Owyhee Subbasin Plan

Chapter 2 Technical Assessment

Prepared By:

The Shoshone-Paiute Tribes,

Contract Administrator and Owyhee Coordinating Committee Member

and

The Owyhee Watershed Council,

Owyhee Coordinating Committee Member

Prepared for:

The Northwest Power and Conservation Council

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Steven C. Vigg,

Steven Vigg & Company

Editor and Project Coordinator

Disclaimer:

Final approval by the Northwest Power and Conservation Council is contingent upon a favorable review by the Independent Scientific Review Panel and meeting requirements for adoption as an amendment to the Council's Fish & Wildlife Program.

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<u>Planning Team – Members who attended Owyhee Subbasin Plan Meetings</u>

- Rex Barrie, S. Board of Control
- Gayle Batt, Idaho Water Users Association
- Leonard Beitz, Businessman and Oregon Resident
- Jay Chamberlin, Manager, Owyhee Irrigation District
- Tom Dayley, Idaho Subbasin Coordinator NWPPC
- Jim Desmond, Owyhee County NRC
- Guy Dodson, Shoshone-Paiute Tribes
- Terry Gibson, Chairman Tribal Council, Shoshone-Paiute Tribes
- Carl Hill, Owyhee Watershed Council
- Jerry Hoagland, Owyhee Watershed Council
- Lisa Jim, Shoshone-Paiute Tribes
- Jennifer Martin, Owyhee Watershed Council
- John Meisinger, Shoshone-Paiute Tribes
- Ross Nishihara, Farmer and Oregon Resident
- Lance Phillips, Malheur Co. SWCD
- John Urquidi, Landowner and Idaho Resident
- Steven Vigg, Consultant

<u>Technical Team – Members who attended Owyhee Subbasin Plan Meetings</u>

- Patrick Coffin, Bureau of Land Management
- Pam Druliner, Bureau of Land Management
- Tim Dykstra, Biologist, Shoshone-Paiute Tribes
- Dave Ferguson, Idaho Soil Conservation Commission

- Jeff Fryer, Oregon Technical Team, Columbia River Inter-Tribal Fish Commission
- Brent Grasty, Bureau of Land Management
- Tracy Hillman, Principal Consultant, BioAnalysts
- Bonnie Hunt, Bureau of Land Management
- Gary Johnson, Nevada department of Wildlife
- Duane LaFayette, Idaho Soil Conservation Commission
- Eric Leitzinger, Isaho department of Fish & Game
- Ray Lister, Bureau of Land Management
- Allyn Meuleman, U.S. Bureau of Reclamation
- Bradley Nishitani, GIS Consultant, BioAnalysts
- Robert Orr, Bureau of Land Management
- Keith Paul, U.S. Fish & Wildlife Service
- Ray Perkins, Oregon Department of Fish & Wildlife
- Ed Petersen, Natural Resources Conservation Service
- Pat Ryan , Bureau of Land Management
- Chris Salove, Owyhee County Commissioner
- Clint Shock, Owyhee Watershed Council
- Chuck Slaughter, University of Idaho, Owyhee Watershed Council
- Pamella Smolczynski, Idaho Department of Environmental Quality
- Cynthia Tait, Bureau of Land Management
- Walt Van Dyke, Oregon Department of Fish & Wildlife
- Jack Wenderoth, Bureau of Land Management
- Randy Wiest, Oregon Department of State Lands
- Bruce Zoellick, Bureau of Land Management

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- Lisa Jim, Shoshone-Paiute Tribal Member – Owyhee, Nyssa and Jordan Valley meetings
- Nancy Jackson, Riddle & Petan Rancher – Owyhee, NV meeting
- John Jackson, Petan Ranch – Owyhee, NV meeting
- Peter Jackson, Riddle & Petan Ranch – Owyhee, NV meeting
- Guy Dodson, Shoshone-Paiute Tribal Member & Rancher – Owyhee, Grand View and Jordan Valley meetings
- John Crum, Shoshone-Paiute Tribal Member – Owyhee, NV meeting
- Stephanie Zody, Shoshone – Paiute News – Owyhee, NV meeting
- Jake Sellman, Staff, Shoshone-Paiute Wildlife & Parks – Owyhee, NV meeting
- Tim Dykstra, Staff, Shoshone-Paiute Tribes – Owyhee and Grand View meetings
- Tom Dayley, Northwest Power & Conservation Council – Owyhee, Nyssa and Jordan Valley meetings
- Mattie Allen, Staff, Shoshone-Paiute Tribes Wildlife & Parks – Owyhee, NV meeting Kyle Prior, Shoshone-Paiute Business Council, Tribal Member – Owyhee, NV meeting

- Herman Atkinis, Shoshone-Paiute Administration, Tribal Member – Owyhee, NV meeting
- Jennifer Martin, Owyhee Watershed Council, Ontario, OR – Owyhee, Grand View, Nyssa and Jordan Valley meetings
- Jerry Hoagland – Owyhee Watershed Council and Rancher, Wilson, ID – Owyhee, Grand View and Jordan Valley meetings
- Steven Vigg, Consultant – Presenter at Owyhee, Grand View, Nyssa and Jordan Valley meetings
- Carl Hill, Owyhee Watershed Council and Farmer, Adrian, OR – Grand View, Nyssa and Jordan Valley meetings
- John Carothers, Landowner and Rancher, Grand View, ID – Grand View meeting
- John Urquidi, Landowner, Hot Springs, ID – Grand View meeting
- Pam Smolczynski, Idaho DEQ, Boise, ID – Grand View meeting
- Gene Davis, Rancher, Bruneau, ID – Grand View meeting
- Chuck Jones, Rancher, and Simplot Co. Manager, Grand View, ID – Grand View meeting
- Dana Rutan, Rancher (Oreana, ID) –Grand View meeting
- Derron Frederick, Landowner and Rancher (Grand View, ID) – Grand View meeting
- Craig Baker, Landowner and Rancher, Murphy, ID – Grand View meeting
- Chris Collett, Landowner and Rancher, Oreana, ID – Grand View meeting
- Brian Collett, Landowner and Rancher, Oreana, ID – Grand View meeting
- Jeanette Hemenway, – Landowner, Grand View, ID – Grand View meeting
- George Bennett – Landowner, Grand View, ID – Grand View meeting
- Donna Bennett – Landowner, Grand View, ID – Grand View meeting
- Kevin Lawson, Grand View, ID –Grand View meeting
- Jim Jencks, recreationist, Kuna, ID – Grand View meeting
- Ross Nishihara, Landowner and Farmer, Adrian, OR – Nyssa meeting
- Ray Perkins, ODFW Biologist and Presenter, Ontario, OR – Nyssa and Jordan Valley meetings
- Ronald Detweiler, Landowner and Farmer, Nyssa, OR – Nyssa meeting
- George Jones, Landowner and Farmer , Nyssa, OR – Nyssa meeting
- Ed Petersen, NRCS, Ontario, OR – Nyssa meeting
- Kathy Pratt, Malheur Watershed Council, Ontario, OR – Nyssa meeting
- Reid Saito, Onion Growers Association , Nyssa, OR – Nyssa meeting
- Scott Cruickshank, Malheur Growers Association, Ontario, OR – Nyssa meeting
- Lou Wettstein, Malheur County Court Ontario, OR – Nyssa meeting
- Paul Skeen, Malheur Growers Association, Nyssa, OR – Nyssa meeting
- Cameron Skeen, Landowner and Farmer , Nyssa, OR – Nyssa meeting
- Harry Smith, Landowner and Farmer Ontario, OR – Nyssa meeting
- Glade Chadwick, Landowner and Farmer , Nyssa, OR – Nyssa meeting
- Linda Rowe, Malheur County SWCD, Ontario, OR – Nyssa meeting
- Lynn Jensen, Malheur County Extension Service, Ontario, OR – Nyssa meeting
- Bob Ebbers, Landowner and Farmer , Nyssa, OR – Nyssa meeting

- Jay Chamberlin, Owyhee Irrigation District , Nyssa, OR – Nyssa meeting
- Ryan Martin, Owyhee Watershed Council, Adrian, OR – Nyssa meeting
- Dave Bunker, Landowner and Farmer / Oregon Farm Bureau Federation, Nyssa, OR – Nyssa meeting
- Lawrence Ziemer, Landowner and Farmer , Nyssa, OR – Nyssa meeting
- Megan Price – resident, Adrian, OR – Jordan Valley meeting
- Leonard Beitz – Landowner , Adrian, OR – Jordan Valley meeting
- Jesse White – Owyhee Watershed Council and Landowner, Jordan Valley, OR – Jordan Valley meeting
- Pam White – Owyhee Watershed Council and Landowner, Jordan Valley, OR – Jordan Valley meeting
- Vernon Kershner – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Elias Jaca – Landowner, Murphy, OR – Jordan Valley meeting
- Forest Fretwell – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Jerry Raburn – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Bill Lowry – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Tim Lowry – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Ed Dowell – Owyhee Watershed Council and Landowner, Rome, OR – Jordan Valley meeting
- Robert Corbari – Owyhee Watershed Council and Landowner, Rome, OR – Jordan Valley meeting
- Matthew Bowen – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Martin Andre – Owyhee Watershed Council and Landowner, Arock, OR – Jordan Valley meeting
- Jim Elordi – Landowner, Jordan Valley, OR – Jordan Valley meeting
- Dennis Stanford – Owyhee Watershed Council and Landowner, Jordan Valley, OR – Jordan Valley meeting
- Jayne Collins – Owyhee Watershed Council and Landowner, Jordan Valley, OR – Jordan Valley meeting
- Mike Hanley – Landowner, Jordan Valley, OR – Jordan Valley meeting

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2.1 Subbasin Overview

The following picture captures the essence of the Owyhee Subbasin (Image 2.1).

Image 2.1. Owyhee Subbasin perspective (source: BLM Southeast Oregon Record of Decision 2002).

The Owyhee subbasin is a vast and remote area with few people compared to most other areas in the Columbia Basin. Water is scarce and has always been the key factor for survival, sustainability, and utilization of the surrounding landscape – for people and fish & wildlife.

2.1.1 Subbasin Description

General Description

The Owyhee subbasin encompasses 11,049 square miles (7.07 million acres) of southwestern Idaho, southeastern Oregon, and north central Nevada. The Idaho portion of the subbasin is bordered to the northeast by the Owyhee Mountains. The Sheeps head Mountains in the west define the Oregon portion of the subbasin. The Nevada portion of the subbasin is bordered to the east by the Jarbidge, Bull Run, and Independence Mountains, and to the south by the Santa Rosa Range. These mountains separate the

Owyhee subbasin from the Great Basin Hydrologic Province to the south. The entire Owyhee subbasin lies in the Intermountain Semi desert Ecological Province, as defined by Bailey (1995).

The Owyhee River originates in north central Nevada. It flows in a northwest direction through the southwest corner of Idaho and southeast Oregon. It then turns north to empty into the Snake River at river mile (RM) 394, near the town of Nyssa, Oregon. The total length of the mainstem is 280 miles (Bureau of Reclamation 1958). The Owyhee Dam impounds the Owyhee River at RM 28. Seven fourth-field hydrologic units (HUC's) make up the subbasin (Figure 2.1).

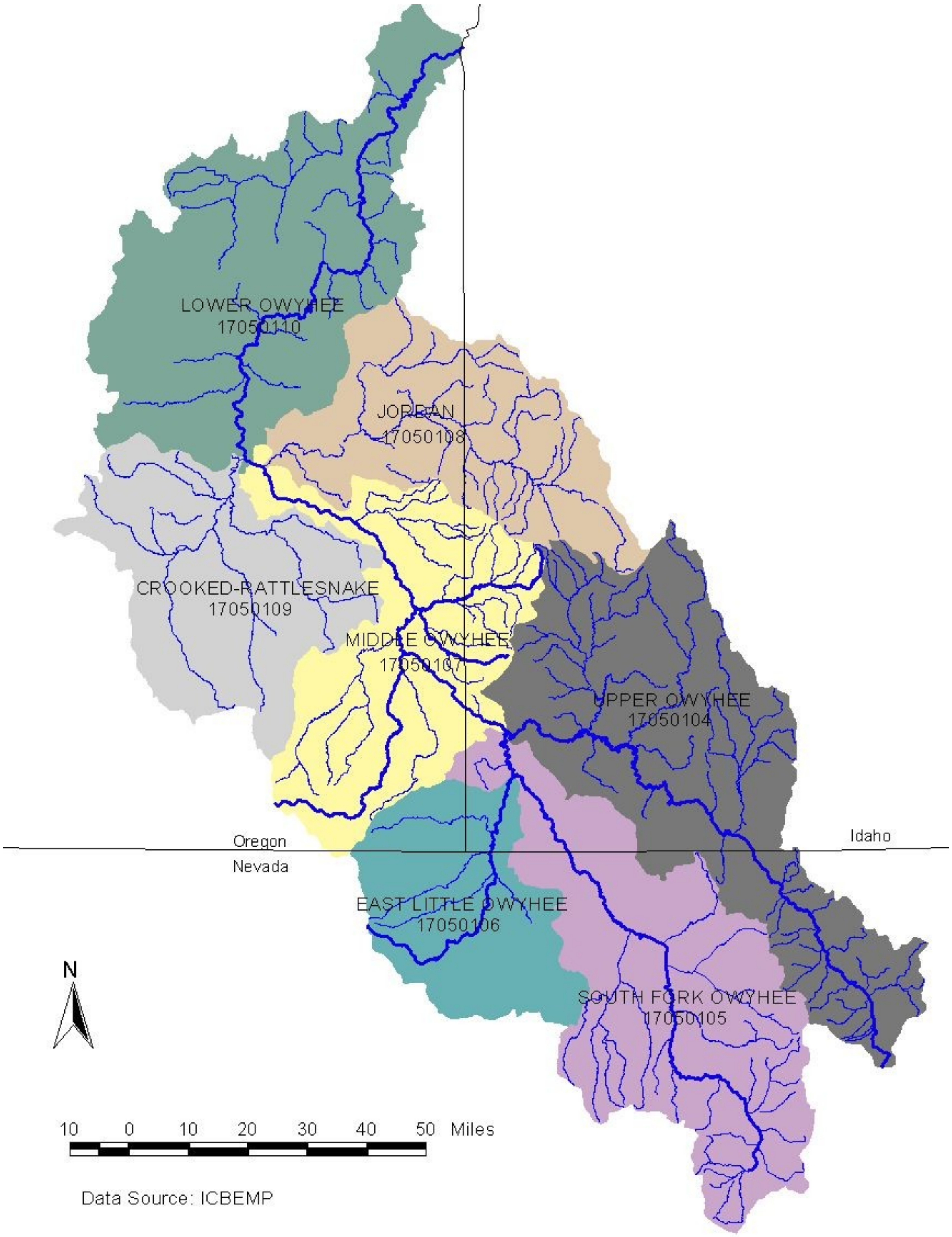


Figure 2.1. Fourth-field hydrologic unit codes (HUCs) in the Owyhee subbasin (Perugini et al. 2002)

Topography

The Owyhee landscape is topographically diverse, with broken plateaus, barren rocky ridges, cliffs, and deep gulches and ravines that dissect the areas of rugged terrain. Elevations in the Owyhee subbasin range from 2,198 feet at its confluence with the Snake River to 10,348 feet at McAfee Peak in the Independence Mountains of Nevada (Figure 2.2). The mean elevation in the subbasin is 5,112 feet.

Low relief rolling hills and expansive plateaus characterize the Owyhee Uplands, which expands on the south side of the Snake River from the area near Twin Falls, Idaho into Oregon (Franklin and Dyrness 1984 cited in Perkins and Bowers 2000). This region exhibits erosional features common to dry climates such as arroyos and coarse sediment deposition. The Owyhee River and tributaries cut deep canyons (in some places over 1,000 feet deep) through the Owyhee Plateau, many of which have near vertical walls. The Owyhee Plateau is characterized by gradually sloping terrain, canyons, arroyos, and basalt butte remnants of extinct volcanoes (Figure 2.2).

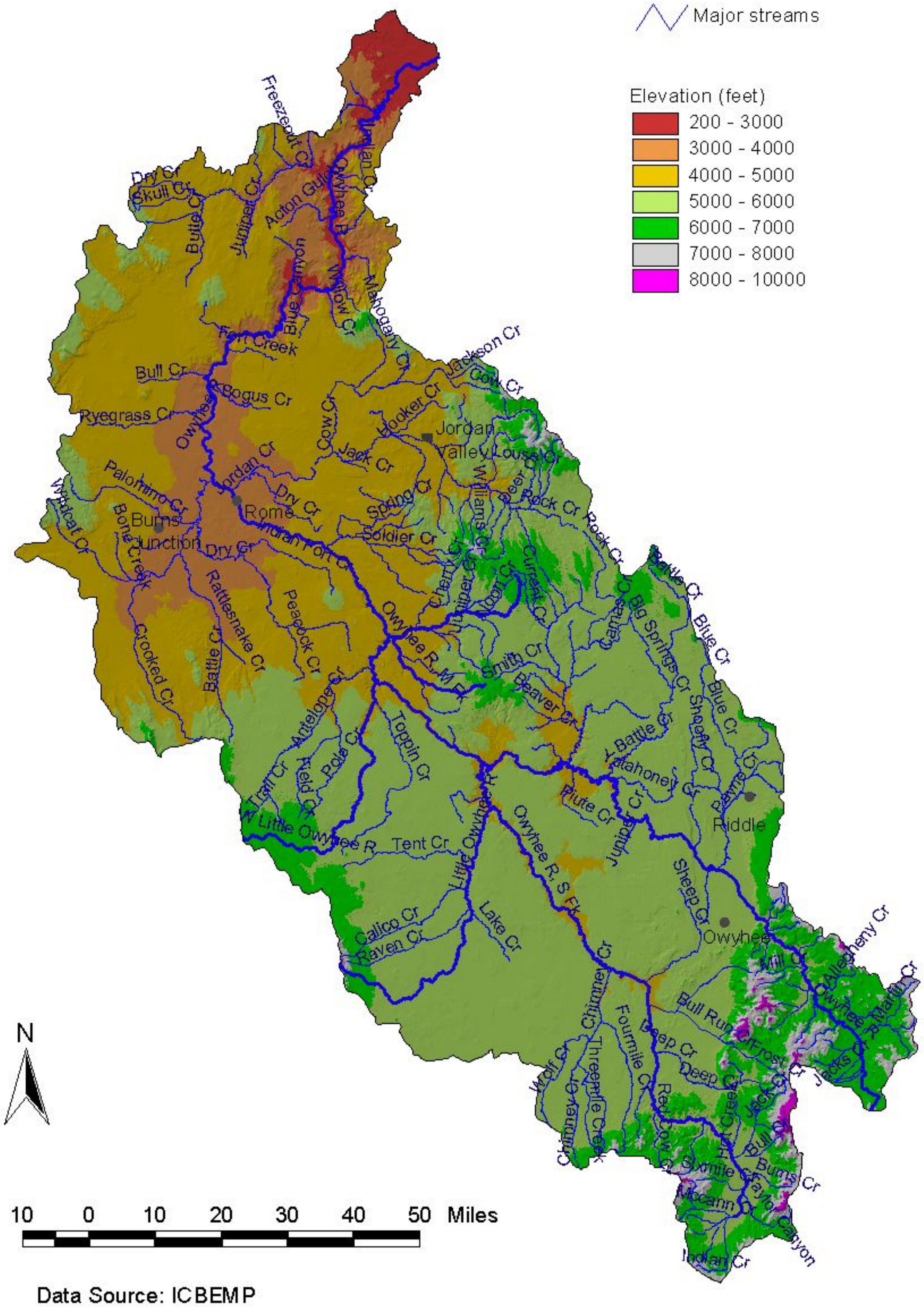


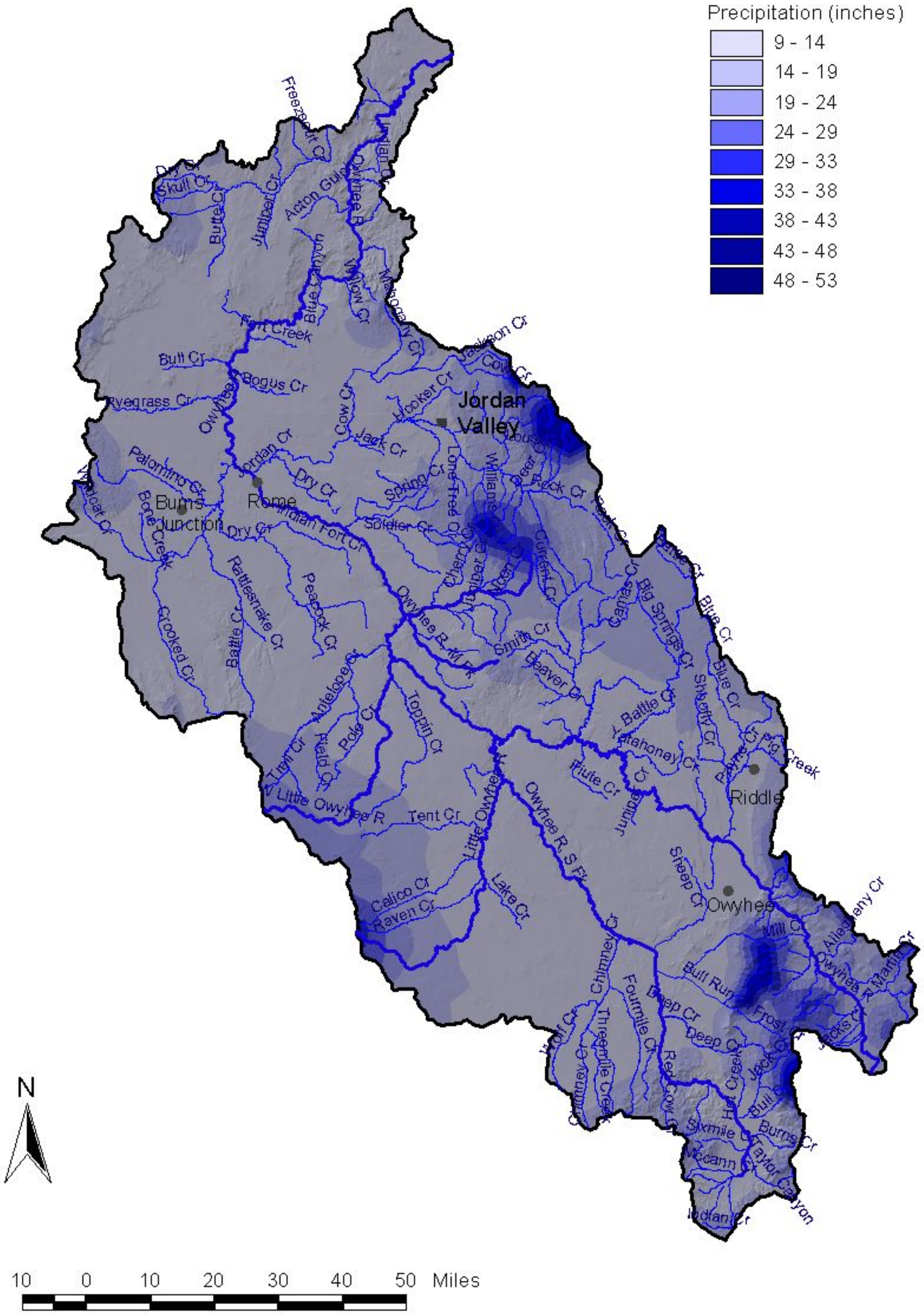
Figure 2.2. Elevation and topography, Owyhee subbasin (Perugini et al. 2002)

In the lower portion of the subbasin, the Owyhee Reservoir occupies a deep, narrow and winding canyon cut into a series of gently to steeply tilted layers of volcanic tuff, sediments, lava flows and dikes (USBR 1993). Downriver from Owyhee Dam, the Owyhee River enters the Snake River Plain. Topographical relief in this portion of the subbasin is greatly reduced and this area supports irrigated agriculture.

