood control levees, these are now more stable river systems with more homogenous aquatic and riparian communities and narrowed floodplains.

Unnamed Creek in the Palouse Prairie, stream with no riparian habitat in foreground, Palouse Prairie remnant in the background © 2015 Tiege Ulschmid

Target Viability

Poor. The riverine systems of the Palouse are generally in poor condition. Many have been heavily altered to accommodate anthropogenic uses including, but not limited to, human development (e.g., hydroelectric production, flood control, urbanization, transportation systems) and agricultural production. Alterations typically include straightening of tributaries in the upper watersheds to pass water and reduce flooding potential, removal of riparian buffers that would protect rivers from pollutants, and removal of in-stream complexity. These alterations typically result in heavy incision downstream, loss of stream complexity that would benefit fish species, loss of floodplain connectivity, and higher potential of pollutants mobilizing down waterways. Alterations have the potential to negatively impact both resident and anadromous fish populations that reside in the riverine systems through direct habitat loss as well as habitat degradation from decreases in water quality and quantity (e.g., hydroelectric production, flood control, urbanization, transportation systems), and inputs from agricultural and other synthetic pollution.

Spotlight Species of Greatest Conservation Need: Anadromous Fish (Steelhead, fall-run and spring/summer-run Chinook Salmon) (cross reference Idaho Batholith Section)

Prioritized Threats and Strategies for Riverine–Riparian Forest & Shrubland

Very High rated threats to Riverine–Riparian Forest & Shrubland in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality Inventory, reported that NPS pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA, 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides, and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides. Create buffers to capture agricultural runoff	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse. Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU) Western Toad

Objective	Strategy	Action(s)	Target SGCNs
	and leaching.	Use Conservation Districts, NRCS, and FSA programs to create natural riparian buffers around wetlands and linked water sources. Promote the use of a variety of native species in buffers; a mix of trees, shrubs, grasses, forbs, and sedges would be best for wildlife and the variety of rooting depths would capture the most pollutants and prevent them from entering the stream. Use Conservation Districts and USDA programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	

Changes in precipitation & broad-scale hydrologic regimes

Precipitation patterns in the region appear to be shifting toward a wetter, rainfall-dominated regime in late winter and spring, possibly increasing the number and severity of rain-on-frozen-ground events. This also leads to a drier spring and summer because diminished snowpacks have limited ability to charge a watershed throughout the year. Loss of year-round groundwater recharge can result in drought conditions for native plants, which allows weeds to invade. Less groundwater recharge may decrease total available slope and Depressional Wetlands available to continually charge a watershed and support stream base flows long after precipitation stops in a given annual rain cycle. Rain-on-snow events and lack of holding capacity in upper watersheds increases flashiness (i.e., higher spring runoff highs, and lower summer run off lows) and decreases late season water infiltration. Less available water leads to less available habitat for fish species, as well as potentially increases the likelihood of predation and less favorable or detrimental living conditions, including dissolved oxygen, increased water temperatures, and decreased rearing habitat for certain fish species. Within areas of intense anthropogenic alterations, little native vegetation remains that would aid in streambank stability, provide root structure to improve soil-moisture holding capacity, and provide shade over adjacent streams. The excessive removal of this streamside habitat is coupled with straightening and ditching of the watershed, thereby decreasing the amount of moisture-holding capacity and increasing the flashiness of the overall watershed. This lends itself to excessive flow events that scour banks making reestablishment of new vegetation difficult.

Objective	Strategy	Action(s)	Target SGCNs
Restore hydrologic function and restore riparian habitats.	Create partnerships interested in collaborative restoration. Reduce the amplitude of hydrologic flow and erosion and sedimentation	Strategically identify important, sensitive, and critical areas that have been damaged or destroyed. Remove drain tiles in agricultural areas. Restore native habitat on the periphery of croplands to slow snowmelt. Reconnect streams into historic channels and floodplains.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU)

Objective	Strategy	Action(s)	Target SGCNs
	rates.	Restore stream meanders. Restore and replant native riparian habitats along streams. Use American Beaver to accomplish hydrologic and habitat restoration.	Western Toad
	Raise water table for incised and channelized streams.	Encourage acceptance and tolerance of beavers through education and outreach. Provide tools/equipment for landowners to facilitate living with beavers (e.g., chicken wire to protect trees, information on how to minimize flooding, etc.).	