Climate

The climate of the area is arid, with hot summers and cool winters (Bailey 1995). The arid climate is due in part to a rain shadow affect from the Cascade and Sierra Mountains to the west (USDI 1999). Precipitation falls primarily from November through February. High-intensity thunderstorms occur between April and September; storms during June or July are typically drier than those in August or September (USDI 1999). Mean annual precipitation for the subbasin is 13 inches and ranges 8 inches at the Owyhee Dam to 53 inches in the headwaters (Figure 2., Daly et al. 1997). Flood events are generated by spring runoff or convective summer storms. Recent dry periods include 1966, 1968, 1977, 1987-88, 1990-92 and 1994. Years with heavy snow pack and subsequent flooding occurred in 1965, 1982-84, and 1993 (Perkins and Bowers 2000).

Temperatures at Owyhee Dam (RM 28.5) range from a maximum of 107˚F in the summer to a minimum of -16˚F in the winter (USBR 1993). On an average, 64 days each year have temperatures of 90˚F or above.



Data source: PRISM

Figure 2.3. Precipitation patterns in the Owyhee subbasin (Perugini et al. 2002)

Geology

The mainstem of the Owyhee River originates in the Basin and Range Geologic Province in Nevada and flows in a northwest direction until entering the Snake River Plain. Most of the Owyhee subbasin lies within large volcanic fields characteristic of the Snake River Plain and southeastern Oregon (Orr and Orr 1996).

The Basin and Range Province began to evolve around 18 million years ago as a result of a regional east-west extension (USDI 1998). This was accompanied by large-volume basaltic lava flows. About 15.5 million years ago, similar caldera-forming eruptions occurred in the Owyhee Reservoir area. Catastrophic rhyolite eruptions covered and smoothed over the landscape, filling and plugging canyons, and periodically impounding water in large natural reservoirs (Orr and Orr 1996). Individual rhyolite flows were typically 300 feet thick and as deep as 800 feet (USBR 1993) (Figure 2.; Orr and Orr 1996). During a second phase of volcanism, fluid basalt flows welled up from cracks to fill low spots in the landscape and create a vast volcanic plateau (Orr and Orr 1996).

Towards the end of the basalt eruptions in the Snake River Plain, a graben began to form. Lava flows dammed the Snake River at the narrows of Hells Canyon on the Oregon-Idaho border (about 13 million years ago) and Lake Idaho formed. Lake Idaho filled the structural subsidence of the Snake River Plain in a lake -- 150 miles long and 50 miles wide -- from the Oregon border to near Twin Falls (Orr and Orr 1996). Sediments deposited during this time period (Idaho Group Sediments) exist at lower elevations where the Owyhee subbasin enters the Snake River Plain (Orr and Orr 1996).

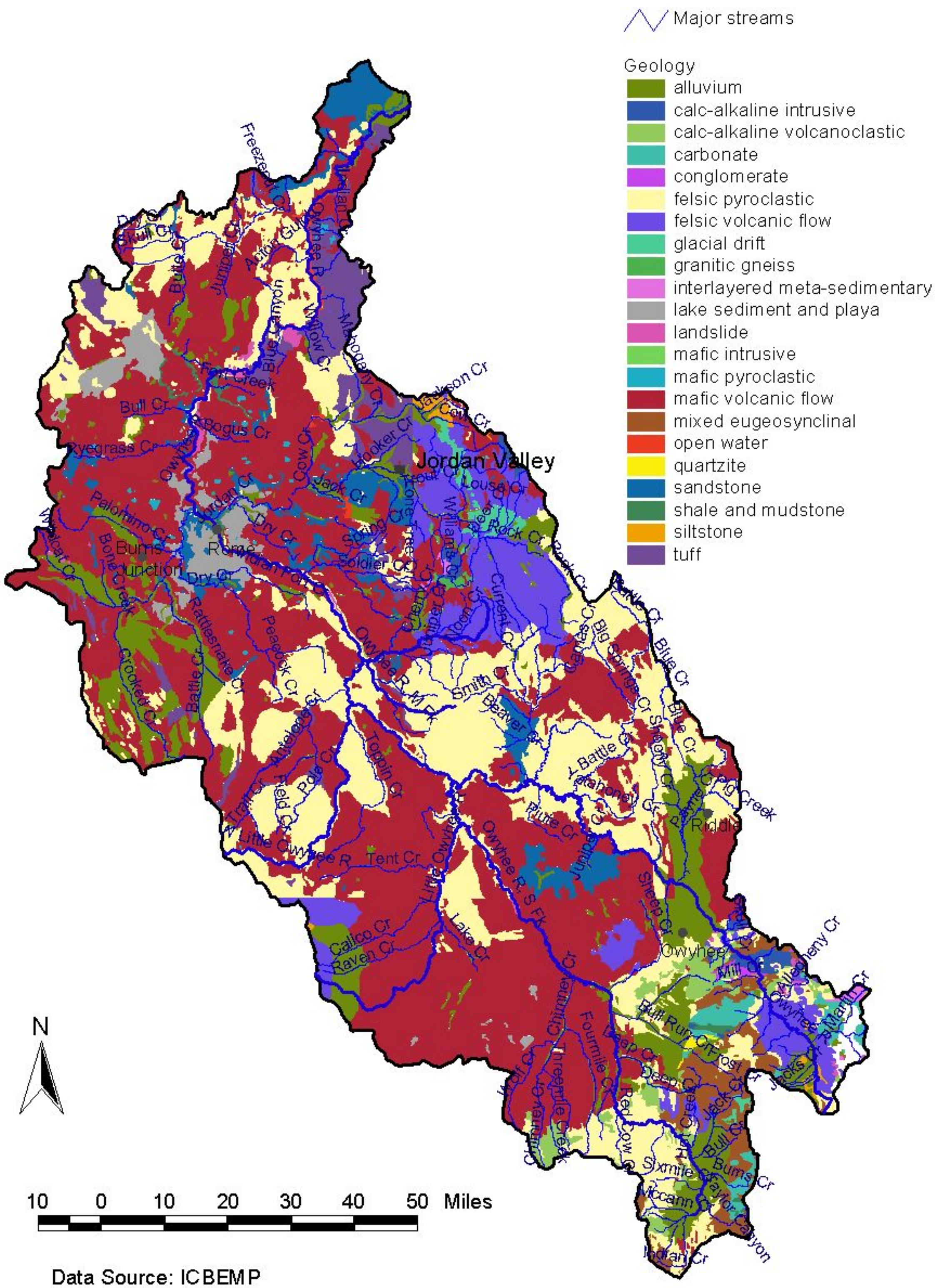


Figure 2.4. Geologic patterns of the Owyhee subbasin (Perugini et al. 2002)

About 1.5 million years ago, Lake Idaho cut through what is now Hells Canyon, connecting the Snake River Basin to the Columbia River Basin. Once this happened, the Snake River, Owyhee River, and other major tributaries in the Snake River Province, cut their current valleys. About 14,500 years ago, the Bonneville Flood flushed a final veneer of sand and gravel into the lower subbasin (Orr and Orr 1996). This flood deepened and widened the Snake River Canyon, which in turn led to further downcutting of the tributary canyons. Most recently, stream alluvium have been deposited in river and stream bottoms and lake sediments have been deposited by wind and water in depressions in the basalt flows (DAF 1998). Volcanism has continued into recent times as evidenced by basalt flows at Jordan Craters that date back 4,000 years (USDI 1998) (Table 2.1).

Table 2.1. Owyhee subbasin geology (ICBEMP).

Lithology	Acres	Kilometers^2	Miles^2	Percent
Mafic volcanic flow	3,172,360	12,838	4,957	44.99
Alluvium	669,772	2,711	1,047	9.50
Sandstone	262,071	1,061	409	3.72
Felsic pyroclastic	1,657,665	6,708	2,590	23.51
Tuff	236,833	958	370	3.36
Open water	15,601	63	24	0.22
Mafic intrusive	617	2	1	0.01
Mafic pyroclastic	10,725	43	17	0.15
Felsic volcanic flow	419,791	1,699	656	5.95
Calc-alkaline intrusive	35,383	143	55	0.50
Lake sediment and playa	146,612	593	229	2.08
Landslide	22,060	89	34	0.31
Shale and mudstone	17,708	72	28	0.25
Siltstone	16,924	68	26	0.24
Glacial drift	37,266	151	58	0.53
Carbonate	54,972	222	86	0.78
Granitic gneiss	6,578	27	10	0.09
Interlayered meta-sedimentary	8,450	34	13	0.12
Calc-alkaline volcanoclastic	92,721	375	145	1.31
Mixed eugeosynclinal	157,001	635	245	2.23
Conglomerate	5,693	23	9	0.08
Quartzite	5,197	21	8	0.07
Totals	7,052,001	28,539	11,019	100.00

Soils

Most soils in the subbasin are young and poorly developed because soil-building processes, such as rock weathering, decomposition of plant materials, accumulation of organic matter, and nutrient cycling, proceed slowly in arid environments (USDI 1998). The predominant soil types in the subbasin are of volcanic origin, with lacustrine and alluvial deposits common in low elevation areas (Franklin and Dyrness 1984 cited in Perkins and Bowers 2000). Land use, prolonged drought, and catastrophic storms have contributed to various processes of upland soil erosion. Many of the ephemeral stream channels exhibit signs of gully erosion, as measured by their degree of channel incision (USDI 1998). Gully erosion has plagued these pinnate drainages for over 30 years by entraining soils following high magnitude storm events (USDI 1998). Severe overland erosion has decreased soil productivity in many areas of the Owyhee subbasin. These areas are often coincident with areas where intensive land use has, and still, occurs. The reduction in soil productivity is reflected by the lack of continued succession beyond early seral stage plant communities (USDI 1998).

In higher elevation portions of the Owyhee, such as the Owyhee Mountains and high plateaus of the upper subbasin, processes of upland erosion are most common on soils with a sedimentary and/or granitic parent material (USDI 1999[1]). Many of these soils occur on steep, poorly vegetated slopes, which convey sediment to stream channels (USDI 1999). Rill and gully erosion are low in most of these areas, except for the portions of the Snake River Uplands dominated by sedimentary or granitic-derived soils (USDI 1999).

In Oregon and Idaho microbiotic soil crusts, which protect the soils from erosion, have experienced widespread disturbance from livestock trampling, and in some areas from OHMV use (USDI 1999). The accordant soil compaction has stunted plant growth and increased erosion (USDI 1999). This is considered a widespread problem throughout the subbasin in areas with rangeland crusts (USDI 1998; USDI 1999).

Vegetation

Historically, two major vegetation types dominated the lower elevation desert upland communities: big sagebrush (*Artemisia* spp.)/bunchgrass communities and salt desert communities. These assemblages are still common throughout the subbasin, but have been replaced by exotics or agricultural species in some areas (Figure 2.5).

Shrub-steppe is the predominant vegetative community across the subbasin (Kuchler 1964). Canyons with intermittent streams contain riparian and desert shrub plant communities. Perennial rivers and streams, low lying areas, springs, and irrigation ditches support riparian and wetland plant communities (Figure 2.5). In the western part

[1] This document is being contested by the Owyhee Watershed Council.

of the subbasin and in areas near the mouth of the Owyhee River, saltbush-greasewood plant communities occur (Kuchler 1964).

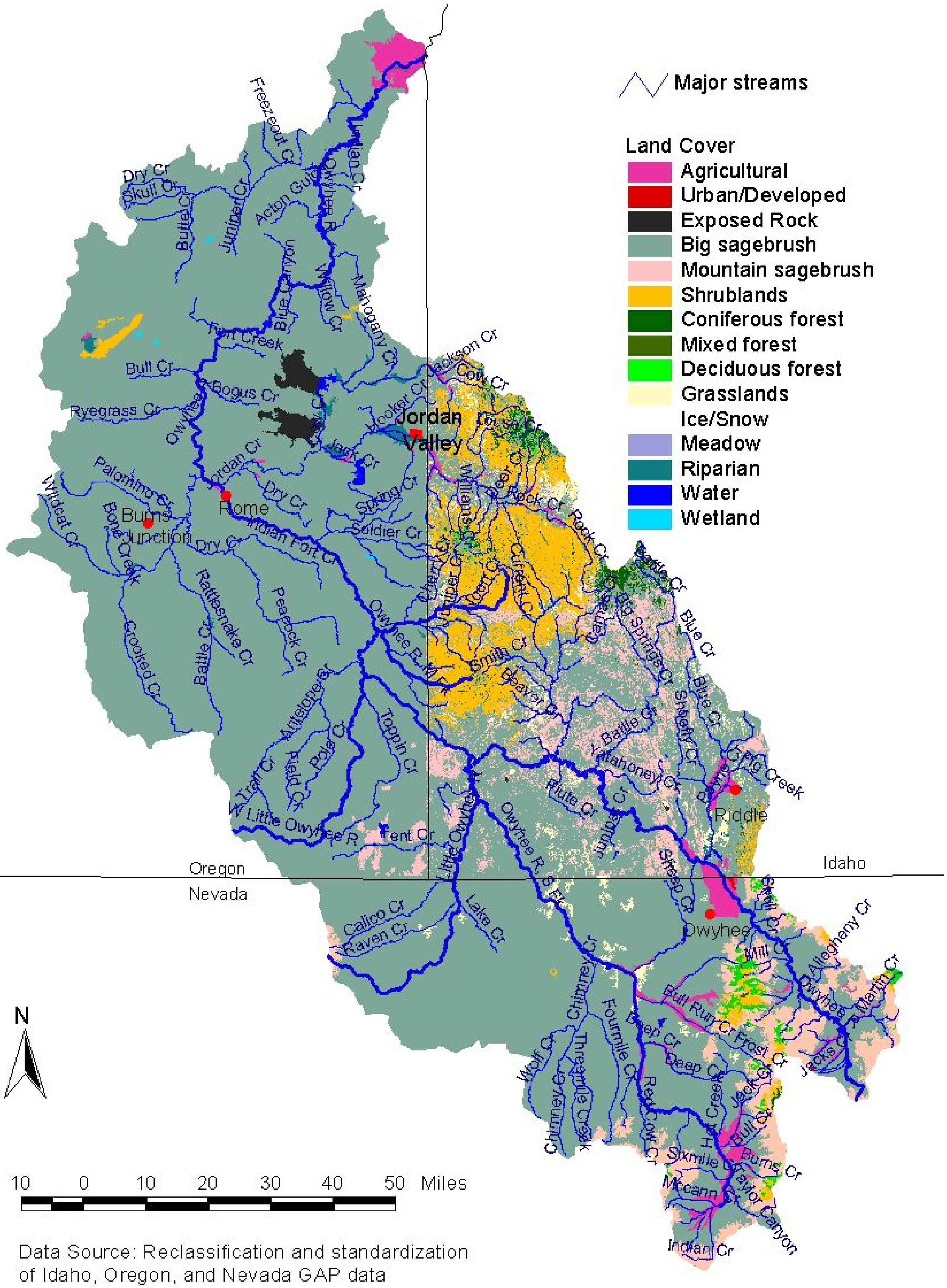


Figure 2.5. Vegetation in the Owyhee subbasin (Perugini et al. 2002)

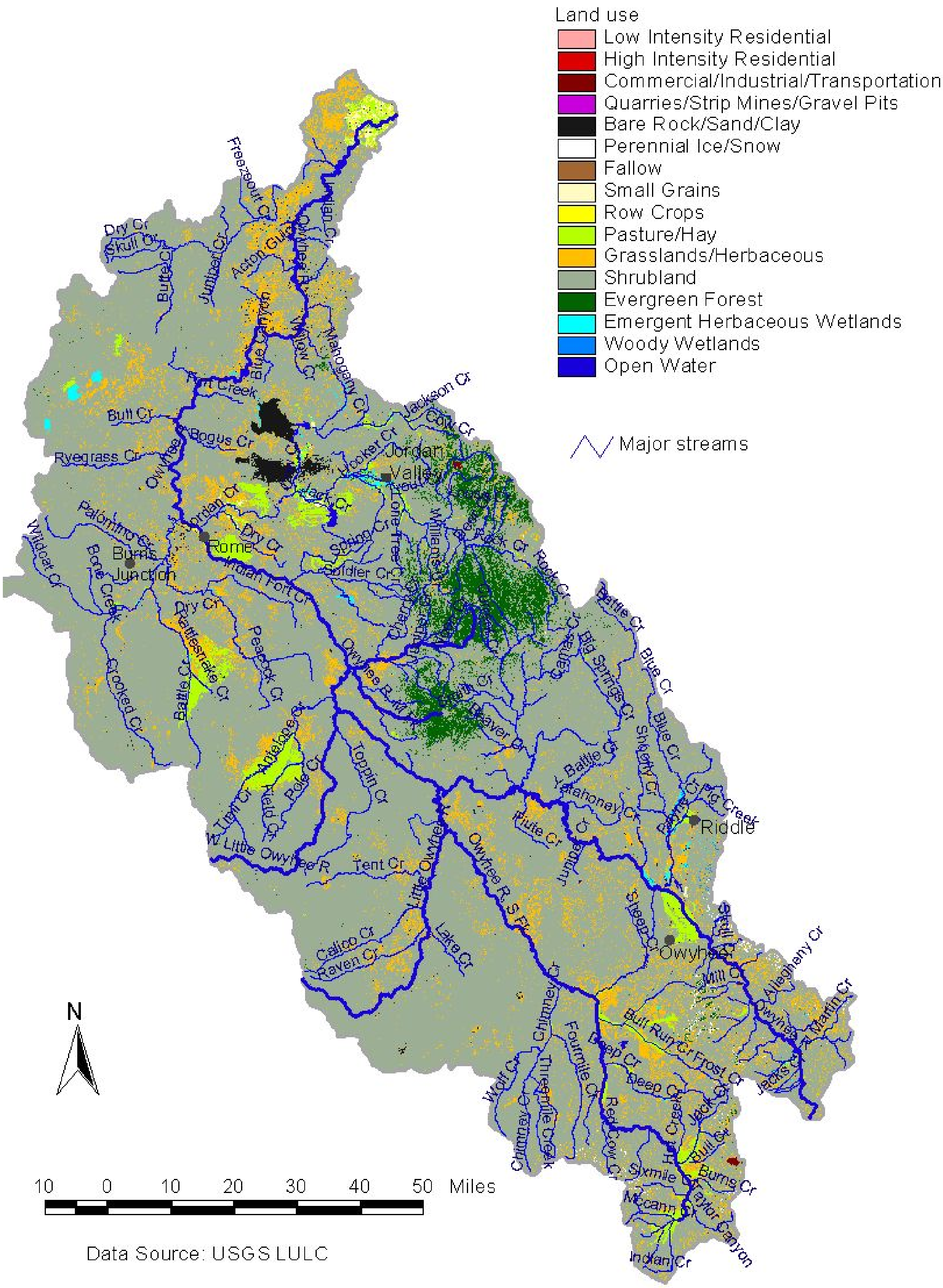


Figure 2.6. Land cover patterns in the Owyhee subbasin (Perugini et al. 2002)

Big sagebrush communities dominate almost every vegetation mosaic. Big sagebrush *(Artemisia tridentata)*, various bunchgrasses, shrubs, and juniper (*Juniperus* spp.) woodlands characterize high-elevation sagebrush-steppe. The Wyoming big sagebrush (*Artemisia tridentata* spp. *wyomingensis*)/bluebunch wheatgrass (*Agropyron spicatum*) association is the most widespread in the subbasin (USBR 1993; USDI 1999). Other common grass associates include Idaho fescue (*Festuca idahoensis*), squirreltail *(Hordeum jubatum)*, Sandberg bluegrass *(Poa secunda)*, Thurber needlegrass (*Stipa thurberiana*), Indian ricegrass *(Oryzopsis hymenoides)*, wildrye (*Elymus* spp.), and cheatgrass (*Bromus tectorum)*. The abundance and distribution of the grass associates varies with regard to slope, elevation and aspect as well as range condition (USBR 1993). The big sagebrush/grass association is most vigorous on north facing slopes and on deep soils. Low sagebrush/grass associations primarily occur on ridge tops with shallow, rocky soil profiles at intermediate and high elevations (USBR 1993).

Common shrubs in the subbasin include big sagebrush, low sagebrush (*Artemisia arbuscula*), rabbitbrush (*Chrysothamnus* spp.), antelope bitterbrush (*Purshia tridentata*), currant (*Ribes* spp.), red osier dogwood *(Cornus stolonifera)*, and wild rose *(Rosa* spp.*)*. Snowberry *(Symphoricarpos albus*), greasewood *(Sarcobatus vermiculatus)*, serviceberry (*Amelanchier alnifolia*), mountain mahogany (*Cercocarpus montanus)*, spiny hopsage (*Grayia spinosa*), four-wing saltbush (*Atriplex canescens*), broom snakeweed *(Gutierrezia sarothrae)*, horsebrush *(Tetradymia* spp.*)* and purple sage (*Salvia* spp.) occur less frequently, but are important to wildlife.

Alkaline soils occur on the flats above the upper Owyhee River and support a salt desert shrub mosaic. These communities are most common where internal drainage and old lakebeds are present (USBR 1993). The dominant shrubs in these communities include greasewood, shadscale saltbush (*Atriplex gardneri*), and spiny hopsage.

High elevation areas in the south and central portions of the subbasin, support aspen *(Populus* spp.*)*, Douglas fir (*Pseudotsuga menziesii)* and sub-alpine fir *(Abies lasiocarpa)* (Figure 2.). Juniper stands occur throughout the Owyhee Mountains and are a component of the sagebrush steppe vegetation type beginning at approximately 4,500 feet in elevation. Juniper can be found with stands of aspen and mahogany at 5,500 foot elevations and higher, and with Douglas fir and sub-alpine fir on the highest slopes (USDI 1999).

Fire suppression has facilitated the dispersion and expansion of juniper into former big sagebrush communities (USDI 1998; 1999). Heavy grazing prior to the Taylor Grazing Act has also had some impact of the expansion of juniper. This has decreased understory vegetation valuable for watershed protection, wildlife, and livestock. The uplands of the North Fork Owyhee River, and isolated areas along the main Owyhee are the only areas that have significant stands of juniper in Oregon's portion of the subbasin (USDI 1993).

The BLM estimates that 35,000–40,000 acres of Douglas fir occur at higher elevations of the Owyhee Mountains. Douglas fir communities are bordered by juniper communities at lower elevations and by sub-alpine fir communities at higher elevations (7,900 feet or above). Mountain mahogany is common at high elevations in the western portion of the subbasin and is the dominant species on Mahogany Mountain (Perkins and Bowers 2000). Other high elevation vegetation includes juniper, quaking aspen, snowberry, sagebrush and willow (*Salix* spp.) (USDI 1998).