High rated threats to Riverine–Riparian Forest & Shrubland in the Palouse Prairie

Improper grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Nutrient loading by livestock into riparian systems can be detrimental to resident fish and amphibian populations. Therefore, water quality can be greatly reduced by having livestock in or adjacent to riparian areas. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing, and size of pastures can all help to decrease loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Restore hydrologic function and restore riparian habitats.	Reduce impacts of grazing on riparian systems.	Partner with landowners to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) on riparian zones and stream quality.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU) Western Toad

Road development

The Palouse Prairie's topography lends itself to roads that are often built along creeks and up draws, the same areas that riparian and wetland habitats can be found. Develolpment of new roads often leads to habitat removal through drainages to accommodate the road. Current roads may be poorly designed and increase sediment production to streams. Roads may impede or disrupt stream flows due to dysfunctional culverts or undersized bridges.

Objective	Strategy	Action(s)	Target SGCNs
Improve water quality and preserve riparian habitat.	Minimize sedimentation and erosion due to roads. Ensure hydrologic processes are maintained or restored.	Use proper planning and engineering techniques to ensure that adverse effects of new roads are minimized. Create partnerships to evaluate current road structure, culverts, and bridges to identify where road removal or repair can improve water quality and hydrologic function.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU) Western Toad

Invasive aquatic, riparian & invertebrate species

Due to the loss of hydrologic conditions in and around riparian areas, nonnative, invasive, and noxious plant species are able to colonize areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to wetland systems. Invasive invertebrate species have the potential to seriously degrade habitat quality for wildlife and cause severe economic damage.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of aquatic invasive plant and invertebrate species.	Improve education about invasive species, how they are spread, and what is at risk. Continue and expand monitoring and control of aquatic invasive species.	Partner with ISDA on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing education program. Continue boat wash stations.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU) Western Toad

Out of basin passage issues for anadromous fish species

Dams pose challenges to upstream and downstream migration of anadromous fish species to and from their spawning and rearing areas.

Objective	Strategy	Action(s)	Target SGCNs
Provide connectivity between spawning and rearing habitat for anadromous fish.	Enhance fish passage.	Continue work with federal, state, and tribal organizations on current fish passage and hydrosystem management issues.	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook Salmon (Snake River fall-run ESU) Chinook Salmon (Snake River spring/summer-run ESU)

Species designation, planning & monitoring

In addition to conservation actions to address specific threats, some species require inventory and monitoring to assess their current status and distribution in Idaho. As such, we identify needs for 9 species in the section below and identify appropriate actions.

Western Pearlshell

Approximately 7% of the known Idaho distribution of this aquatic bivalve is found within the Palouse Prairie. Little is known about the actual distribution within the section, but it is closely associated with high-quality waters primarily in rivers and large streams. Further study is required to learn more about its actual distribution and potential threats.

Nez Perce Pebblesnail

This newly described species was discovered as a result of recent molecular analyses (Hershler and Liu 2012). Because of its recent discovery, its distribution and ecology are poorly known. It is believed to occur in the lower portions of the Clearwater, Snake, and Salmon rivers and their associated tributaries.

3 Mayfly Species

Three species of stream-dwelling mayflies that occur in the Palouse Prairie Section have limited distributions that warrant inventory work. *Paraleptophlebia traverae* historically occurred in the Grangeville area, but has not been found since the 1930s. It is potentially extinct. *P. falcula* is known from a few observations in the headwater streams of the Palouse River around Laird Park. *Parameletus columbiae* has not been found in Idaho since 1965; it historically occurred in the Bitterroot Mountains Section as well.