No significant harvest of Douglas fir has occurred in the Owyhee Resource Area[2] for at least 20 years (USDI 1999). A Timber Production Capability Classification (TPCC) forest inventory conducted in 1980 found 36,200 acres of commercial forest (primarily Douglas fir) in the Owyhee Mountains (BLM 1999). Approximately 25% (10,000 acres) were classified as in excellent condition.

At lower elevations, such as in the bottom of draws and canyons, riparian vegetation is the dominant vegetation type and includes cottonwood (*Populus* spp.), coyote willow (*Salix* spp.), hawthorn (*Crataegus* spp.), and chokecherry (*Prunus virginiana)* (USDI 1999). Juniper and hackberry occur in isolated areas (USBR 1993). Meadow grasses, sedges (*Carex* spp.), rushes (*Juncus* spp.) and forbs occur in the understory. Greasewood dominates alkaline riparian areas (USBR 1993). High flows during spring runoff and high magnitude storm events limit riparian vegetation and favor establishment of herbaceous shrubs.

Riparian areas in the Owyhee Mountains are generally narrow bands consisting of willow, aspen, black cottonwood, red osier dogwood or alder. Chokecherry, black hawthorn and Wood's rose are common at the edge of riparian areas (Idaho Department of Environmental Quality Date Unknown IDEQ DU). Herbaceous riparian communities include rushes, bluegrass and other grasses and forbs. In general, high elevation riparian areas are in better ecological condition because of higher precipitation and subsurface moisture. Areas where livestock grazing has been restricted by steep terrain or other physical barriers have also faired better (IDEQ DU). Deep soil meadows are typically dominated by rushes, sedges, bluegrass, mules-ears, iris and other herbaceous species, while shallow sites are dominated by willows, aspen, and woody riparian plant species (IDEQ DU).

Exotic weeds pose a significant threat to native vegetative communities and wildlife species throughout the subbasin (BLM 1999). These weeds have become established in many areas, resulting in a reduction in foraging, nesting and brood rearing habitat for wildlife. Cheatgrass represents a serious threat to sagebrush-steppe communities and the wildlife species that depend on them. This introduced species invades disturbed areas such as roadsides, grazed areas and agricultural lands. It can outcompete native perennial species because it germinates earlier in the season, allowing it to establish and monopolize soil resources before other species. Cheatgrass provides less protection to soils and less cover for wildlife than the shrubs or bunchgrasses that it replaces. Once established, this species is very difficult and expensive to control.

Sensitive Plants

Sensitive Plants are found throughout the subbasin and are listed in Appendix Table 2.4.1.

2.1.2 Hydrology

Surface Flows

Surface flows in the Owyhee subbasin fluctuate interannually and seasonally (BLM 1999). Forty-one years of stream flow data on the Owyhee River gauging station at Rome, Oregon showed no discernible trend (due to the substantial variation in annual precipitation) (BLM 1998). The basinwide average annual streamflow is 995 cfs, (USGS data). Maximum discharge at the Rome station was 50,000 cfs on March 18, 1993, and minimum flow was 42 cfs on August 12, 1954.

Most surface runoff originates as high elevation rainfall or snowmelt, producing peak discharges during the spring (BLM 1998; Perkins and Bowers 2000). Year-to-year variability in rainfall and snowfall influence both quantity and duration of spring runoff (BLM 1998). The average annual runoff per unit area ranges from less than 1 inch throughout the majority of the subbasin, to greater than 5 inches in the Trout Creek Mountains (BLM 1998). Runoff from snowmelt can be many times the discharge of streams in the summer months. Snow pack in the headwaters and groundwater inputs sustain flows in the mainstem Owyhee (USDI 1993).

The morphology of stream channels in the Owyhee subbasin influences hydrology. The highly confined, steep gradient channels that characterize the mainstem and tributary rivers do not allow efficient dispersal of energy during high flow events. These features contribute significantly to the disruption of riparian vegetation and fish habitat during runoff, and act to accelerate high flows. The average stream gradient from the Oregon-Idaho border to the backwater of the Owyhee Dam is 13 feet per mile ((USDI-BLM 1993). Most of this stretch of river is confined to narrow canyons with bedrock substrate (USDI-BLM 1993). Approximately 41 miles of the West Little Owyhee's 51 miles total length is confined to a canyon with an average gradient drop per mile of 47 feet (USDI-BLM 1993). Toppin Creek (the main tributary to West Little Owyhee) has a gradient drop of 160 feet per mile over the lower 5 miles of the stream.

The South Fork's hydrology is characterized as "flashy," with peak flows occurring any time between January and June, most typically in May and June (Ingham 1999). The South Fork headwaters are located in the Bull Run Mountains (primarily Paleozoic sedimentary rock in origin) of northern Nevada. Below the headwaters, the South Fork flows through the high desert Owyhee Plateau where the geology is primarily basalt and rhyolite.

Groundwater

Limited information is available on groundwater quantity. Aquifers occur in silicic volcanic rocks and are mainly recharged from precipitation (BLM 1999). The groundwater in the subbasin occurs at great depths, but supplements surface flows in many areas through springs or seeps (BLM 1999). Based on water data taken from 134 springs occurring within the Owyhee Resource Area, 70% yield $\leq$2 gallons per minute (GPM), 19% yield 2-3 GPM, and 11% yield $\geq$3 GPM (BLM 1999). The average yield for all 134 springs was 17 GPM.

Water Quality

Water quality impairment can be linked to historic and present land use activities as well as to natural geology of the area. Improper management of livestock grazing, mining, and agricultural activities have impacted water quality.

Prolonged and intense grazing that result in the removal or elimination of riparian vegetation may contribute to elevated water temperatures, fine sediment deposition, and an increase in fecal coliform bacteria (Platts 1986).

Historic mining operations still impact watersheds today through elevated concentrations of heavy metals, such as mercury, in sediments. Sources of mercury in the Owyhee are both natural and anthropogenic, but its introduction into the water system was accelerated by historic placer mining activities. Residual mercury from gold and silver mining is especially problematic in Jordan Creek (Newell et al. 1996). In addition, the Rio Mine upstream of Duck Valley Indian Reservation has negatively impacted water quality for humans, fish and wildlife.

Pesticides and their breakdown products have been detected at sites along the Owyhee River below irrigated farmland and in drain water return canals (Rinella et al. 1994). Nitrate-plus-nitrite, arsenic, boron, TDS, major ions, and selenium concentrations increase proportionally downstream along the Owyhee River, as irrigated agricultural return flows enter the channel.

The effects of reduced water quality on aquatic and terrestrial biota vary. Fish sampled from the Owyhee Reservoir, Antelope Reservoir and Jordan Creek by Oregon Department of Environmental Quality (ODEQ) contained concentrations of mercury that exceeded levels allowed by FDA for commercial fish (mean mercury level 2.9 mg/kg)and EPA protection levels for pregnant women (Rinella et al. 1994). Fish consumption advisories were issued by the State in response to these findings. Selenium concentrations in aquatic insects exceeded State standards for waterfowl in portions of the Owyhee River, and cadmium levels were detected at high concentrations in carp samples from Owyhee Reservoir.

Riparian area conditions influence water quality. The excessive removal of riparian vegetation leaves streambanks vulnerable. Removal of riparian vegetation through livestock grazing leaves streambanks vulnerable to erosion during high flows, causes streambank sloughing and cave-in, and ultimately contributes to the high sedimentation levels common in many streams throughout the subbasin. Riparian disturbance and subsequent increases in sedimentation may occur from imProper placed roads, poorly vegetated uplands and improper grazing (Perkins and Bowers 2000).

2.1.3 Land Ownership

The majority (77.8%) of the land in the Owyhee subbasin is federally owned. The remainder is owned by the Shoshone-Paiute Tribes (3.7%), private landowners (13.2%), and the state (5.3%) (Figure 2.; Table 2.2).

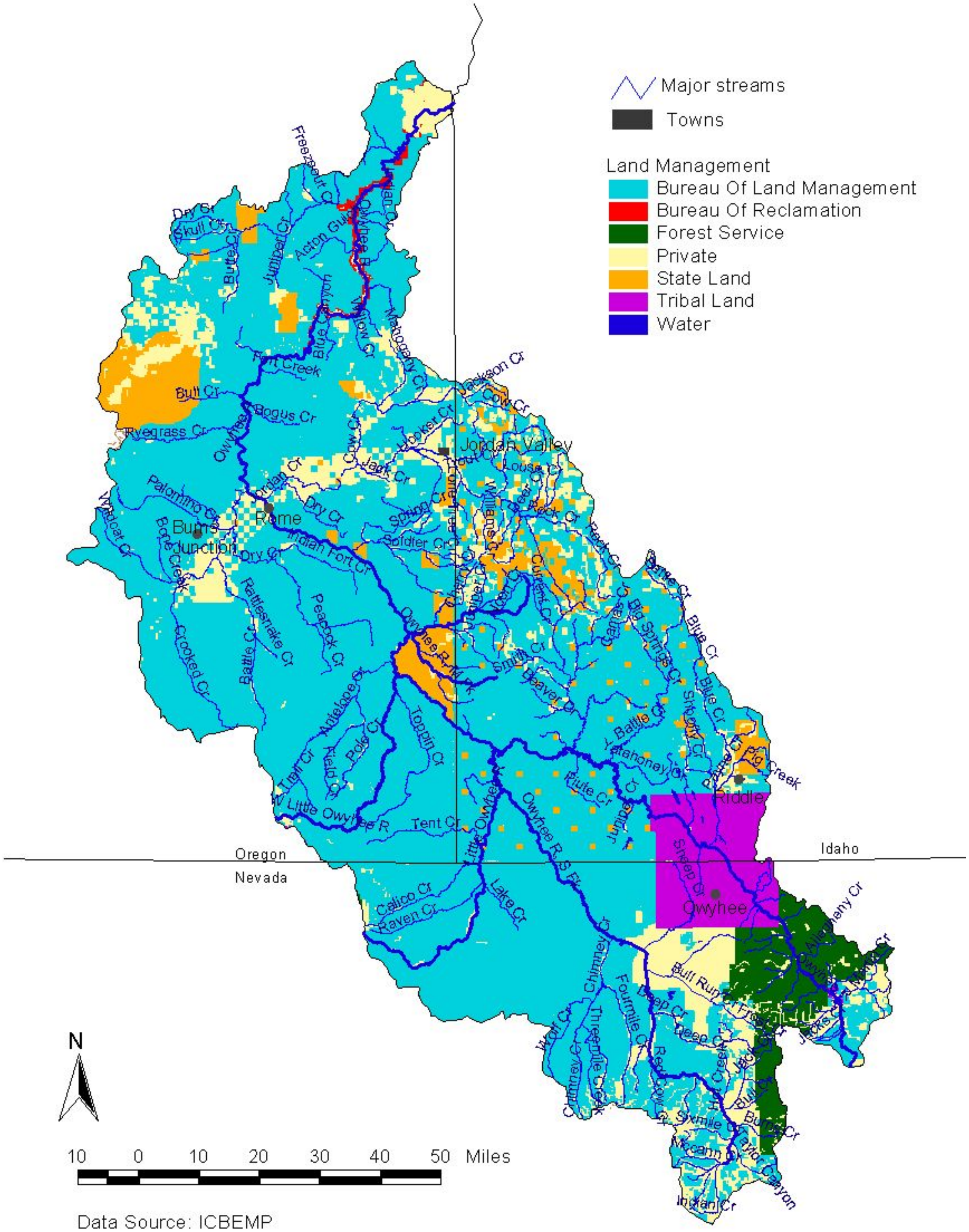


Figure 2.7. Land management of the Owyhee subbasin (Perugini et al. 2002)

Table 2.2. Ownership in the Owyhee Subbasin (ICBEMP data)

Ownership	Management	Acres	Kilometers^2	Miles^2	Percent
Federal	Bureau of Land Management	5,339,525.19	21,608.76	8,343.14	73.9
Private	Private	954,689.14	3,863.57	1,491.73	13.2
Federal	Bureau of Reclamation	28,143.68	113.90	43.98	0.4
State	State Land	382,818.14	1,549.24	598.16	5.3
Tribal	Shoshone-Paiute Tribes	265,833.44	1,075.81	415.37	3.7
Federal	Water	9,743.13	39.43	15.22	0.1
Federal	Forest Service	242,004.13	979.38	378.14	3.4
Totals		7,222,756.85	29,230.09	11,285.74	100.0

2.2 Focal Species Characterization and Status

A summary of focal species for the Owyhee Subbasin is presented in (Table 2.4).

Table 2.4. Owyhee Subbasin Focal Species – final list agreed-upon at the 1-28-2004 meeting.

Assessment Section	Focal Habitat Types Owyhee Subbasin	Focal Species
Terrestrial	Upland aspen forest	Aspen
	Pine/Fir/Mixed Conifer Forests	Elk
	Old Growth western juniper and mountain mahogany woodlands	Mule deer
	Shrub-steppe (including sagebrush steppe and salt-scrub shrublands)	Sage grouse Golden eagle Pronghorn antelope
	Riparian and wetlands	Columbia spotted frog Beaver Yellow Warbler Bald eagle White-faced ibis
	Agricultural Lands	California quail
	Grasslands	Grasshopper sparrow
	Canyon / Gorge	California Bighorn sheep Peregrine falcon
Aquatic	Fishes	
	Streams (creeks & rivers)	Redband trout
	Reservoirs/lakes (upper reaches only)	Redband trout

2.2.1 Focal Habitats

2.2.1.1 Upland aspen forest

Geographic Distribution. Quaking aspen groves are the most widespread habitat in North America, but are a minor type Oregon (Crawford and Kagan 2004; Image 2.2). Upland Aspen habitat is found in isolated mountain ranges of Southeastern Oregon, e.g. Steens Mountains. Aspen stands are much more common in the Rocky Mountain region.

Image 2.2. Upland Aspen Forest (Source: nwhi.org/ibis).

In the western United States, aspen may form extensive stands which occupy a considerable area within a drainage or its distribution may be more limited and is expressed as riparian stringers or disjunct patches. As a general rule, the latter is more characteristic in Nevada – exceptions include extensive aspen stands in the Snake, Schell Creek, White Pine, Jarbidge, Independence, and Monitor Ranges, as well as the Santa Rosa and Ruby Mountains. Scattered stands occur as far south as the Spring Mountains near Las Vegas and in the adjacent Sheep Range (Lanner 1984). The Nevada GAP reports 122,070 hectares of aspen in Nevada, likely a serious underestimation.

Physical Setting. This habitat generally occurs on well-drained mountain slopes or canyon walls that have some moisture. Rockfalls, talus, or stony north slopes are often typical sites. It may occur in steppe on moist microsites. This habitat is usually not associated with streams, ponds, or wetlands. This habitat is found from 2,000 to 9,500 ft (610 to 2,896 m) elevation.
Within Nevada, aspen generally occupies elevations between 6.000 and 8,000 feet (Lanner 1984). Aspen stands are found on all aspects and grow where soil moisture is not a limiting factor.

Landscape Setting. Aspen forms a "subalpine belt" above the Western Juniper and Mountain Mahogany Woodland habitat and below Montane Shrub-steppe Habitat on Steens Mountain in southern Oregon (Crawford and Kagan 2004). It can occur in seral stands in the lower Eastside Mixed Conifer Forest and Ponderosa Pine Forest and Woodlands habitats. Primary land use is livestock grazing.

Structure. Deciduous trees usually <48 ft (15 m) tall dominate this woodland or forest habitat (Figure 2.12). The tree layer grows over a forb-, grass-, or low-shrub-dominated undergrowth. Relatively simple 2-tiered stands characterize the typical vertical structure of woody plants in this habitat. This habitat is composed of 1 to many clones of trees with larger trees toward the center of each clone. Conifers invade and create mixed evergreen-deciduous woodland or forest habitats.

Succession and Stand Dynamics. There is no generalized successional pattern across the range of this habitat. Aspen sprouts after fire and spreads vegetatively into large clonal or multiclonal stands. Because aspen is shade intolerant and cannot reproduce under its own canopy, conifers can invade most aspen habitat.

Effects of Management and Anthropogenic Impacts. Domestic sheep reportedly consume four times more aspen sprouts than do cattle. Heavy livestock browsing can adversely impact aspen growth and regeneration. With fire suppression and alteration of fine fuels, fire rejuvenation of aspen habitat has been greatly reduced since about 1900. Conifers now dominate many seral aspen stands and extensive stands of young aspen are uncommon (Crawford and Kagan 2004). The current distribution of Upland Aspen in Mid-Snake subbasins is presented in Figure 2.8 and the historic distribution is presented in Figure 2.9 (Source: nwhi.org/ibis).

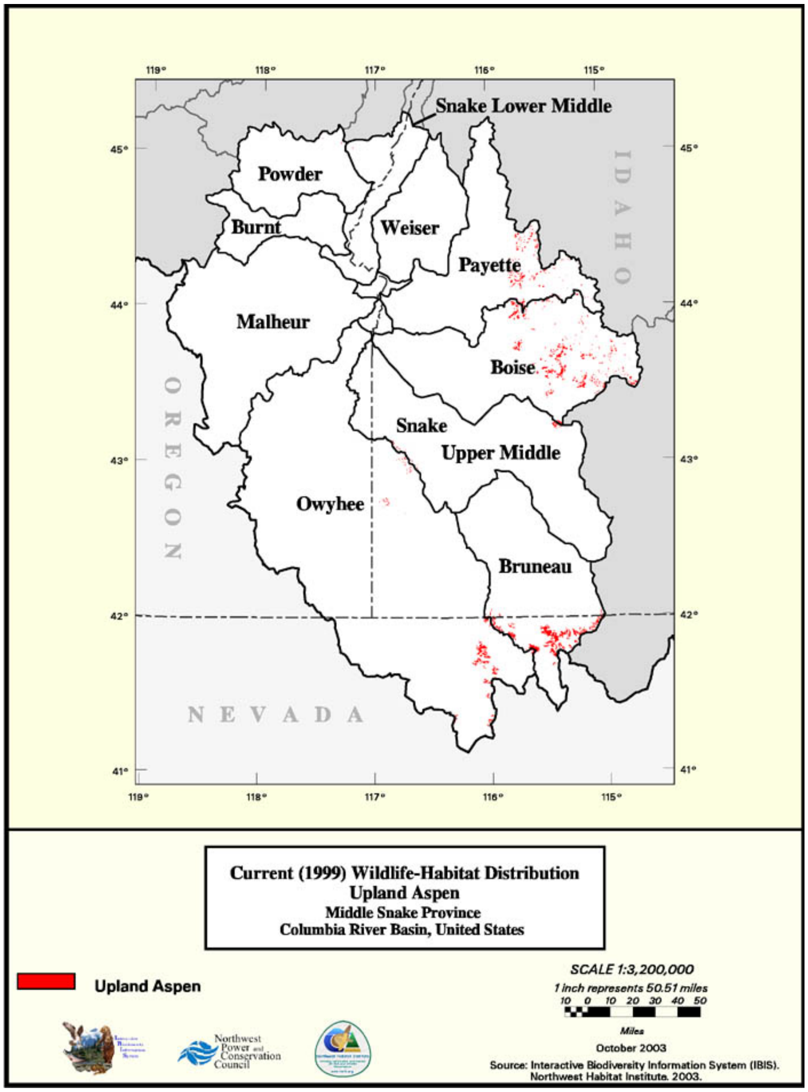


Figure 2.8. Current wildlife-habitat distribution of Upland Aspen in Mid-Snake subbasins (Source: nwhi.org/ibis).

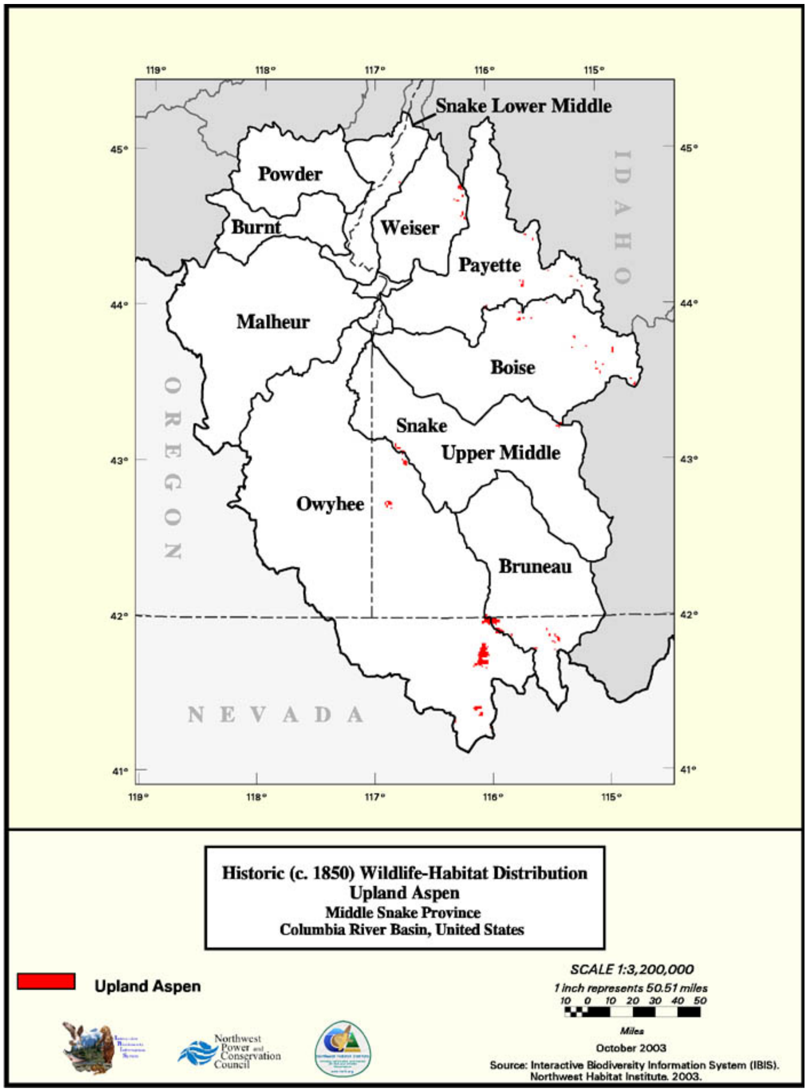


Figure 2.9. Historic wildlife-habitat distribution of Upland Aspen in Mid-Snake subbasins (Source: nwhi.org/ibis).

Status and Trends. With fire suppression and change in fire regimes, the Aspen Forest habitat is less common than before 1900. None of the 5 Pacific Northwest upland quaking aspen community types in the National Vegetation. ?

2.2.1.2 Mixed Conifer Forests (Fir and Pine)

Geographic Distribution. The Eastside Mixed Conifer Forest habitat appears primarily the Blue Mountains, East Cascades, and Okanogan Highland Ecoregions of Oregon, Washington, adjacent Idaho, and western Montana (Image 2.3). It also extends north into British Columbia.

Image 2.3. Mixed Conifer Forest – Fir and Pine (Source: nwhi.org/ibis).