Cascades Needlefly

Known from a small number of locations in Clearwater and Latah counties, Cascades Needlefly is a refugium species from the last ice age. This species is also found in Oregon and Washington and is associated with seeps and springs with cold, clean water.

Snowfly Species

Three species of stream-dwelling snowflies that occur in the Palouse Prairie Section have limited distributions that warrant inventory work. The Idaho Snowfly is known from a handful of locations in Latah County. The distribution of the Straight Snowfly also appears to be limited to a handful of locations in Latah County. Both species have not been found since the 1980s and were petitioned for listing under ESA in 2010 (Xerces Society 2010). The Palouse Snowfly is believed to have a somewhat wider distribution, occuring in southeast Washington, northeast Oregon, and north-central Idaho. It is a recently-described species that is thought to be associated with relatively pristine, gravel-based streams and rivers (Zegner and Baumann 2004).

Umatilla Willowfly

The Umatilla Willowfly occurs in Latah County in Idaho and has also been found in northeast Oregon. It is known to occur in creeks and small rivers but has rarely been reported, collected as part of invertebrate sampling efforts.

Objective	Strategy	Action(s)	Target SGCNs
Increase our current understanding of the status of poorly-documented stream invertebrates.	Determine the true distribution and rarity of poorly-documented stream invertebrates.	Revisit historical sites for species that have not been detected in >20 years in Idaho, to see if the species is still present. Where locally appropriate, expand existing fieldwork to include aquatic invertebrates.	Nez Perce Pebblesnail A Mayfly (*Paraleptophlebia traverae*) A Mayfly (*Paraleptophlebia falcula*) A Mayfly (*Parameletus columbiae*) Cascades Needlefly Idaho Snowfly Palouse Snowfly Straight Snowfly Umatilla Willowfly Western Pearlshell

Palouse Prairie Section Team

An initial version of the Palouse Prairie Section project plan was completed for the 2005 Idaho State Wildlife Action Plan (formerly Comprehensive Wildlife Conservation Strategy). A small working group developed an initial draft of the Section Plan, which was then reviewed by a wider group of partners and stakeholders during a 2-day workshop held at the IDFG Panhandle Regional Office, Coeur d'Alene, Idaho in February 2015. Since then, we have continued to work with key internal and external stakeholders to improve upon the plan. Individuals, agencies, and organizations involved in this plan are listed in Table 10.3.

Table 10.3 Individuals, agencies, and organizations involved in developing this plan [a]

First name	Last name	Affiliation
Joel	Sauder*	Idaho Department of Fish and Game, Clearwater Region
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Joshua	White*	Idaho Department of Fish and Game, Clearwater Region
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Brett	Bowersox	Idaho Department of Fish and Game, Clearwater Region
Terry	Cundy	Potlatch Forest Holdings, Inc.
Rita	Dixon*	Idaho Department of Fish and Game, Headquarters
Kas	Dumroese	USDA Forest Service, Rocky Mountain Research Station, Moscow Forestry Sciences Laboratory
Brenda	Erhardt	Latah Soil and Water Conservation District
Cristy	Garris	Foundations of Success
Terry	Gray	Independent Consultant
Clay	Hayes	Idaho Department of Fish and Game, Clearwater Region
Trish	Heekin	Latah Soil and Water Conservation District
Jacie	Jensen	Farmer, Native Seed Producer
Chris	Johnson	Natural Resources Conservation Service
Craig	Johnson	Bureau of Land Management
Juanita	Lichthardt	Idaho Department of Fish and Game, Headquarters
Andrew	Mackey	Idaho Department of Fish and Game, Clearwater Region
Kristen	Pekas	Idaho Department of Fish and Game, Clearwater Region
Lynn	Rasmussen	Nez Perce Soil and Water Conservation District
Derrick	Reeves	Idaho Department of Lands
Dave	Skinner	Retired Plant Materials Center
Leona	Svancara	Idaho Department of Fish and Game, Headquarters

First name	Last name	Affiliation
Kevin	Traylor	Natural Resources Conservation Service
Amy	Trujillo	Executive Director, Palouse Land Trust

[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.