In Nevada, these forests are mostly concentrated on the western and eastern margins of the state. Coniferous forests comprise the major vegetative expressions for the Sierra Nevada, and are distributed in widely scattered tracts of varying size along Nevada's eastern border from Jarbidge in the northeast corner to Great Basin National Park in the Snake Range along the central Utah border (Neel 1999).

Physical Setting. The Eastside Mixed Conifer Forest habitat is primarily mid-montane with an elevation range of between 1,000 and 7,000 ft (305-2,137 m), mostly between 3,000 and 5,500 ft (914-1,676 m). Parent materials for soil development vary. This habitat receives some of the greatest amounts of precipitation in the inland northwest, 30-80 inches (76-203 cm)/year. Elevation of this habitat varies geographically, with generally higher elevations to the east.
Coniferous forests in Nevada take on two major growth forms. The forests of the Sierra Nevada and the eastern border attain well-developed timber stand structures typified by tall stems reaching diameters at breast height (dbh) up to 190 cm, but usually ranging between 38 and 76 cm. The limber pine - bristlecone pine forests of the central mountain ranges rarely attain saw-timber characteristics; rather, they typically assume stunted, tortured growth forms highly influenced by wind and the harsh conditions of their high elevation sites (Neel 1999).

Landscape Setting. This habitat makes up most of the continuous montane forests of the inland Pacific Northwest (Crawford 2004). It is located between the subalpine portions of the Montane Mixed Conifer Forest habitat in eastern Oregon and lower tree line Ponderosa Pine and Forest and Woodlands.

Structure. Eastside Mixed Conifer habitats are montane forests and woodlands. Stand canopy structure is generally diverse, although single-layer forest canopies are currently more common than multilayered forests with snags and large woody debris (Figure 2.11(Crawford 2004). The tree layer varies from closed forests to more open-canopy forests or woodlands. This habitat may include very open stands. The undergrowth is complex and diverse. Tall shrubs, low shrubs, forbs or any combination may dominate stands. Deciduous shrubs typify shrub layers. Prolonged canopy closure may lead to development of a sparsely vegetated undergrowth.

Composition. This habitat contains a wide array of tree species (9) and stand dominance patterns. Douglas-fir (Pseudotsuga menziesii) is the most common tree species in this habitat. It is almost always present and dominates or co-dominates most overstories. Lower elevations or drier sites may have ponderosa pine (Pinus ponderosa) as a co-dominant with Douglas-fir in the overstory and often have other shade-tolerant tree species growing in the undergrowth. On moist sites, grand fir (Abies grandis), western redcedar (Thuja plicata) and/or western hemlock (Tsuga heterophylla) are dominant or co-dominant with Douglas-fir. Other conifers include western larch (Larix occidentalis) and western white pine (Pinus monticola) on mesic sites, Engelmann spruce (Picea engelmannii), lodgepole pine (Pinus contorta), and subalpine fir (Abies lasiocarpa) on colder sites. Rarely, Pacific yew (Taxus brevifolia) may be an abundant undergrowth tree or tall shrub.

Natural Disturbance Regime. Fires were probably of moderate frequency (30-100 years) in presettlement times. Inland Pacific Northwest Douglas-fir and western larch forests have a mean fire interval of 52 years 22. Typically, stand-replacement fire-return intervals are 150-500 years with moderate severity-fire intervals of 50-100 years. Specific fire influences vary with site characteristics. Generally, wetter sites burn less frequently and stands are older with more western hemlock and western redcedar than drier sites. Many sites dominated by Douglas-fir and ponderosa pine, which were formerly maintained by wildfire, may now be dominated by grand fir (a fire sensitive, shade-tolerant species) (Crawford 2004).

Succession and Stand Dynamics. Successional relationships of this type reflect complex interrelationships between site potential, plant species characteristics, and disturbance regime . Generally, early seral forests of shade-intolerant trees (western larch, western white pine, ponderosa pine, Douglas-fir) or tolerant trees (grand fir, western redcedar, western hemlock) develop some 50 years following disturbance. This stage is preceded by forb- or shrub- dominated communities. These early stage mosaics are maintained on ridges and drier topographic positions by frequent fires. Early seral forest develops into mid-seral habitat of large trees during the next 50-100 years. Stand replacing fires recycle this stage back to early seral stages over most of the landscape. Without high-severity fires, a late-seral condition develops either single-layer or multilayer structure during the next 100-200 years. These structures are typical of cool bottomlands that usually only experience low-intensity fires.

Effects of Management and Anthropogenic Impacts. This habitat has been most affected by timber harvesting and fire suppression. Timber harvesting has focused on large shade-intolerant species in mid- and late-seral forests, leaving shade-tolerant species. Fire suppression enforces those logging priorities by promoting less fire-resistant, shade-intolerant trees. The resultant stands at all seral stages tend to lack snags, have high tree density, and are composed of smaller and more shade-tolerant trees. Mid-seral forest structure is currently 70% more abundant than in historical, native systems. Late-seral forests of shade-intolerant species are now essentially absent. Early-seral forest abundance is similar to that found historically but lacks snags and other legacy features.

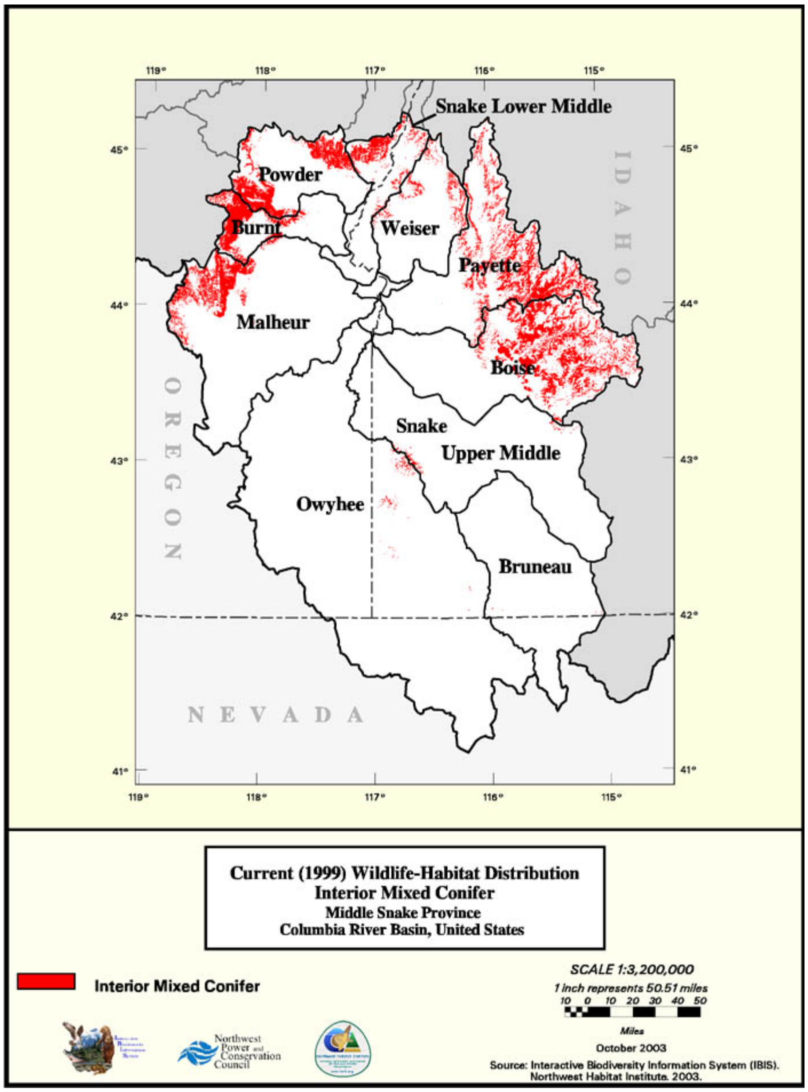


Figure 2.10. Current Wildlife-Habitat Distribution Interior Mixed Conifer (Source: nwhi.org/ibis).

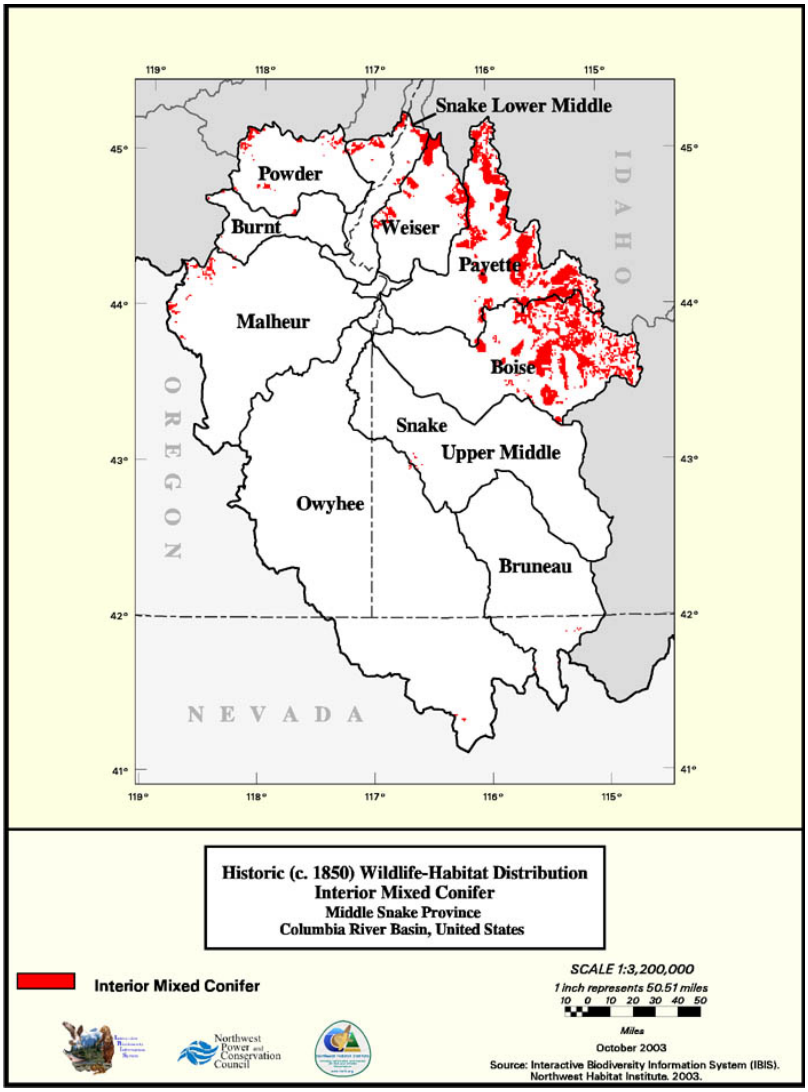


Figure 2.11. Historic Wildlife-Habitat Distribution Interior Mixed Conifer (Source: nwhi.org/ibis).

Status and Trends. Quigley and Arbelbide (1997)concluded that the Interior Douglas-fir, Grand fir, and Western redcedar/Western hemlock cover types are more abundant now than before 1900, whereas the Western larch and Western white pine types are significantly less abundant. Twenty percent of Pacific Northwest Douglas-fir, grand fir, western redcedar, western hemlock, and western white pine associations listed in the National Vegetation Classification are considered imperiled or critically imperiled. Roads, timber harvest, periodic grazing, and altered fire regimes have compromised these forests. Even though this habitat is more extensive than pre-1900, natural processes and functions have been modified enough to alter its natural status as functional habitat for many species.

2.2.1.3 Old Growth western juniper and mountain mahogany woodlands

Geographic Distribution. This habitat is distributed from the Pacific Northwest south into southern California and east to western Montana and Utah, where it often occurs with pinyon-juniper habitat (Image 2.4).

Image 2.4. Old Growth Western Juniper and Mountain Mahogany Woodlands (Source: nwhi.org/ibis).

In Oregon , this dry woodland habitat appears primarily in the Owyhee Uplands, High Lava Plains, and northern Basin and Range ecoregions. Many isolated mahogany communities occur throughout canyons and mountains of eastern Oregon (Crawford and Kagan 2004). In Nevada, the mountain mahogany habitat type generally occurs in scattered pockets on mountain slopes throughout the Great Basin and is most common in central, eastern and northern Nevada. The Nevada GAP estimates 228,320 hectares of this type occur in the state (Neel 1999). Utah juniper dominates isolated areas in northeastern Nevada along the Utah border, and mixes freely with pinyon across the mountain ranges south of the Humboldt River.

Physical Setting. This habitat is widespread and variable, occurring in basins and canyons, and on slopes and valley margins in the southern Columbia Plateau, and on fire-protected sites in the northern Basin and Range province. It may be found on benches and foothills. Western juniper and/or mountain mahogany woodlands are often found on shallow soils, on flats at mid- to high elevations, usually on basalts. Other sites range from deep, loess soils and sandy slopes to very stony canyon slopes. At lower elevations, or in areas outside of shrub-steppe, this habitat occurs on slopes and in areas with shallow soils. Mountain mahogany can occur on steep rimrock slopes, usually in areas of shallow soils or protected slopes. This habitat can be found at elevations of 1,500- 8,000 ft (457-2,438 m), mostly between 4,000-6,000 ft (1,220-1,830 m). Average annual precipitation ranges from approximately 10 to 13 inches (25 to 33 cm), with most occurring as winter snow.

Landscape Setting. This habitat reflects a transition between Ponderosa Pine Forest and Woodlands and Shrub-steppe, Eastside Grasslands, and rarely Desert Playa and Salt Desert Scrub habitats. Western juniper generally occurs on higher topography, whereas the shrub communities are more common in depressions or steep slopes with bunchgrass undergrowth. In the Great Basin, mountain mahogany may form a distinct belt on mountain slopes and ridgetops above pinyon-juniper woodland. Mountain-mahogany can occur in isolated, pure patches that are often very dense. The primary land use is livestock grazing.

Structure. This habitat is made up of savannas, woodlands, or open forests with 10-60% canopy cover. The tallest layer is composed of short (6.6-40 ft 2-12 m tall) evergreen trees. Dominant plants may assume a tall-shrub growth form on some sites. The short trees appear in a mosaic pattern with areas of low or medium-tall (usually evergreen) shrubs alternating with areas of tree layers and widely spaced low or medium-tall shrubs. The herbaceous layer is usually composed of short or medium tall bunchgrass or, rarely, a rhizomatous grass-forb undergrowth. These vegetated areas can be interspersed with rimrock or scree. A well-developed cryptogam layer often covers the ground, although bare rock can make up much of the ground cover (Figure 2.14)

Succession and Stand Dynamics. Juniper invades shrub-steppe and steppe and reduces undergrowth productivity (Crawford and Kagan 2004). Although slow seed dispersal delays recovery time, western juniper can regain dominance in 30-50 years following fire. A fire-return interval of 30-50 years typically arrests juniper invasion. The successional role of curl-leaf mountain mahogany varies with community type. Mountain brush communities where curl-leaf mountain mahogany is either dominant or co-dominant are generally sTable 2.2.and successional rates are slow.

Effects of Management and Anthropogenic Impacts. Over the past 150 years, with fire suppression, overgrazing, and changing climatic factors, western juniper has increased its range into adjacent shrub-steppe, grasslands, and savannas. Increased density of juniper and reduced fine fuels from an interaction of grazing and shading result in high severity fires that eliminate woody plants and promote herbaceous cover, primarily annual grasses. Diverse mosses and lichens occur on the ground in this type if it has not been too disturbed by grazing. Excessive grazing will decrease bunchgrasses and increase exotic annual grasses plus various native and exotic forbs. Animals seeking shade under trees decrease or eliminate bunchgrasses and contribute to increasing cheatgrass cover (Crawford and Kagan 2004).

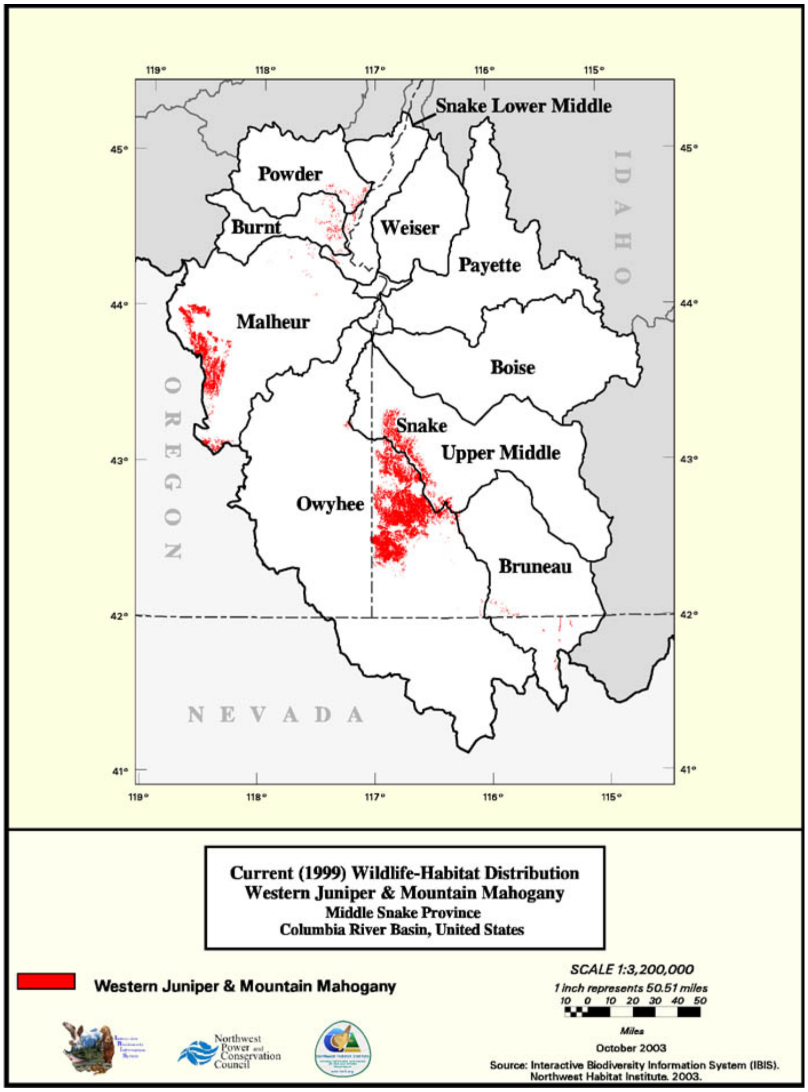


Figure 2.12. Current Wildlife-Habitat Distribution Old Growth Western Juniper and Mountain Mahogany Woodlands (Source: nwhi.org/ibis).

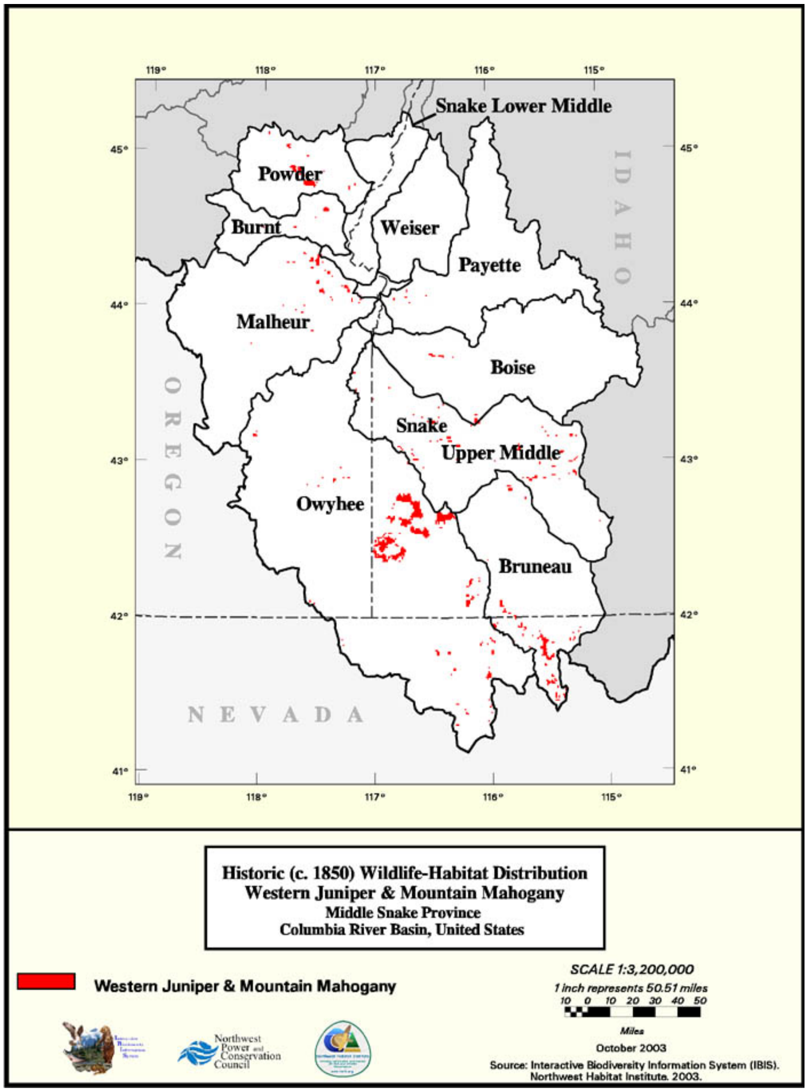


Figure 2.13. Historic Wildlife-Habitat Distribution Old Growth Western Juniper and Mountain Mahogany Woodlands (Source: nwhi.org/ibis).

Status and Trends. This habitat is dominated by fire-sensitive species, and therefore, the range of western juniper and mountain mahogany has expanded because of an interaction of livestock grazing and fire suppression. Quigley and Arbelbide (1997)concluded that in the Inland Pacific Northwest, Juniper/Sagebrush, Juniper Woodlands, and Mountain Mahogany cover types now are significantly greater in extent than before 1900. Although it covers more area, this habitat is generally in degraded condition because of increased exotic plants and decreased native bunchgrasses. One third of Pacific Northwest juniper and mountain mahogany community types listed in the National Vegetation Classification are considered imperiled or critically imperiled (Crawford and Kagan 2004).

2.2.1.4 Shrub-steppe (including sagebrush steppe and salt-scrub shrublands)

Geographic Distribution. Shrub-steppe habitats are common across the Columbia Plateau of Oregon, Idaho, and adjacent Nevada (Image 2.5).

Image 2.5. Shrub-steppe habitat (Source: nwhi.org/ibis).

In Nevada, sagebrush generally occurs throughout the Great Basin and is most common in valleys and mountain ranges north of the Mojave Desert biome. GAP analysis defined 4 major sagebrush classifications in Nevada including Sagebrush, Sagebrush/Bitterbrush, Sagebrush/Perennial Grass, and Mountain Sagebrush habitat types arranged respectively from lower to higher elevational types (Neel 1999). The salt desert scrub type is the most extensive habitat type in the state of Nevada, covering roughly 8.9 million hectares. The term "salt desert scrub" actually encompasses several subtypes, characterized by the presence of a variety of generally salt-tolerant shrubs of the family Chenopodiaceae ("Goosefoot" family). Community composition is largely influenced by soil salinity and drainage (Neel 1999).

It extends up into the cold, dry environments of surrounding mountains. Basin big sagebrush shrub-steppe occurs along stream channels, in valley bottoms and flats throughout eastern Oregon. Wyoming sagebrush shrub-steppe is the most widespread habitat in eastern Oregon, occurring throughout the Columbia Plateau. Mountain big sagebrush shrub-steppe habitat occurs throughout the mountains of the eastern Oregon. Three-tip sagebrush shrub-steppe occurs mostly along the northern and western Columbia Basin and occasionally appears in the Owyhee Upland ecoregions of Oregon. Interior shrub dunes and sandy steppe and shrub-steppe habitat is concentrated at low elevations near the Columbia River and in isolated pockets in the Northern Basin and Range and

Owyhee Uplands. Bolander silver sagebrush shrub-steppe is common in southeastern Oregon.

Physical Setting. Generally, this habitat is associated with dry, hot environments in the Pacific Northwest although variants are in cool, moist areas with some snow accumulation in climatically dry mountains. Elevation range is wide (300-9,000 ft 91-2,743 m) with most habitat occurring between 2,000 and 6,000 ft (610-1,830 m). Habitat occurs on deep alluvial, loess, silty or sandy-silty soils, stony flats, ridges, mountain slopes, and slopes of lake beds with ash or pumice soils.

Landscape Setting. Shrub-steppe habitat defines a biogeographic region and is the major vegetation on average sites in the Columbia Plateau, usually below Ponderosa Pine Forest and Woodlands, and Western Juniper and Mountain Mahogany Woodlands habitats. It forms mosaic landscapes with these woodland habitats and Eastside Grasslands, Dwarf Shrub-steppe, and Desert Playa and Salt Scrub habitats (Crawford and Kagan 2004). Mountain sagebrush shrub-steppe occurs at high elevations occasionally within the dry Eastside Mixed Conifer Forest and Montane Mixed Conifer Forest habitats. Shrub-steppe habitat can appear in large landscape patches (Figure 2.17). Livestock grazing is the primary land use in the shrub-steppe although much has been converted to irrigation or dry land agriculture. Large areas occur in military training areas and wildlife refuges.

Natural Disturbance Regime. Barrett et al.concluded that the fire-return interval for this habitat is 25 years. The native shrub-steppe habitat apparently lacked extensive herds of large grazing and browsing animals until the late 1800's. Burrowing animals and their predators likely played important roles in creating small-scale patch patterns.

Succession and Stand Dynamics. With disturbance, mature stands of big sagebrush are reinvaded through soil-stored or windborne seeds. Invasion can be slow because sagebrush is not disseminated over long distances. Site dominance by big sagebrush usually takes a decade or more depending on fire severity and season, seed rain, postfire moisture, and plant competition. Three-tip sagebrush is a climax species that reestablishes (from seeds or commonly from sprouts) within 5-10 years following a disturbance. Certain disturbance regimes promote three-tip sagebrush and it can out-compete herbaceous species. Bitterbrush is a climax species that plays a seral role colonizing by seed onto rocky and/or pumice soils. Bitterbrush may be declining and may be replaced by woodlands in the absence of fire. Silver sagebrush is a climax species that establishes during early seral stages and coexists with later arriving species. Big sagebrush, rabbitbrush, and short-spine horsebrush invade and can form dense stands after fire or livestock grazing. Frequent or high-intensity fire can create a patchy shrub cover or can eliminate shrub cover and create Eastside Grasslands habitat.

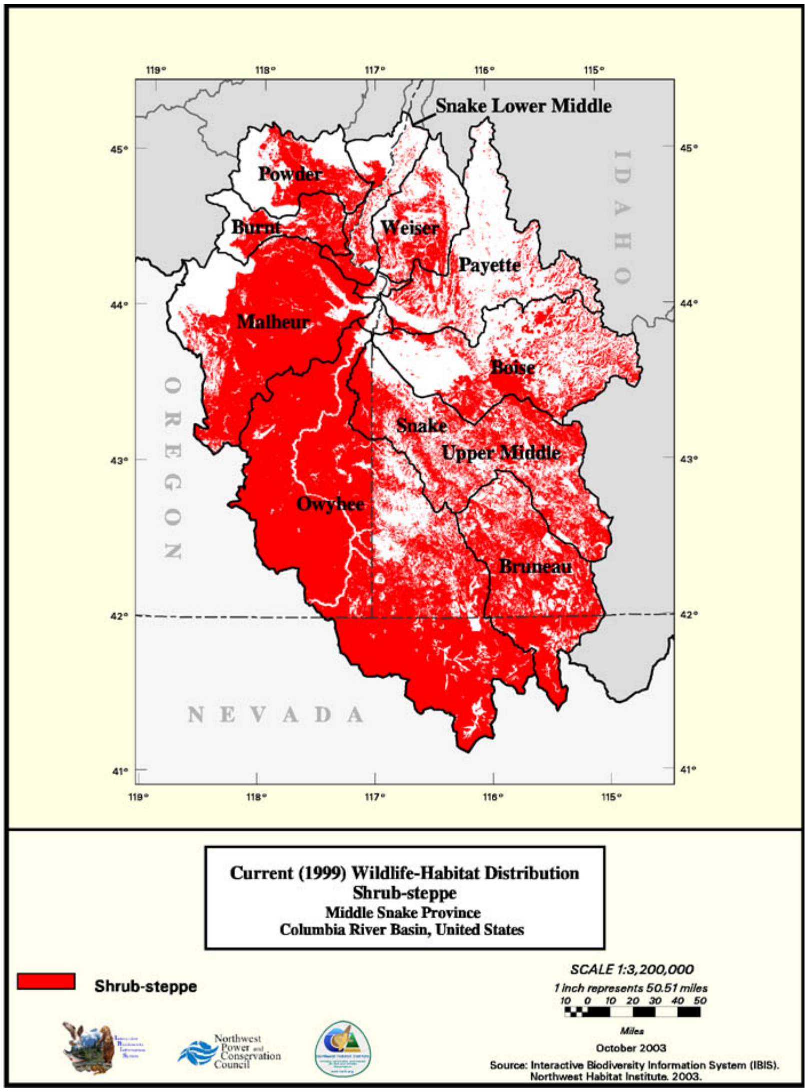


Figure 2.14. Current wildlife-habitat distribution shrub-steppe (Source: nwhi.org/ibis).

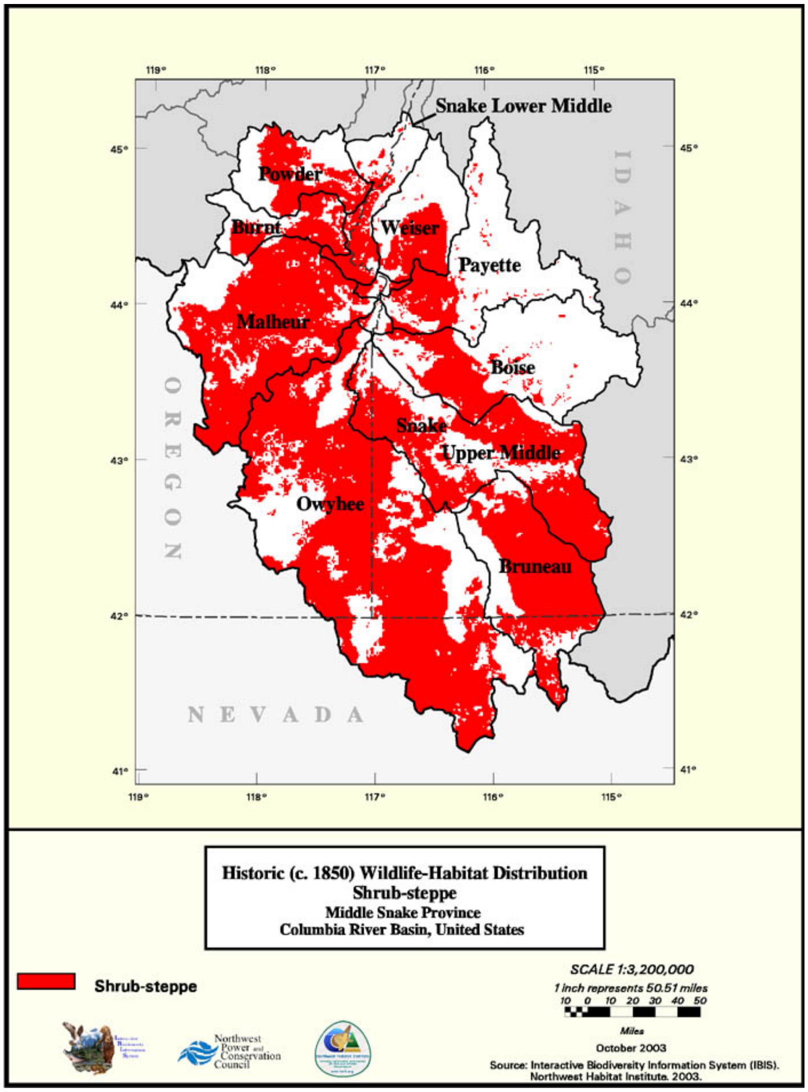


Figure 2.15. Historic wildlife-habitat distribution shrub-steppe (Source: nwhi.org/ibis).

Status and Trends. Shrub-steppe habitat still dominates most of southeastern Oregon although half of its original distribution in the Columbia Basin has been converted to agriculture (Crawford and Kagan 2004). Alteration of fire regimes, fragmentation, livestock grazing, and the addition of >800 exotic plant species have changed the character of shrub-steppe habitat. Quigley and Arbelbide (1997)concluded that Big Sagebrush and Mountain Sagebrush cover types are significantly smaller in area than before 1900, and that Bitterbrush/Bluebunch Wheatgrass cover type is similar to the pre-1900 extent. They concluded that Basin Big Sagebrush and Big sagebrush-Warm potential vegetation type's successional pathways are altered, that some pathways of Antelope Bitterbrush are altered and that most pathways for Big Sagebrush-Cool are unaltered. Overall this habitat has seen an increase in exotic plant importance and a decrease in native bunchgrasses (Crawford and Kagan 2004). More than half of the Pacific Northwest shrub-steppe habitat community types listed in the National Vegetation Classification are considered imperiled or critically imperiled.

2.2.1.5 Riparian and wetlands

Geographic Distribution. Riparian and wetland habitats dominated by woody plants are scarce but important habitats found throughout the Owyhee Subbasin of southeast Oregon, southwest Idaho, and north-central Nevada (Image 2.6). Mountain alder-willow riparian shrublands are major habitats in the forested zones of eastern Oregon. Eastside lowland willow and other riparian shrublands are the major riparian types throughout eastern Oregon at lower elevations. Black cottonwood riparian habitats occur throughout eastern Oregon, at low to middle elevations. White alder riparian habitats are restricted to perennial streams at low elevations, in drier climatic zones in Hells Canyon at the border of Oregon and Idaho, in the Malheur River drainage.

Image 2.6. Eastside (Interior) riparian-wetlands habitat (Source: nwhi.org/ibis).

Lowland riparian habitats are those associated with the floodplains of Nevada's major river systems occurring below 5,000 feet elevation in the northern half of the state and below 4,000 feet in the southern half. Those river systems are the Humboldt, the Truckee, the Carson and the Walker Rivers in the north, and the Colorado River and its tributaries in the south. Habitat conditions supported by these lowland floodplains are lush in stark contrast to the arid landscapes through which they course. Total lowland riparian habitat area in Nevada is estimated at 57,344 hectares (Nevada GAP).

Physical Setting. Riparian habitats appear along perennial and intermittent rivers and streams. This habitat also appears in impounded wetlands and along lakes and ponds. Their associated streams flow along low to high gradients. The riparian and wetland forests are usually in fairly narrow bands along the moving water that follows a corridor along montane or valley streams. The most typical stand is limited to 100-200 ft (31-61 m) from streams. Riparian forests also appear on sites subject to temporary flooding during spring runoff. Irrigation of streamsides and toeslopes provides more water than precipitation and is important in the development of this habitat, particularly in drier climatic regions. Hydrogeomorphic surfaces along streams supporting this habitat have seasonally to temporarily flooded hydrologic regimes. Eastside riparian and wetland habitats are found from 100- 9,500 ft (31-2,896 m) in elevation.

Landscape Setting. Eastside riparian habitats occur along streams, seeps, and lakes within the Eastside Mixed Conifer Forest, Ponderosa Pine Forest and Woodlands, Western Juniper and Mountain Mahogany Woodlands, and part of the Shrub-steppe habitat. This habitat may be described as occupying warm montane and adjacent valley and plain riparian environments (Crawford and Kagan 2004).

Structure. The Eastside riparian and wetland habitat contains shrublands, woodlands, and forest communities. Stands are closed to open canopies and often multilayered. A typical riparian habitat would be a mosaic of forest, woodland, and shrubland patches along a stream course. The tree layer can be dominated by broadleaf, conifer, or mixed canopies. Tall shrub layers, with and without trees, are deciduous and often nearly completely closed thickets. These woody riparian habitats have an undergrowth of low shrubs or dense patches of grasses, sedges, or forbs. Tall shrub communities (20-98 ft 6-30 m, occasionally tall enough to be considered woodlands or forests) can be interspersed with sedge meadows or moist, forb-rich grasslands. Intermittently flooded riparian habitat has ground cover composed of steppe grasses and forbs. Rocks and boulders may be a prominent feature in this habitat (Figure 2.20).
Annual precipitation and temperature ranges for Nevada's lowland riparian habitats reflect Nevada's extremes – from less than 12 to more than 76 cm of precipitation per year and from -30 to over 120 F temperature. Riparian vegetation is distributed according to different plant species' affinity for water and the extent to which the river's flow is distributed across its floodplain.

The Humboldt River drains most of northeastern Nevada from the southwestern foot of the Jarbidge Mountains and the western foot of the Ruby Mountains over 467 km to the Humboldt Sink south of Lovelock. Meadows of grasses, sedges (Carex spp.) and rushes (Juncus spp.) are predominant on much of the floodplain of the Humboldt River and its tributaries, while occurring on shorter, more disjunct stretches of the other northern Nevada river floodplains. Creeping wildrye (Elymus triticoides) is one of the most important meadow grasses. Other types that may occur on a lowland floodplain include saltgrass (Distichlis spicata), greasewood (Sarcobatus vermiculatus), sagebrush (Artemisia tridentata), wildrye (Elymus cinereus), and in southern Nevada, arrowweed (Pluchea sericea) and saltgrass.

Natural Disturbance Regime. This habitat is tightly associated with stream dynamics and hydrology (Crawford and Kagan 2004). Flood cycles occur within 20-30 years in most riparian shrublands although flood regimes vary among stream types. Fires recur typically every 25-50 years but fire can be nearly absent in colder regions or on topographically protected streams. Rafted ice and logs in freshets may cause considerable damage to tree boles in mountain habitats. Beavers crop younger cottonwood and willows and frequently dam side channels in these stands. These forests and woodlands require various flooding regimes and specific substrate conditions for reestablishment. Grazing and trampling is a major influence in altering structure, composition, and function of this habitat; some portions are very sensitive to heavy grazing (Crawford and Kagan 2004).

Succession and Stand Dynamics. Riparian vegetation undergoes "typical" stand development that is strongly controlled by the site's initial conditions following flooding and shifts in hydrology (Crawford and Kagan 2004). The initial condition of any hydrogeomorphic surface is a sum of the plants that survived the disturbance, plants that can get to the site and the amount of unoccupied habitat available for invasions. Subsequent or repeated floods or other influences on the initial vegetation select species that can survive or grow in particular life forms. A typical woody riparian habitat dynamic is the invasion of woody and herbaceous plants onto a new alluvial bar away from the main channel. If the bar is not scoured in 20 years, a tall shrub and small deciduous tree stand will develop. Approximately 30 years without disturbance or change in hydrology will allow trees to overtop shrubs and form woodland. Another 50 years without disturbance will allow conifers to invade and in another 50 years a mixed hardwood-conifer stand will develop. Many deciduous tall shrubs and trees cannot be invaded by conifers. Each stage can be reinitiated, held in place, or shunted into different vegetation by changes in stream or wetland hydrology, fire, grazing, or an interaction of those factors.

Effects of Management and Anthropogenic Impacts. Management effects on woody riparian vegetation can be obvious, e.g., removal of vegetation by dam construction, roads, logging, or they can be subtle, e.g., removing beavers from a watershed, removing large woody debris, or construction of a weir dam for fish habitat (Crawford and Kagan 2004). In general, excessive livestock or native ungulate use leads to less woody cover and an increase in sod-forming grasses particularly on fine-textured soils. Undesirable forb species, such as stinging nettle and horsetail, increase with livestock use.

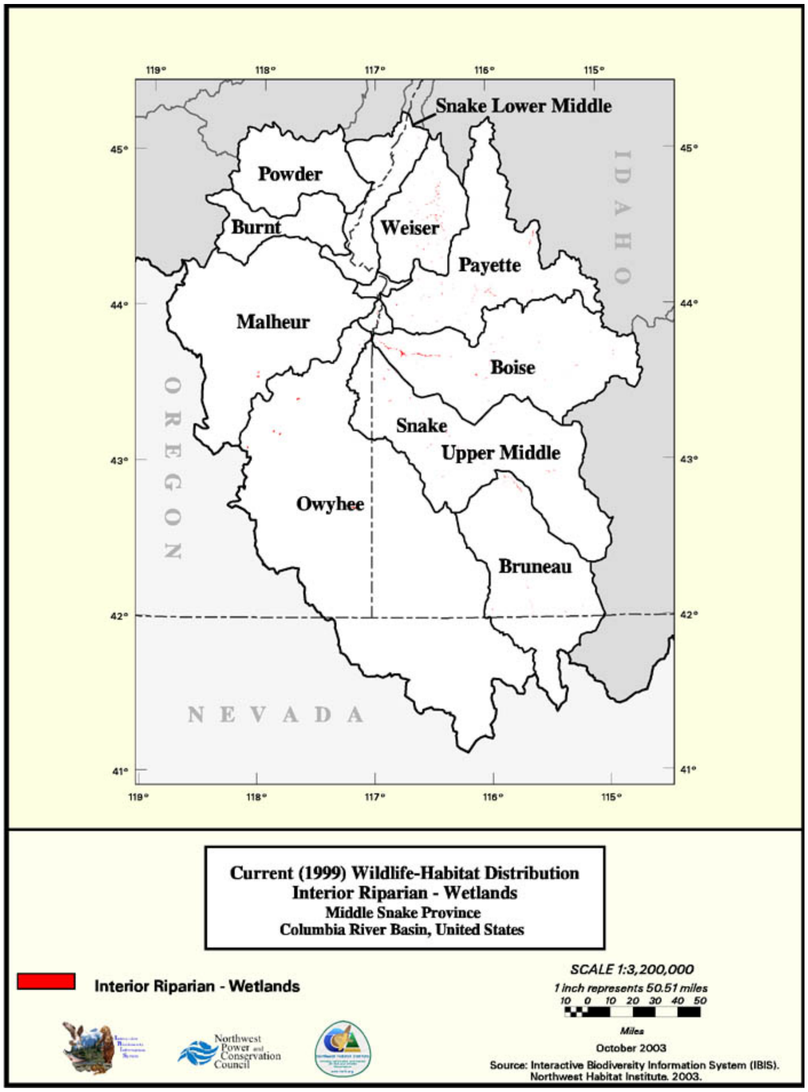


Figure 2.16. Current Wildlife-Habitat Distribution Eastside (Interior) Riparian-Wetlands (Source: nwhi.org/ibis).

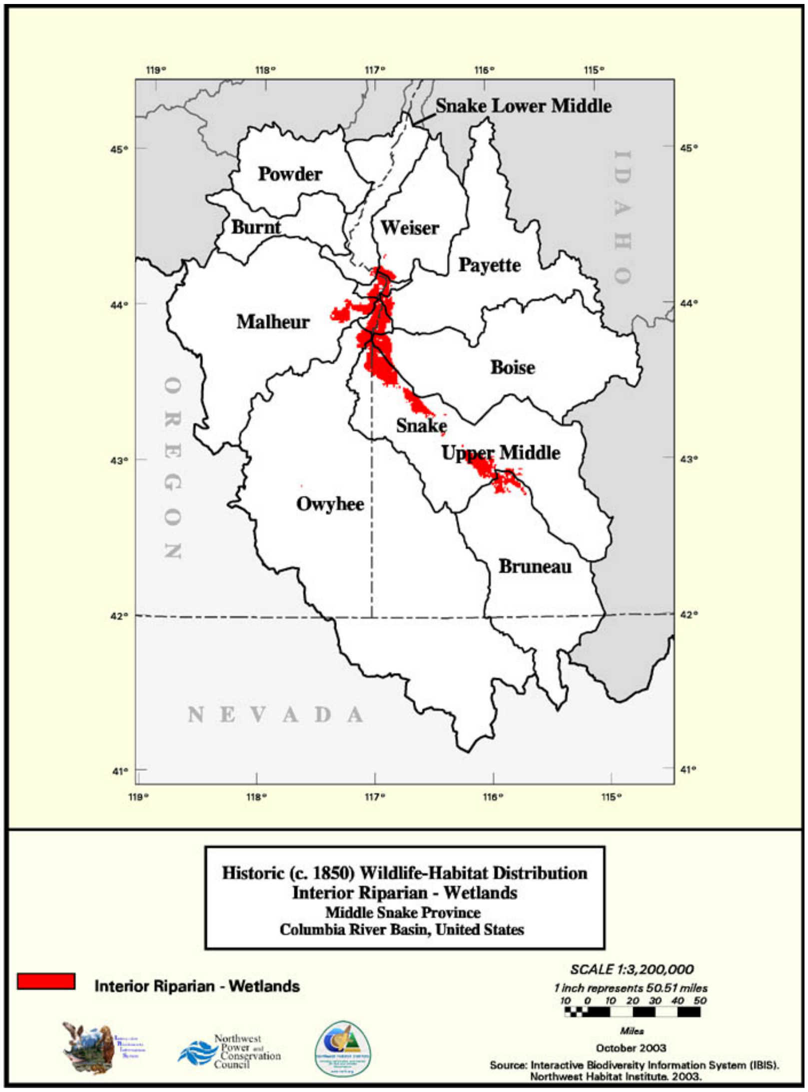


Figure 2.17. Historic Wildlife-Habitat Distribution Eastside (Interior) Riparian-Wetlands (Source: nwhi.org/ibis).

Status and Trends. Quigley and Arbelbide (1997)concluded that the Cottonwood-Willow cover type covers significantly less in area now than before 1900 in the Inland Pacific Northwest. The authors concluded that although riparian shrubland was a minor part of the landscape, occupying 2%, they estimated it to have declined to 0.5% of the landscape. Approximately 40% of riparian shrublands occurred above 3,280 ft (1,000 m) in elevation pre-1900; now nearly 80% is found above that elevation. This change reflects losses to agricultural development, roading, dams and other flood-control activities. The current riparian shrublands contain many exotic plant species and generally are less productive than historically. Quigley and Arbelbide (1997)found that riparian woodland was always rare and the change in extent from the past is substantial.

2.2.1.6 Agricultural Lands

Geographic Distribution. Agricultural habitat in the Owyhee Subbasin is restricted to relatively low to mid-elevations (<6,000 ft) associated with river systems or irrigation diversions (Image 2.7). Although in the Pacific Northwest this habitat is generally most plentiful in broad river valleys, it is more restricted in the gentle rolling terrain and high desert east of the Cascades.

Image 2.7. Agriculture, Pasture and Mixed Environs (Source: nwhi.org/ibis).

The majority of Nevada's agricultural lands are located in valley bottoms and on river systems. Water is taken from streams and rivers or large, high volume wells. Crops are watered by either flood irrigation or sprinkler systems. Approximately 222,469 hectares (less than one percent) of Nevada is classified as irrigated land and an additional 2,481,624 hectares (less than nine percent) are recorded as irrigated pastureland (Neel 1999).

Physical Setting. Agricultural habitat in arid regions east of the Cascades with <10 inches (25 cm) of rainfall require supplemental irrigation or fallow fields for 1-2 years to accumulate sufficient soil moisture. Soils types are variable, but usually have a well developed A horizon. This habitat is found from 0 to 6,000 ft (0 to 1,830 m) elevation.

Landscape Setting. Agricultural habitat occurs within a matrix of other habitat types at low to mid-elevations, including Eastside grasslands, Shrub-steppe, Westside Lowlands Conifer-Deciduous Forest and other low to mid-elevation forest and woodland habitats (Edge et al. 2004). This habitat often dominates the landscape in flat or gently rolling terrain, on well-developed soils, broad river valleys, and areas with access to abundant irrigation water. Unlike other habitat types, agricultural habitat is often characterized by regular landscape patterns (squares, rectangles, and circles) and straight borders because of ownership boundaries and multiple crops within a region. Edges can be abrupt along the habitat borders within agricultural habitat and with other adjacent habitats.

Structure. This habitat is structurally diverse because it includes several cover types ranging from low-stature annual grasses and row crops (<3.3 ft 1 m) to mature orchards (>66 ft 20 m)(Figure 2.27). However, within any cover type, structural diversity is typically low because usually only 1 to a few species of similar height are cultivated (Edge et al. 2004). Depending on management intensity or cultivation method, agricultural habitat may vary substantially in structure annually; cultivated cropland and modified grasslands are typified by periods of bare soil and harvest whereas pastures are mowed, hayed, or grazed 1 or more times during the growing season. Structural diversity of agricultural habitat is increased at local scales by the presences of non-cultivated or less intensively managed vegetation such as fencerows, roadsides, field borders, and shelterbelts.

Natural Disturbance Regime. Natural fires are almost totally suppressed in this habitat, except for unimproved pastures and modified grasslands, where fire-return intervals can resemble those of native grassland habitats. Fires are generally less frequent today than in the past, primarily because of fire suppression, construction of roads, and conversion of grass and forests to cropland. Bottomland areas along streams and rivers are subject to periodic floods, which may remove or deposit large amounts of soil.

Succession and Stand Dynamics. Management practices disrupt natural succession and stand dynamics in most of the agricultural habitats (Edge et al. 2004). Abandoned eastside agricultural habitats may convert to other habitats, mostly grassland and shrub habitats from the surrounding native habitats. Some agricultural habitats that occur on highly erodible soils, especially east of the Cascades, have been enrolled in the U.S. Department of Agriculture Conservation Reserve Program. In the absence of fire or mowing, westside unimproved pastures have increasing amounts of hawthorn, snowberry, rose (Rosa spp.), Himalaya blackberry, spirea, Scot's broom, and poison oak. Douglas-fir or other trees can be primary invaders in some environments.

Effects of Management and Anthropogenic Impacts. The dominant characteristic of agricultural habitat is a regular pattern of management and vegetation disturbance. With the exception of the unimproved pasture cover type, most areas classified as agricultural habitat receive regular inputs of fertilizer and pesticides and have some form of vegetation harvest and manipulation. Management practices in cultivated cropland include different tillage systems, resulting in vegetation residues during the non-growing season that range from bare soil to 100% litter. Cultivation of some crops, especially in the arid eastern portions of both states, may require the land to remain fallow for 1-2 growing seasons in order to store sufficient soil moisture to grow another crop. Harvest in cultivated cropland, Christmas tree plantations, and nurseries, and mowing or haying in improved pasture cover types substantially change the structure of vegetation. Harvest in orchards and vineyards are typically less intrusive, but these crops as well as Christmas trees and some ornamental nurseries are regularly pruned. Improved pastures are often grazed after haying or during the nongrowing season. Livestock grazing is the dominant use of unimproved pastures (Edge et al. 2004). All of these practices prevent agricultural areas from reverting to native vegetation. Excessive grazing in unimproved pastures may increase the prevalence of weedy or exotic species.

In Nevada, the greatest threat to the long-term productivity of agricultural lands may turn out to be the increased pressure upon prime lands from residential and commercial development. As Nevada's population continues to grow, land prices will continue to grow as well. Simple economics will make it more difficult for a farmer to stay on his land in the face of increasingly lucrative offers to sell and subdivide. When prime farm land goes under asphalt, it is likely out of production for decades. Most potential that land may have had as wildlife habitat has been effectively precluded for the duration. While efforts to make housing developments more "wildlife friendly" are commendable and worth continuing, the overall loss of land potential can never be completely mitigated. Societal trends will continue to pose difficult challenges with respect to the maintenance of Nevada's most productive parcels of land in the foreseeable future (Neel 1999).

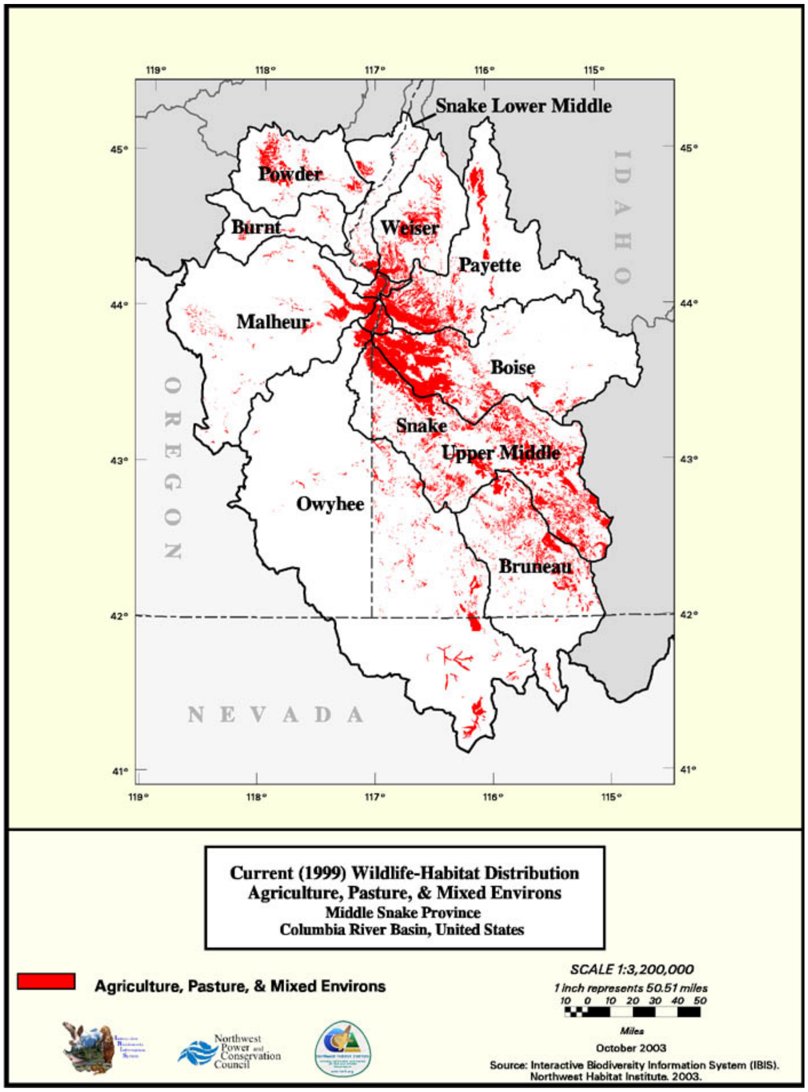


Figure 2.18 Current Wildlife-Habitat Distribution Agriculture, Pasture and Mixed Environs (Source: nwhi.org/ibis).

Status and Trends. Agricultural habitat has steadily increased in amount and size in both states since Eurasian settlement of the region. Conversion to agricultural habitat threatens several native habitat types. The greatest conversion of native habitats to agricultural production occurred between 1950 and 1985, primarily as a function of U.S. agricultural policy 96. Since the 1985 Farm Bill and the economic downturn of the early to mid 1980's, the amount of land in agricultural habitat has stabilized and begun to decline. The 1985 and subsequent Farm Bills contained conservation provisions encouraging farmers to convert agricultural land to native habitats 96, 153. Clean farming practices and single-product farms have become prevalent since the 1960's, resulting in larger farms and widespread removal of fencerows, field borders, roadsides, and shelterbelts. In Oregon, land-use planning laws prevent or slow urban encroachment and subdivisions into areas zoned as agriculture.

2.2.1.7 Grasslands

Geographic Distribution. This habitat is found primarily in the Columbia Basin of Idaho, Oregon, Idaho fescue grassland habitats were formerly widespread in Idaho; most of this habitat has been converted to agriculture (Crawford and Kagan 2004; Image 2.8).

Image 2.8. Eastside (Interior) Grasslands (Source: nwhi.org/ibis).

Similar grasslands appear on the High Lava Plains ecoregion, where they occur in a matrix with big sagebrush or juniper woodlands. In Oregon they are also found in burned shrub-steppe and canyons in the Basin and Range and Owyhee Uplands. Sand dropseed and three-awn needlegrass grassland habitats are restricted to river terraces Owyhee Uplands of Oregon. Primary location of this habitat extends along the Snake River from Lewiston south to the Owyhee River.

Physical Setting. This habitat develops in hot, dry climates in the Pacific Northwest. Annual precipitation totals 8-20 inches (20-51 cm); only 10% falls in the hottest months, July through September. Snow accumulation is low (1-6 inches 3-15 cm) and occurs only in January and February in eastern portions of its range and November through March in the west. More snow accumulates in grasslands within the forest matrix. Soils are variable: (1) highly productive loess soils up to 51 inches (130 cm) deep, (2) rocky flats, (3) steep slopes, and (4) sandy, gravel or cobble soils. An important variant of this habitat occurs on sandy, gravelly, or silty river terraces or seasonally exposed river gravel or Spokane flood deposits. The grassland habitat is typically upland vegetation but it may also include riparian bottomlands dominated by non-native grasses. This habitat is found from 500 to 6,000 ft (152-1,830 m) in elevation.

Landscape Setting. Eastside grassland habitats appear well below and in a matrix with lower treeline Ponderosa Pine Forests and Woodlands or Western Juniper and Mountain Mahogany Woodlands. It can also be part of the lower elevation forest matrix. Most grassland habitat occurs in 2 distinct large landscapes: plateau and canyon grasslands. Several rivers flow through narrow basalt canyons below plateaus supporting prairies or shrub-steppe. The canyons can be some 2,132 ft (650 m) deep below the plateau. The plateau above is composed of gentle slopes with deep silty loess soils in an expansive rolling dune-like landscape. Grasslands may occur in a patchwork with shallow soil scablands or within biscuit scablands or mounded topography. Naturally occurring grasslands are beyond the range of bitterbrush and sagebrush species. This habitat exists today in the shrub-steppe landscape where grasslands are created by brush removal, chaining or spraying, or by fire. Agricultural uses and introduced perennial plants on abandoned or planted fields are common throughout the current distribution of eastside grassland habitats.

Structure. This habitat is dominated by short to medium-tall grasses (<3.3 ft 1 m)(Figure 2.25). Total herbaceous cover can be closed to only sparsely vegetated (Crawford and Kagan 2004). In general, this habitat is an open and irregular arrangement of grass clumps rather than a continuous sod cover. These medium-tall grasslands often have scattered and diverse patches of low shrubs, but few or no medium-tall shrubs (<10% cover of shrubs are taller than the grass layer). Native forbs may contribute significant cover or they may be absent. Grasslands in canyons are dominated by bunchgrasses growing in lower densities than on deep-soil prairie sites. The soil surface between perennial plants can be covered with a diverse cryptogamic or microbiotic layer of mosses, lichens, and various soil bacteria and algae. Moister environments can support a dense sod of rhizomatous perennial grasses. Annual plants are a common spring and early summer feature of this habitat.

Natural Disturbance Regime. The fire-return interval for sagebrush and bunchgrass is estimated at 25 years 22. The native bunchgrass habitat apparently lacked extensive herds of large grazing and browsing animals until the late 1800's. Burrowing animals and their predators likely played important roles in creating small-scale patch patterns.

Succession and Stand Dynamics. Currently fires burn less frequently in the Palouse grasslands than historically because of fire suppression, roads, and conversions to croplan. Without fire, black hawthorn shrubland patches expand on slopes along with common snowberry and rose. Fires covering large areas of shrub-steppe habitat can eliminate shrubs and their seed sources and create eastside grassland habitat. Fires that follow heavy grazing or repeated early season fires can result in annual grasslands of cheatgrass, medusahead, knapweed, or yellow star-thistle. Annual exotic grasslands are common in dry grasslands and are included in modified grasslands as part of the Agriculture habitat.

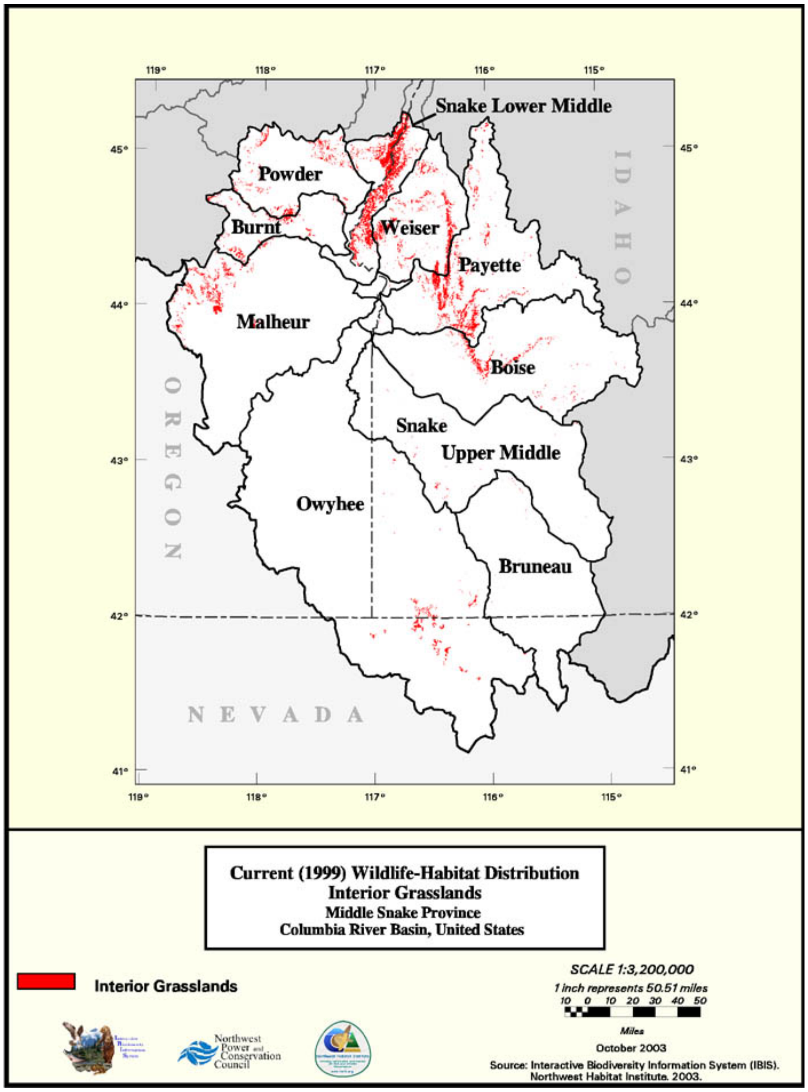


Figure 2.19. Current wildlife-habitat distribution interior grasslands (Source: nwhi.org/ibis).

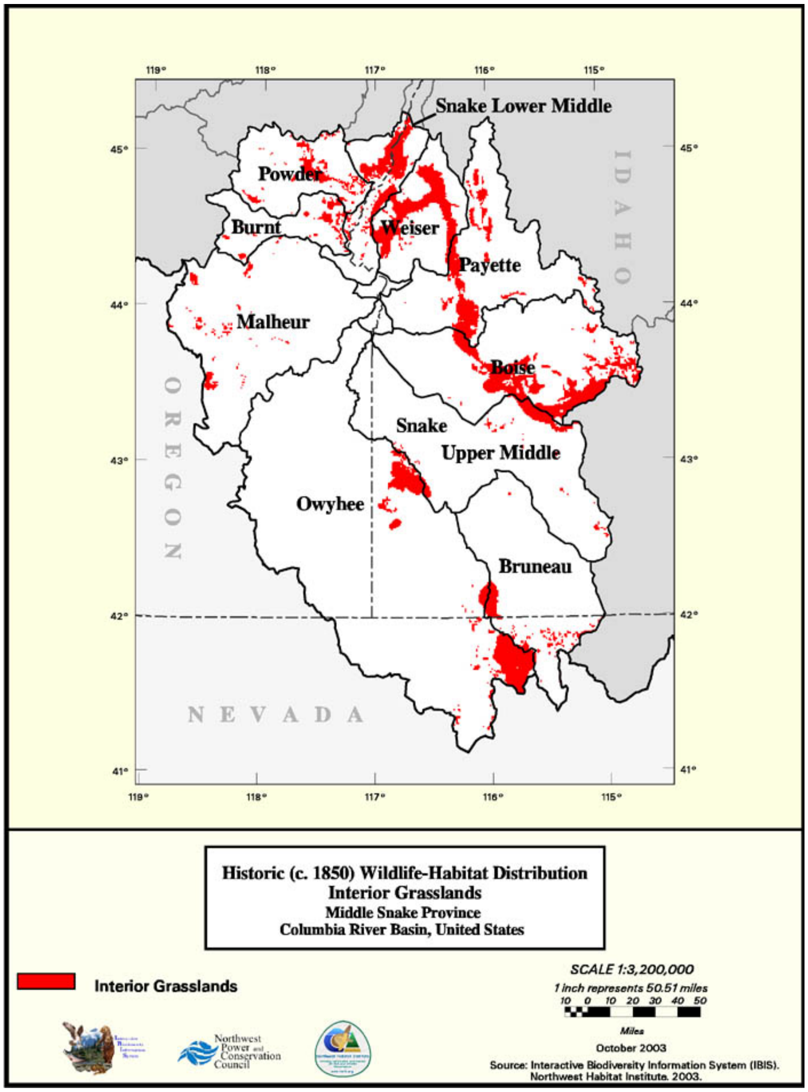


Figure 2.20. Historic wildlife-habitat distribution interior grasslands (Source: nwhi.org/ibis).

Effects of Management and Anthropogenic Impacts. Large expanses of grasslands are currently used for livestock ranching (Crawford and Kagan 2004). Deep soil Palouse sites are mostly converted to agriculture. Drier grasslands and canyon grasslands, those with shallower soils, steeper topography, or hotter, drier environments, were more intensively grazed and for longer periods than were deep-soil grasslands. Evidently, these drier native bunchgrass grasslands changed irreversibly to persistent annual grass and forblands. Some annual grassland, native bunchgrass, and shrub-steppe habitats were converted to intermediate wheatgrass, or more commonly, crested wheatgrass (Agropyron cristatum)-dominated areas. Apparently, these form persistent grasslands and are included as modified grasslands in the Agriculture habitat. With intense livestock use, some riparian bottomlands become dominated by non-native grasses. Many native dropseed grasslands have been submerged by dam reservoirs.

2.2.1.8 Canyon / Gorge[3]

Violent geological forces first molded this landscape about 14 million years ago. The shifting Yellowstone hot spot first erupted in the area where Idaho, Oregon and Nevada meet, spewing gigantic clouds of volcanic ash into the air. When these superheated billows of ash reached the ground, they cooled into masses of welded rhyolitic tuffs characteristic of the Owyhee region (source: http://www.sierraclub.org/owyhee).

Shifting slowly northeast, the rhyolite caldera blew again, about 11 million years ago, in the Bruneau region, belching more molten rhyolite and leaving basalt shield volcanoes (source: http://www.sierraclub.org/owyhee). Later, massive Lake Idaho began to form, flooding the volcanic crescent of the Snake River Plain. As time passed, the climate grew moist and cool; plants and animals, some long-extinct like the saber-toothed tiger and the scimitar-toothed cat, flourished in and around this series of ancient lakes just north of the eruptions. The fossils of these creatures are still visible in a series of extraordinary exposed strata found only in the Owyhee-Bruneau Canyonlands.

Nearly a million years ago in a prolonged flood, Lake Idaho drained out Hells Canyon, and, as the water level dropped, the mouths of the Owyhee, Bruneau, and Jarbidge Rivers and their tributaries began to erode headwards, carving a fantastic labyrinth of canyons in the thick layers of igneous deposits (source: http://www.sierraclub.org/owyhee). These gargantuan natural forces left a network of exposed rhyolitic formations found nowhere else in the world, and molded the fantastic topography of the Owyhee-Bruneau Canyonlands. Just 3,000 years ago, the climate began to grow warmer and drier, and the surrounding flora and fauna in turn changed and adapted, until the present-day high desert ecosystem developed in the remnants of massive volcanic and climatic changes.

Today, in this desert is defined by rivers, expansive reaches of sage steppe, lush riparian pockets, ancient juniper woodlands, and intermittent drainages. The canyon/gorge habitat supports rare, endemic, and diverse populations of flora and fauna including sage grouse, California bighorn sheep, spotted bats, Columbia spotted frogs, red band trout, rattlesnake stickseed, Davis's peppergrass, and the unique papposa sagebrush (source: http://www.sierraclub.org/owyhee). The prevailing sagebrush steppe supports a network of thriving biotic communities. Pronghorn antelope, gray fly-catchers, mule deer, loggerhead shrikes, ferruginous hawks, pygmy rabbits, and scores of other birds, mammals, reptiles, and invertebrates utilize the forage and cover of the sagebrush landscape.

This diversity of biological life is linked to the health of the Owyhee as a dynamic ecosystem, in which all the fish & wildlife species rely on the streams, riparian oases, and sage-related terrestrial communities to provide necessary habitat and food. The Owyhee syatem has been identified by the Interior Columbia Basin Ecosystem Management Project (ICBEMP) as one of only three regions in the entire basin with high range

[3] The information in this section is derived primarily from the Canyonlands description from the Sierra Club website (source: http://www.sierraclub.org/owyhee/natural_history.asp).

integrity, the Owyhee is the largest and one of the last remaining examples of the flourishing sage steppe that once covered the Columbia Plateau. It provides the expansive habitat that these species and natural processes need to survive in one of the most rapidly growing and changing sectors of the West.

The Owyhee Canyonlands also incorporate a rich cultural resource where people have long joined in a close-linked relationship between water, land and life. The canyons run through some of the richest archaeological and cultural sites in the country, a place inhabited for thousands of years by the ancestors of the Shoshone and Northern Paiute Tribes and bands, and still an essential and sacred landscape for native Tribal peoples.

2.2.2 Focal Species

Determining focal species for an ecoprovince/subbasin, planners should consider the following criteria (Ibis 2004):

- Threatened, endangered, and state sensitive species.
- Species listed in the Partners in Flight program.
- Species used to model impacts from adjacent hydro-development under the USFWS Habitat Evaluation Procedure (HEP Species).
- Managed Species (i.e. game species).
- Functional specialist and critically linked species (These are species that represent the only species performing a few functions or filling a critical functional role in a given analysis area).
- Species with an association to salmonids.

Although certain wildlife species were selected as “focal species” for specific habitat types, most of these species frequently occur in many other habitat types in the Owyhee Subbasin. Many terrestrial wildlife species migrate during the year, and some species occur predominately in a given habitat type during a specific season. The following list of “focal species” for the Owyhee Subbasin indicates the number of habitats – where the species is present, generally associated, or closely associated – as determined from the Northwest Habitat Institute’s www.Ibis data base.

Number of Habitats:	Present	Generally Associated	Generally Associated	Total Number
Rocky Mountain elk	2	4	--	6
Mule deer	--	8	--	8
Sage grouse	2	1	4	7
Golden eagle	7	7	--	14
Pronghorn antelope	2	2	4	8
Columbia spotted frog	--	9	3	12
American Beaver	4	3	3	10
Yellow Warbler	--	1	1	2

Bald eagle	4	6	1	11
White-faced ibis	--	3	1	4
California quail	--	7	--	7
Grasshopper sparrow	--	2	2	4
California Bighorn sheep	3	1	2	6
Peregrine falcon	3	13	--	16

Table 2.5. Focal species selected by the Owyhee Subbasin Planning group for specific habitat types (shaded yellow). The extent of the species common distribution is indicated by "X"s across the range of habitat types listed in the table.

Focal Species	Habitat Type for Focal Species (shaded yellow; see Table 2.4.key for full name)						
	Aspen	Conifer	Juniper	Shrub	Wet	Ag.	Grass	Canyon
Rocky Mountain elk		X (summer)		X (Sum/ fall)	X	X	X (Sum/ fall)	
Mule deer	X	X	X	X	X	X	X	X
Sage grouse			X	X	X	X	X	X
Golden eagle	X	X	X	X	X	X	X	X
Pronghorn antelope				X			X	
Columbia spotted frog	X	X	X	X	X	X	X	
American Beaver					X			
Yellow Warbler					X			
Bald eagle					X			
White-faced ibis					X			
California quail						X		
Grasshopper sparrow							X	
California Bighorn sheep								X
Peregrine falcon	X	X	X	X	X	X	X	X

Table 2.5.Key:
Conifer= Mixed Conifer Forests (pine, fir)
Juniper= Old Growth western juniper and mountain mahogany woodlands
Shrub= Shrub-steppe Our "shrub-steppe designation includes sagebrush steppe and salt-scrub shrublands.
Wet= Riparian and wetlands
Ag.= Agricultural Lands
Grass= Grasslands
Canyon= Canyon / Gorge

2.2.2.1 Rocky Mountain elk[4]

Focal Habitat – Species Box
Pine/Fir/Mixed Conifer Forests
Rocky Mountain elk

Rocky Mountain elk are a common game species associated with forested habitats in the foothills and mountainous areas of the Owyhee Subbasin (Image 2.9). Elk were an important source of food for Native Americans.

Image 2.9. Rocky Mountain elk; photo credits Stan Osolinski.

Elk occur in six habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.6); Elk are present in two habitats;

- Alpine Grasslands and Shrublands
- Urban and Mixed Environments

And generally associated with the following four habitats;

- Montane Mixed Conifer Forest

[4] This species account is based in part on a draft by Paul Ashley and Stacy Stovall. (2004). Rocky mountain elk. Southeast Washington Ecoregional Assessment., January 2004

- Agriculture, Pastures, and Mixed Environs
- Herbaceous Wetlands
- Montane Coniferous Wetlands

Table 2.6. Elk (Cervus elaphus) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Feeds and Breeds	High	Genetic ecotone for Roosevelt and Rocky Mountain elk; generally summer use only.
Alpine Grasslands and Shrublands	Present	Feeds and Breeds	High	Summer and fall only.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Urban and Mixed Environs	Present	Feeds and Breeds	High	none
Herbaceous Wetlands	Generally Associated	Feeds	High	none
Montane Coniferous Wetlands	Generally Associated	Feeds and Breeds	High	none
Total Habitat Associations with Elk:	6			

The vegetative communities are a mixture of forests and bunch-grasses on the ridges. The lowlands comprise mostly agricultural crops and range land. This combination of habitats is very attractive to elk.

Elk are highly adaptable animals, occupying variable habitats throughout western North American, from deserts in some areas to mountains at over 10,000 feet in elevation. As with most species, elk require food, water, and cover. Thomas (1979) defined various habitat components and how they should be managed to maximize elk use. Optimum elk habitat is arranged in such a way that forage and cover receive the maximum proper use of the maximum possible area (forage/cover ratio). In optimum habitat, cover/forage ratios should be arranged in such a way that elk make maximum use of the area in an efficient manner.

Optimum elk habitat consists of a forage cover ratio of 60% forage area and 40% cover (Thomas et al. 1979). Cover quality is defined in two ways; satisfactory and marginal. 40% stands of coniferous trees that are > 40 feet tall, with a canopy closure of > 70%. Marginal cover is defined as coniferous trees > 10 feet tall with a canopy closure of >

40%. Cover provides protection from weather and predators. Forage areas are all areas that do not fall into the definition of cover. Optimal elk use of forage areas occurs within 600 feet of cover areas (Reynolds 1962; Harper 1969; Kirsch 1962; Hershey and Leege 1976; Pedersen 1974; Leckenby 1984).Proper spacing of forage and cover areas is very important in order to maximize use of these areas by elk (Thomas et al. 1979).

Limiting Factors Affecting Elk Population Status
Recent studies (Myers et al. 1999) have documented how road densities, forage: cover ratios, stand composition, amount of edge, and opening size influence seasonal elk use. Elk face problems from high road densities, and habitat deterioration from long term fire suppression and past logging practices. Many habitat improvement projects have been developed and completed. Other projects have attempted to reduce elk damage on private lands.

2.2.2.2 Mule deer[5]

Focal Habitat – Species Box
Old Growth western juniper and mountain mahogany woodlands
Mule deer

Image 2.10. Mule deer in sagebrush habitat; photo credits Marinel Miklja.

[5] This species account is based in part on a draft by Paul Ashley and Stacey Stovall (2004) Mule Deer. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment. Appendix F: Focal Species Accounts. February, 2004.

Mule deer have been an important member of the Owyhee Subbasin for Native Americans prior to settlement by Euro-Americans. Today mule deer remain an important component of the landscape, providing recreational opportunities for hunters and wildlife watchers. Mule deer range throughout the Owyhee Subbasin, occupying various habitats from coniferous forest to the farmlands and shrub steppe/grassland habitats.

Mule deer occupy a variety of cover types across the Owyhee Subbasin. Consequently, habitat requirements vary with vegetative and landscape components contained within each herd range. Forested habitats provide mule deer with forage as well as snow intercept, thermal, and escape cover. Mule deer occupying mountain-foothill habitats live within a broad range of elevations, climates, and topography which includes a wide range of vegetation; many of the deer using these habitats are migratory. Mule deer are found in the deep canyon complexes along the major rivers and in the channeled scablands of the Owyhee Subbasin; these areas are dominated by native bunch grasses or shrub-steppe vegetation. Habitats that were historically shrub step and are currently utilized for agriculture likely enable the land to support higher number of mule deer.

The Mule Deer occurs in eight habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.7); Mule Deer are generally associated with the following eight habitats;

- Montane Mixed Conifer Forest
- Interior Mixed Conifer Forest
- Alpine Grasslands and Shrublands
- Agriculture, Pastures, and Mixed Environs
- Urban and Mixed Environs
- Herbaceous Wetlands
- Montane Coniferous Wetlands
- Interior Riparian-Wetlands

Table 2.7. Mule Deer (Odocoileus hemionus) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Feeds and Breeds	High	none
Interior Mixed Conifer Forest	Generally Associated	Feeds and Breeds	High	none
Alpine Grasslands and Shrublands	Generally Associated	Feeds and Breeds	High	none
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Urban and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Herbaceous Wetlands	Generally Associated	Feeds	High	none
Montane Coniferous Wetlands	Generally Associated	Feeds and Breeds	High	none
Interior Riparian-Wetlands	Generally Associated	Feeds and Breeds	High	none

Mule deer diets are as varied as the landscapes they inhabit. (Kufeld et. al. 1973) have identified 788 plant species that have been eaten by mule deer; this list includes 202 trees and shrubs, 484 forbs, and 84 grasses, rushes, and sedges. Diets vary by season, age, and sex. Mule deer utilize agriculture land resources for forage. The Mule deer population increased after livestock grazing cattle ate Bitterbrush buck (Jerry Hoagland; personal correspondent; 2004).

Mule deer are distributed throughout the Owyhee Subbasin, from higher elevations (6000 ft.) in the mountains, to the lowland farming areas.

Limiting Factors Affecting Mule Deer Population Status: Population numbers need to be substantiated.

Some of the limiting factors affecting mule deer include competition by other ungulates, drought, fire, over-harvest by hunters, predation, disease and parasites.

2.2.2.3 Sage grouse[6]

Focal Habitat – Species Box
Shrub-steppe (including sagebrush steppe and salt-scrub shrublands)
Sage Grouse

[6] This species account is based in part from a draft written by Tim Dykstra, Shoshone-Paiute Tribes with input from Keith Paul, US Fish & Wildlife Service (April 2004); and in part from Nevada Partners in Flight; Bird Conservation Plan; Edited by Larry A. Neel; November 29, 1999.

Golden Eagle
Pronghorn Antelope

Image 2.11. Sage grouse; photo credits Herbert Clarke.

The sage grouse is North America's largest grouse, a characteristic feature of habitats dominated by big sagebrush (Artemisia tridentate) in Western North America (Schroeder et al. 1999). The first written accounts of this species were based on observations by the Lewis and Clark expedition in 1805, when the species was widespread in the West (Schroeder et al. 1999). Sage grouse were an important game species for Native Americans and European settlers and continue to be valued for hunting and food (Storch 2000). Because of the stunning display of sage grouse on their strutting grounds, they have become popular with naturalists and bird watchers.

Due to loss, fragmentation, and degradation of greater sage grouse habitat and large reductions of their population, seven petitions have been submitted to the U.S. Fish and Wildlife Service (Service) requesting listing of distinct populations and the entire species, collectively. The Service determined that there was not significant information available to classify the greater sage grouse into two distinct population segments (the western and eastern subspecies of sage grouse). In a recent news release dated April 15, 2004, the Service announced its completion of evaluating three petitions to list the greater sage grouse rangewide as either threatened or endangered. The Service has determined that the petitions and other available information provide substantial biological information indicating that further review of the status of the species is warranted. This status review will determine whether the greater sage grouse warrants listing as a threatened or endangered species.

Concern about long-term declines in sage grouse populations has prompted western State wildlife agencies and Federal agencies such as the Bureau of Land Management (BLM), U.S. Forest Service, and the Service to engage in a variety of cooperative efforts aimed at conserving and managing sagebrush habitat for the benefit of sage grouse and other sagebrush-dependent species.

The sage grouse occurs in seven habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.8). Sage grouse are closely associated with four habitat types in the Owyhee Subbasin:

- Interior Grasslands
- Shrub-steppe
- Dwarf Shrub-steppe
- Desert Playa and Salt Scrub Shrublands

Table 2.8. Sage Grouse (Centrocercus urophasianus) association with all habitats occurring in the OWYHEE Subbasin: (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Western Juniper and Mountain Mahogany Woodlands	Present	Feeds and Breeds	High	none
Interior Canyon Shrublands	Present	Feeds and Breeds	High	none
Interior Grasslands	Closely Associated	Feeds and Breeds	High	none
Shrub-steppe	Closely Associated	Feeds and Breeds	High	Sagebrush obligate species.
Dwarf Shrub-steppe	Closely Associated	Feeds and Breeds	High	Potentially critical early brooding habitat; sagebrush obligate species.
Desert Playa and Salt Scrub Shrublands	Closely Associated	Feeds and Breeds	High	Desert playa, not the salt scrub shrublands, is the critical post brood-rearing habitat.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds and Breeds	High	Uses Conservation Reserve Program (CRP) lands within this habitat; usually uses this habitat only in close proximity to shrub steppe habitat (1- 2 km).
Total Habitat Associations with Sage Grouse:	7			

Description

Adult male sage grouse has fuscous upperparts, profusely marked with drab gray and white; tail long and pointed; primaries plain brown; chin and throat sepia (blackish); sides of neck, breast, and upper belly whitish and slightly distended, forming a ruff; belly and undertail-coverts sepia, with large white spots on tips of undertail-coverts; thighs buff (Schroeder et al. 1999). Head has yellow fleshy comb above eye, and long filoplumes that arise from back of the neck (Schroeder et al. 1999). During courtship displays, tail fanned and breast distended, exposing two yellow ocher patches of bare skin (cervical apteria) on lower throat and breast (Schroeder et al. 1999). These apteria briefly exposed during the display, appearing as round balloons. The adult female is similar to the male but smaller and has fuscous feathers, marked with drab gray and white on head and breast, creating a more cryptic appearance overall than in male (Schroeder et al. 1999). Female also lacks cervical apteria and has smaller comb over eye than male (Schroeder et al. 1999).

Life History

Diet

Sagebrush dominates diet during late autumn, winter, and early spring (Girard 1937, Rasmussen and Griner 1938, Bean 1941, Batterson and Morse 1948, Patterson 1952, Leach and Hensley 1954, Barber 1968, Wallestad et al. 1975, Schroeder et al. 1999). Sage grouse eat numerous species of sagebrush, including big, low (*Artemisia arbuscula*), silver (*Artemisia cana*), and fringed (*Artemisia fridida*) (Remington and Braun 1985, Welch et al. 1988, 1991, Myers 1992, Schroeder et al. 1999). Insects are an important component of the juvenile diet, especially during the first three weeks of life; after which forbs increase in importance as juveniles age (Patterson 1952, Trueblood 1954, Klebenow and Gray 1968, Savage 1968, Peterson 1970, Johnson and Boyce 1990, Drut et al. 1994, Pyle and Crawford 1996, Schroeder et al. 1999). Although insects are also eaten by adults during spring and summer, forbs and sagebrush dominate their diet (Rasmussen and Griner 1938, Moos 1941, Knowlton and Thornley 1942, Patterson 1952, Leach and Hensley 1954, Schroeder et al. 1999).

Reproduction

The breeding of sage grouse begins in mid-March when the males start to congregate on the leks (BLM et al. 2000). Females come to the leks to mate and generally nest in the vicinity (BLM et al. 2000). Nesting rates vary from year to year and from area to area (Bergerud 1988, Coggins 1998, Connelly et al 1993, Gregg 1991, and Schroeder 1997). This variation is most likely a result of the quality of available nutrition and the general health of pre-laying females (Barnett and Crawford 1994). At least 70% of the females in a population will initiate a nest each year, with higher nest initiation rate recorded during years of higher precipitation in comparison to periods of drought (Coggins 1998). Renesting rates by females who have lost their first clutch are 10 to 40 % (Bergerud 1988, Connelly et al. 1993, Eng 1963, Patterson 1952, and Petersen 1980). Clutch size per nest normally ranges from seven to ten eggs (Connelly unpub., Schroeder 1997, Wakkinen 1990, BLM et al. 2000).

Breeding Territory/Home Range

Adult males are highly territorial on leks, actively defending areas of 53.8-1076 ft^2 (5-100 m^2) (Simon 1940, Patterson 1952, Dalke et al 1960, Hartzler 1972, Wiley 1973, Gibson and Bradbury 1987, Schroeder et al. 1999). Yearling males rarely defend territories or breed, although they are physiologically capable of breeding (Eng 1963). Leks vary from 1 to 16 ha in size because of number of males attending lek and topography of lek site (Scott 1942, Patterson 1952, Wiley 1973, Schroeder et al. 1999). Male sage grouse are not territorial off leks (Schroeder et al. 1999). Home range for sage grouse may exceed 579 mi^2 (1,500 km^2) (Connelly, unpub. data, cited in BLM et al. 2000). Sage grouse may have two or more seasonal ranges including a breeding range, a brood-rearing range, and a winter range (BLM et al. 2000).

Migration/Overwintering

Sage grouse populations can be migratory or non-migratory (Beck 1975, Berry and Eng 1985, Connelly et al 1988, Fischer 1994, Wakkinen 1990, and Wallestad 1975, BLM et al. 2000), depending on location and associated land form. Where topographic relief allows, sage grouse generally move to higher elevations from spring through fall as snow melts and plant growth advances (BLM et al. 2000). Non-migratory populations may spend the entire year within an area of 38.61 mi² (100 km²) or less in size (BLM et al. 2000). In migratory populations, seasonal movements may exceed 46.5 mi (75 km) (Connelly et al. 1998, Dalke et al. 1963, BLM et al. 2000).

Survivorship

Annual survival rates for yearling and adult sage grouse vary from 35 to 85 percent for females, and from 38 to 54 percent for males (Connelly et al. 1994, Wallestad 1975, and Zablan 1993, BLM et al. 2000). Lower survival rates for males may be related to the higher predation rates on males during the lekking season (Swensen 1986). Sage grouse tend to live longer than other upland gamebird species; individual birds four to five years old are common (BLM et al. 2000).

Mortality

Predation on eggs and birds is the primary cause of mortality (Schroeder et al. 1999). Other causes of mortality include human disturbance, livestock, farm machinery, moving vehicles, electric or telephone wires, fences, pesticides, fire flood, drought, sun exposure, heavy rain, and cold (Borell 1939, Bean 1941, Batterson and Morse 1948, Patterson 1952, Dalke et al. 1963, Rogers 1964, Wallestad 1975, Barber 1991, Schroeder et al. 1999).

Habitat Requirements

Breeding

Breeding grounds are centered on and within the vicinity of leks. The some lek sites are used from year to year. They are established in open areas surrounded by sagebrush, which is used for escape and protection from predators (Gill 1965, Patterson 1952, BLM et al. 2000). Examples of lek sites include landing strips, old lake beds or playas, low sagebrush flats, openings on ridges, roads, crop land, and burned areas (Connelly et al. 1981, Gates 1985, BLM et al. 2000). The lek is considered the center of year-round activity for resident grouse populations (Eng and Schladweiler 1972, Wallestad and Pyrah 1974, Wallestad and Schladweiler 1974). On the average, most nests are located within 4 miles (6.2 km) of the lek; however some females or hens may nest more than 12 miles (20 km) away from the lek (Autenrieth 1981, Fischer 1994, Hanf et al. 1994, Wakkinen et al. 1992, BLM et al. 2000). Most sage grouse nests are located under sagebrush plants (Gill 1965, Gray 1967, Patterson 1952, Schroeder et al. 1999, Wallestad and Pyrah 1974, BLM et al. 2000). Optimum sage grouse nesting habitat consists of the following: sagebrush stands containing plants 16 to 32 inches (40 to 80 cm) tall with a canopy cover ranging from 15 to 25 percent and an herbaceous understory of at least 15 percent grass canopy cover and 10 percent forb canopy cover that is at least 7 inches (18 cm) tall (BLM et al. 2000). Ideally, these vegetative conditions should be on 80 percent of the breeding habitat for any given population of sage grouse (BLM 2000).

Non-breeding

Sage grouse winter habitats are relatively similar throughout most of their ranges. Because their winter diet consists almost exclusively of sagebrush, winter habitats must provide adequate amounts of sagebrush (BLM et al. 2000). Sagebrush canopy can be highly variable (Beck 1977, Eng and Schladweiler 1972, Patterson 1952, Robertson 1991, Wallestad et al. 1975, BLM et al. 2000). Sage grouse tend to select areas with both high canopy and taller Wyoming big sagebrush (*A. t. wyomingensis*) and feed on plants highest in protein content (Remington and Braun 1985, Robertson 1991, BLM et al 2000). It is critical that sagebrush be exposed at least 10 to 12 inches (25 to 30 cm) above snow level to provide food and cover for wintering sage grouse (Hupp and Braun 1989, BLM et al. 2000). If snow covers the sagebrush, the birds move to areas where sagebrush is exposed. Therefore, good wintering habitat consists of sagebrush with 10 to 30 percent canopy cover on 80 percent of the wintering area (BLM et al. 2000).

Population and Distribution

Distribution

Historic Distribution

Historically, sage grouse occurred in at least 16 states and three Canadian provinces. Since then, sage grouse have been extirpated from British Columbia, Arizona, Utah, Montana, New Mexico, Colorado, Wyoming, Alberta, Oklahoma, Kansas, Nebraska, South Dakota, North Dakota, and Nebraska (Connelly and Braun 1997, Braun 1998, Schroeder et al. 1999). It is unclear whether birds in Oklahoma and Kansas represented a distinct population (Schroeder et al. 1999). Historically, it is estimated that 220 million acres (81 million ha) of sagebrush-steppe vegetation types existed in North America (McArthur and Ott 1996), making it one of the most widespread habitats in the country (BLM et al. 2000). However, much of this habitat has been lost or degraded over the last 100 years (BLM et al. 2000).

Current Distribution

Currently, in states and provinces that still have sage grouse, their range has been reduced. Declines in distribution have been noted throughout the twentieth century (Hornaday 1916, Locke 1932, McClanahan 1940, Aldrich and Duvall 1955, Connelly and Braun 1997, Schroeder et al. 1999). Within the Interior Columbia River Basin, sagebrush habitat has been reduced from about 40 million acres (16 million ha) to 26 million acres (11 million ha), representing a loss of about 35% since the early 1900's (Hann et al. 1997, BLM et al. 2000). Most remaining sagebrush-steppe ecosystems in Oregon are on public lands managed by the Bureau of Land Management (BLM) (BLM et al. 2000).

Objectives and Strategies

Objectives and strategies for Sage Grouse conservation are presently being formulated by the Western States Sage Grouse Committee. Rather than try to set its own objectives, the Nevada Working Group will wait for the completion of the Sage Grouse Committee product and incorporate its recommendations into the framework of its restoration plan.

Objectives and Strategies for Sage Grouse:
http://www.blm.gov/nhp/spotlight/sage_grouse/draft_sage_grouse_strategy.pdf
DRAFT BLM Sage-Grouse Habitat Conservation Strategy
A U.S. Forest Service report on the life history of the sage grouse is available at:
http://www.srs.fs.usda.gov/pubs/gtr/gtr_pnw187.pdf

2.2.2.4 Golden eagle[7]

Focal Habitat – Species Box
Shrub-steppe (including sagebrush steppe and salt-scrub shrublands)
Sage Grouse
Golden Eagle
Pronghorn Antelope

Image 2.12. Golden eagle; photo credits Dale and Marian Zimmerman.

The golden eagle is the largest soaring raptor found within the Owyhee subbasin. They inhabit open country and mountainous terrain. The golden eagle was a powerful and skillful hunter.

[7] This species account is based in part on a draft by Keith Paul, U.S. Fish & Wildlife Service, 4-14-2004.

The golden eagle has long, broad wings and rounded tails which enable them to soar effortless for long periods of time on flat or slightly up-tilted wings. Their wingspan will reach 6-7 feet (2 m) and they will have a length of 30-40 inches (76-102 cm) (BLM 2004). They typically weigh about 7-14 pounds (3.2-6.4 kg) (NYSDEC 2003). Golden eagles have a dark brown body and get their name from the "golden" colored feathers on the back of their head and upper neck. The eyes and beak are dark. The legs are completely feathered to the toes. As with most raptors, the females are noticeably larger than the males. Immature goldens have a patch of white on the tail with a broad black band at the end. The adult tail is gray and brown (BLM 2004).

The sexes are similar, and in flight, the adults are essentially all dark with no light markings. The juveniles, immatures, and sub-adults resemble the adults in their dark plumage, but have white at the base of the primaries and the base of the tail (BLM 2004).

The golden eagle occurs in fourteen habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.9); Golden eagles are more generally associated with the following seven habitats:

- Western Juniper and Mountain Mahogany Woodlands
- Interior Canyon Shrublands
- Interior Grasslands
- Shrub-steppe
- Dwarf Shrub-steppe
- Agriculture, Pastures, and Mixed Environs
- Interior Riparian-Wetlands

Table 2.9. Golden Eagle (Aquila chrysaetos) association with all habitats occurring in the OWYHEE Subbasin: (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Present	Feeds and Breeds	High	Needs cliffs for nesting.
Interior Mixed Conifer Forest	Present	Feeds and Breeds	High	Needs cliffs for nesting.
Upland Aspen Forest	Present	Feeds	Low	none
Alpine Grasslands and Shrublands	Present	Feeds	Moderate	none
Western Juniper and Mountain Mahogany Woodlands	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Interior Canyon Shrublands	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Interior Grasslands	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Shrub-steppe	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Dwarf Shrub-steppe	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Desert Playa and Salt Scrub Shrublands	Present	Feeds	High	none
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds	High	none
Open Water - Lakes, Rivers, and Streams	Present	Feeds	High	none
Herbaceous Wetlands	Present	Feeds	High	none
Interior Riparian-Wetlands	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Total Habitat Associations with Golden Eagle:	14			

Regardless of the habitat type it lives in, cliff nesting is key habitat feature required by the golden eagle for reproduction.

Diet

On average, an adult golden eagle consumes eight to 12 ounces (227 to 340 grams) of food per day throughout the year. Consumption is not likely to be consistent each day, with periods of gorging versus fasting, depending upon availability of prey. Winter consumption is likely greater than summer consumption (BLM 2004).

Principle foods of golden eagles include rodents, hares, and rabbits. The mammalian component of eagle diets as noted form many studies, varies from 70-97 percent, with birds variably being another major component (BLM 2004). A review of North American literature by the BLM (2004) revealed that 52 species of mammals, 48 birds, five reptiles, and two fishes have been recorded in the diets of the golden eagle. Insects, such as the Mormon cricket, are also documented as a prey item (BLM 2004). Throughout most of the Great Basin, black-tailed jackrabbits are the main prey item and numerous studies have correlated eagle production with jackrabbit abundance (Olendorff 1976; Kochert 1980; Thompson et al.; 1982, Carey 2003).

Much has been written about golden eagle attacks on domestic livestock. It is noted that while depredation does occur on occasion, the amount of depredation depends upon the availability of natural food supply, ranching practices, weather, and a variety of other factors (BLM 2004).

Habitat Requirements

Breeding/Foraging
Golden eagles generally prefer open country, usually avoiding extensive areas of coniferous forests. They are commonly found in arid, sloping valleysides, benchlands or flatlands cut by canyons, gullies or rock outcrops, tundra, alpine country, deserts, southern coastal areas, eastern bogs, logged openings, grasslands, and early seral stages of forested lands (BLM 2004). In the Great Basin, golden eagles are usually found in shrub-steppe, grassland, juniper, open ponderosa pine, and mixed conifer/deciduous habitats (Carey 2003). Nests are often found on cliffs with ledges or less commonly in large trees (BLM 2004). They forage in a variety of habitat types and successional stages, preferring areas with an open shrub component that provides food and cover for prey (Carey 2003). Foraging areas may also be characterized by broken terrain that is subjected to varied air currents that provide lift to the eagles (BLM 2004).

Non-breeding/Foraging
For resident golden eagles, non-breeding habitat will typically be the same as breeding habitat with a focus on foraging sites. Migrating eagles tend to use mountain ridges in order to benefit from drafts and other air currents to aid in migration (BLM 2004). Migrating eagles prefer the arid, shrub-steppe habitat for wintering in mid-western and western states (BLM 2004).

Continuing Threat
Golden eagles are extremely susceptible to human disturbance which has been a major factor to nesting failures (BLM 2004). Another major threat to the golden eagle is the loss of shrub steppe habitat. Factors affecting shrub steppe habitat include the actual loss of shrub steppe to agriculture and urbanization, degradation from excessive grazing, and an ever increasing threat from wildfire. In the Great Basin, the loss of shrub steppe habitat has lead to a decrease in the golden eagles main prey, the black-tailed jackrabbit. Electrocution still posses a threat to eagles, but power companies have increasingly been

taking actions to modify power line design to eliminate electrocution as a source of mortality.

2.2.2.5 Pronghorn antelope

Focal Habitat – Species Box
Shrub-steppe (including sagebrush steppe and salt-scrub shrublands)
Sage Grouse
Golden Eagle
Pronghorn Antelope

Image 2.13. Pronghorn antelope; photo credits Michael Durham.

The body is distinctly marked with white on the underside and rump. When alarmed, the guard hairs on the white rump patch are extended vertically, making the white rump patch visible for great distances. The back is brown with shades of cinnamon and the males have a black cheek patch, muzzle and forehead. This dark mask is much less pronounced in females.

The horns are made up of a bony inner core and an outer sheath, which is shed annually. Both sexes have horns but the female horns are rarely longer than two inches if present at all. The average male horns are approximately 12 inches in length and have a prominent prong on one of the two branches.

The Pronghorn Antelope occurs in eight habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.10).; The Pronghorn Antelope is closely associated with four of the habitat types in the Owyhee Subbasin:

- Interior Grasslands
- Shrub-steppe
- Dwarf Shrub-steppe
- Desert Playa and Salt Scrub Shrublands

Table 2.10. Pronghorn Antelope (Antilocapra americana) association with all habitats occurring in the OWYHEE Subbasin. (source: http://nwhi.org/ibis/subbasin/subs3.asp).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Interior Mixed Conifer Forest	Present	Feeds and Breeds	High	May use this habitat where it occurs in a matrix with preferred open habitat types.
Western Juniper and Mountain Mahogany Woodlands	Generally Associated	Feeds and Breeds	High	none
Interior Grasslands	Closely Associated	Feeds and Breeds	High	none
Shrub-steppe	Closely Associated	Feeds and Breeds	High	none
Dwarf Shrub-steppe	Closely Associated	Feeds and Breeds	High	none
Desert Playa and Salt Scrub Shrublands	Closely Associated	Feeds and Breeds	High	none
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Interior Riparian-Wetlands	Present	Feeds	Moderate	none
Total Habitat Associations with Pronghorn Antelope:	8			

HABITAT:

Pronghorn prefer gentle rolling to flat, wide-open topography. Low sagebrush and northern desert shrubs are the preferred vegetation types. Areas such as these with low understory allow antelope to see great distances and permit the animals to move quickly to avoid predators. In Oregon, this is a species of grasslands, sagebrush flats and shad scale-covered valleys of the central and southeastern part of the state. Low sagebrush is an important habitat component (Csuti et al. 1997)

RANGE:

In the Owyhee Subbasin this antelope species is restricted to Western North America (Csuti et al. 1997). Pronghorn antelope are found primarily in the valleys between mountain ranges. Development managers have helped antelope extend their range in the Owyhee Subbasin through numerous transplants and water developments.

FOOD HABITS:

Over 150 different species of grasses, forbs and browse plants are eaten by antelope, which allows them to occupy a variety of habitat types. Succulent plants and sprouts are preferred. Some of the main components of pronghorn diet in many locations include sagebrush, antelope bitterbrush, saltbrush, rabbitbrush, cheatgrass, indian rice grass, crested wheat grass, lambsquarter and shadscale.

STATUS:

Drought and climatic conditions affect populations in the short term, but generally, the basin wide population of pronghorn is increasing.
{From: http://ndow.org/wild/animals/facts/antelope.shtm}

2.2.2.6 Columbia spotted frog (Rana luteiventris) [8]

Focal Habitat – Species Box
Riparian and wetlands
Columbia Spotted Frog
American Beaver
Yellow Warbler
Bald Eagle
White-faced Ibis

[8] The spotted frog species account is based in part on a draft written by Keith Paul, USFWS (02-24-2004) for the Owyhee Subbasin Plan.

Image 2.14. Columbia spotted frog; photo credits William P. Leonard.

The Columbia Spotted Frog occurs in twelve habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.11). The Columbia spotted frog is closely associated with the following three habitats:

- Open Waters: Lakes, Rivers, and Streams
- Herbaceous Wetlands
- Interior Riparian-Wetlands

Table 2.11. Columbia Spotted Frog (Rana luteiventris) association with all habitats occurring in the OWYHEE Subbasin:

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Interior Mixed Conifer Forest	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Upland Aspen Forest	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Western Juniper and Mountain Mahogany Woodlands	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Interior Canyon Shrublands	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Interior Grasslands	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Shrub-steppe	Generally Associated	Feeds	Moderate	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds	Low	Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Open Water - Lakes, Rivers, and Streams	Closely Associated	Feeds and Breeds	Moderate	Rare or absent where predatory fish or bullfrogs occur. Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Herbaceous Wetlands	Closely Associated	Feeds and Breeds	High	Rare or absent where predatory fish or bullfrogs occur. Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.
Montane Coniferous Wetlands	Generally Associated	Feeds and Breeds	Moderate	Rare or absent where predatory fish or bullfrogs occur. Requires shallow water in wet meadows

				or stream/pond edges with abundant aquatic vegetation for breeding.
Interior Riparian-Wetlands	Closely Associated	Feeds and Breeds	High	Rare or absent where predatory fish or bullfrogs occur. Requires shallow water in wet meadows or stream/pond edges with abundant aquatic vegetation for breeding.

The following is a brief description of the three habitat types that the Columbia Spotted Frog is most closely associated with:

1. Herbaceous Wetlands
This habitat may be found on permanently or seasonally flooded wetlands. In general, this habitat is flat, usually with stream or river channels or open water present. Herbaceous wetlands are found in all terrestrial habitats except Subalpine Parkland, Alpine Grasslands, and Shrublands habitats (Crawford et al. nwhi.org/ibis 2004). Herbaceous wetland habitat is generally a mix of emergent herbaceous plants with a grass-like life form (graminoids). Various wetland communities are found in mosaics or in nearly pure stands of single species. Herbaceous cover varies from open to dense.

2. Open Water
There are 4 distinct zones within this aquatic system: (1) the littoral zone at the edge of lakes is the most productive with diverse aquatic beds and emergent wetlands (part of Herbaceous Wetland's habitat); (2) the limnetic zone is deep open water, dominated by phytoplankton and freshwater fish, and extends down to the limits of light penetration; (3) the profundal zone below the limnetic zone, devoid of plant life and dominated with detritivores; (4) and the benthic zone reflecting bottom soil and sediments. Nutrients from the profundal zone are recycled back to upper layers by the spring and fall turnover of the water. Water in temperate climates stratifies because of the changes in water density. The uppermost layer, the epilimnion, is where water is warmer (less dense). Next, the metalimnion or thermocline, is a narrow layer that prevents the mixing of the upper and lowermost layers. The lowest layer is the hypolimnion, with colder and most dense waters. During the fall turnover, the cooled upper layers are mixed with other layers through wind action. High desert streams of the interior are similar to those of the Willamette Valley but are shallower, with fewer pools, and more runs, glides, cobbles, boulders, and sand.

3. Interior Riparian-Wetlands

Riparian habitats appear along perennial and intermittent rivers and streams. This habitat also appears in impounded wetlands and along lakes and ponds. Their associated streams flow along low to high gradients. The riparian and wetland forests are usually in fairly narrow bands along the moving water that follows a corridor along montane or valley streams. The most typical stand is limited to 100-200 ft (31-61 m) from streams.

Columbia Spotted Frog Life History, Key Environmental Correlates, and Habitat Requirements

Life History

The Columbia spotted frog (CSF) is olive green to brown in color, with irregular black spots. They may have white, yellow, or salmon coloration on the underside of the belly and legs (Engle 2004). The hind legs are relatively short relative to body length and there is extensive webbing between the toes on the hind feet. The eyes are upturned (Amphibia Web 2004). Tadpoles are black when small, changing to a dark then light brown as they increase in size. CSFs are about one inch in body length at metamorphosis (Engle 2004). Females may grow to approximately 100 mm (4 inches) snout-to-vent length, while males may reach approximately 75 mm (3 inches) snout-vent length (Nussbaum et al. 1983; Stebbins 1985; Leonard et al. 1993).

Diet

The CSF eats a variety of food including arthropods (e.g., spiders, insects), earthworms and other invertebrate prey (Whitaker et al. 1982). Adult CSFs are opportunistic feeders and feed primarily on invertebrates (Nussbaum et al. 1983). Larval frogs feed on aquatic algae and vascular plants, and scavenged plant and animal materials (Morris and Tanner 1969).

Reproduction

The timing of breeding varies widely across the species range owing to differences in weather and climate, but the first visible activity begins in late winter or spring shortly after areas of ice-free water appear at breeding sites (Licht 1975; Turner 1958; Leonard et al 1996). Breeding typically occurs in late March or April, but at higher elevations, breeding may not occur until late May or early June (Amphibia Web 2004). Great Basin population CSFs emerge from wintering sites soon after breeding sites thaw (Engle 2001).

Adults exhibit a strong fidelity to breeding sites, with oviposition typically occurring in the same areas in successive years. Males arrive first, congregating around breeding sites, periodically vocalizing “advertisement calls” in a rapid series of 3-12 “tapping” notes that have little carrying power (Davidson 1995; Leonard et al. 1996). As a female enters the breeding area, she is approached by and subsequently pairs with a male in a nuptial embrace referred to as amplexus. From several hours to possibly days later, the female releases her complement of eggs into the water while the male, still clinging to the female, releases sperm upon the ova (Amphibia Web 2004). Breeding is explosive (as opposed to season-long), occurring only in the first few weeks following emergence (USFWS 2002a). After breeding is completed, adults often disperse into adjacent wetland, riverine and lacustrine habitats (Amphibia Web 2004).

CSF's have a strong tendency to lay their eggs communally and it is not uncommon to find 25 or more egg masses piled atop one another in the shallows (Amphibia Web 2004). Softball-sized egg masses are usually found in groups, typically along northeast edges of slack water amongst emergent vegetation (USFWS 2002a). After a few weeks thousands of small tadpoles emerge and cling to the remains of the gelatinous egg masses. Newly-hatched larvae remain clustered for several days before moving throughout their natal site (USFWS 2002a). In the Columbia Basin tadpoles may grow to 100 mm (4 in) total length prior to metamorphosing into froglets in their first summer or fall. At high-elevation montane sites, however, tadpoles barely reach 45 mm (1.77 in) in total length prior to the onset of metamorphosis in late fall (Amphibia Web 2004). As young-of-the-year transform, many leave their natal sites and can be found in nearby riparian corridors (USFWS 2002a).

Females may lay only one egg mass per year; yearly fluctuations in the sizes of egg masses are extreme (Utah Division of Wildlife Resources 1998). Successful egg production and the viability and metamorphosis of CSF's are susceptible to habitat variables such as temperature, depth, and pH of water, cover, and the presence/absence of predators (e.g., fishes ,snakes, birds and bullfrogs) (Morris and Tanner 1969; Munger et al. 1996; Reaser 1996).

Migration

David Pilliod observed movements of approximately 2,000 m (6,562 ft) linear distance within a basin in montane habitats (Reaser and Pilliod, in press). Pilliod et al. 1996 (in Koch et al. 1997) reported that individual high mountain lake populations of *R. luteiventris* in Idaho are actually interdependent and are part of a larger contiguous metapopulation that includes all the lakes in the basin. In Nevada, Reaser (1996; in Koch et al. 1997) determined that one individual of R. luteiventris traveled over 5 km (3.11 mi) in a year (NatureServe 2003).

In a three-year study of *R. luteiventris* movement within the Owyhee Mountain subpopulation of the Great Basin population in southwestern Idaho, Engle (2000) PIT-tagged over 1800 individuals but documented only five (of 468) recaptures over 1,000 m (3,281 ft) from their original capture point. All recaptures were along riparian corridors and the longest distance between capture points was 1,765 m (5,791). Although gender differences were observed, 88 percent of all movement documented was less than 300 m (984 ft) from the original capture point (NatureServe 2003).

Though movements exceeding 1 km (0.62 mi) and up 5 km (3.11 mi) have been recorded, these frogs generally stay in wetlands and along streams within 0.6 km (0.37 mi) of their breeding pond (Turner 1960, Hollenbeck 1974, Bull and Hayes 2001). Frogs in isolated ponds may not leave those sites (Bull and Hayes 2001) (NatureServe 2003).

In the Toiyabe Range in Nevada, Reaser (2000) captured 887 individuals over three years, with average mid-season density ranging from 2 to 24 frogs per 150 m (492 ft) of habitat (NatureServe 2003).

Mortality
Based on recapture rates in the Owyhee Mountains, some individuals live for at least five years. Skeletochronological analysis in 1998 revealed a 9-year old female (Engle and Munger 2000).

Mortality of eggs, tadpoles, and newly metamorphosed frogs is high, with approximately 5% surviving the first winter (David Pilliod, personal communication, cited in Amphibia Web 2004).

Habitat Requirements

General
This species is relatively aquatic and is rarely found far from water. It occupies a variety of still water habitats and can also be found in streams and creeks (Hallock and McAllister 2002). CSF's are found closely associated with clear, slow-moving or ponded surface waters, with little shade (Reaser 1997). CSF's are found in aquatic sites with a variety of vegetation types, from grasslands to forests (Csuti 1997).

A deep silt or muck substrate may be required for hibernation and torpor (Morris and Tanner 1969). In colder portions of their range, CSF's will use areas where water does not freeze, such as spring heads and undercut streambanks with overhanging vegetation (IDFG et al. 1995). CSF's may disperse into forest, grassland, and brushland during wet weather (NatureServe 2003). They will use stream-side small mammal burrows as shelter. Overwintering sites in the Great Basin include undercut banks and spring heads (Blomquist and Tull 2002). Cynthia Tait -- BLM Vale fisheries biologist -- provided the following information on Columbia spotted frog winter habitat requirements (Personal correspondence, 2-13-2004): "Spotted frogs overwinter underwater, and consequently require a source of perennial water, such as a spring, that is fairly deep and does not freeze."

Breeding

Reproducing populations have been found in habitats characterized by springs, floating vegetation, and larger bodies of pooled water (e.g., oxbows, lakes, stock ponds, beaver-created ponds, seeps in wet meadows, backwaters) (IDFG et al. 1995; Reaser 1997). Breeding habitat is the temporarily flooded margins of wetlands, ponds, and lakes (Hallock and McAllister 2002). Breeding habitats include a variety of relatively exposed, shallow-water (<60 cm), emergent wetlands such as sedge fens, riverine over-bank pools, beaver ponds, and the wetland fringes of ponds and small lakes. Vegetation in the breeding pools generally is dominated by herbaceous species such as grasses, sedges (Cares spp.) and rushes (Juncus spp.) (Amphibia Web 2004).

Columbia Spotted Frog Population and Distribution

Distribution

Populations of the CSF are found from Alaska and British Columbia to Washington east of the Cascades, eastern Oregon, Idaho, the Bighorn Mountains of Wyoming, the Mary's, Reese, and Owyhee River systems of Nevada, the Wasatch Mountains, and the western desert of Utah (Green et al. 1997). Genetic evidence (Green et al. 1996) indicates that Columbia spotted frogs may be a single species with three subspecies, or may be several weakly-differentiated species.

Two populations of CSFs are found within the Columbia River Basin: Northern DPS and Great Basin DPS. It has been considered to make the Snake River a boundary between the Northern and Great Basin populations, but further genetic work will need to be done to clarify the issue (J. Engle, pers. Comm.., 2004). The Great Basin DPS is further divided into five subpopulations: southeastern Oregon, Owyhee, Jarbidge-Independence, Ruby Mountains, and Toiyabe (J. Engle, C. Mellison, pers. comm., 2004). Of the five subpopulations, only the eastern Oregon, Owyhee, and the Jarbidge-Independence occur in the Columbia River subbasin.

Historic

Historic range of the Northern population is most likely similar to that of the current range. Moving south into the southern populations (Great Basin, Wasatch Front, and West Desert) the range was most likely larger in size. More research needs to be performed to determine the status of CFS in the Owyhee Subbasin.

Current

Great Basin DPS
Nevada The Great Basin population of Columbia spotted frogs in Nevada is geographically separated into three distinct subpopulations; the Jarbidge-Independence Range, Ruby Mountains, and Toiyabe Mountains subpopulations (USFWS 2002c).
The largest of Nevada's three subpopulation areas is the Jarbidge-Independence Range in Elko and Eureka counties. This subpopulation area is formed by the headwaters of streams in two major hydrographic basins. The South Fork Owyhee, Owyhee, Bruneau, and Salmon Falls drainages flow north into the Snake River basin. Mary's River, North Fork of the Humboldt, and Maggie Creek drain into the interior Humboldt River basin. The Jarbidge-Independence Range subpopulation is considered to be genetically and geographically most closely associated with Columbia spotted frogs in southern Idaho (Reaser 1997)(USFWS 2002c).

Columbia spotted frogs occur in the Ruby Mountains in the areas of Green Mountain, Smith, and Rattlesnake creeks on lands in Elko County managed by the U.S. Forest Service (Forest Service). Although geographically, Ruby Mountains spotted frogs are close to the Jarbidge-Independence Range subpopulation, preliminary allozyme evidence suggests they are genotypically different (J. Reaser, pers. comm., 1998). The Ruby Mountains subpopulation is considered discrete because of this difference (J. Reaser, pers. comm., 1998) and because it is geographically isolated from the Jarbidge-

Independence Range subpopulation area to the north by an undetermined barrier (e.g., lack of suitable.habitat, connectivity, and/or predators), and from the Toiyabe Mountains subpopulation area to the southwest by a large gap in suitable.Humboldt River drainage habitat (USFWS 2002c).

Genetic analyses of Great Basin Columbia spotted frogs from the Toiyabe Range suggest that these frogs are distinctive in comparison to frogs from the Ruby Mountains and Jarbidge-Independence Range subpopulation areas (Green et al. 1996, 1997; J. Reaser, pers. comm., 1998). Genetic (mtDNA) differences between the Toiyabe Range frogs and the Ruby Mountains frogs are less than those between the Toiyabe Range frogs and the Jarbidge-Independence Range frogs, but this may be because of similar temporal and spatial isolation (J. Reaser, pers. comm., 1998) (USFWS 2002c).
Idaho and Oregon

Only six historical sites were known in the Owyhee Mountain range in Idaho, and only 11 sites were known in southeastern Oregon in Malheur County prior to 1995 (Munger et al. 1996) (USFWS 2002c). Currently, Columbia spotted frogs appear to be widely distributed throughout southwestern Idaho (mainly in Owyhee County) and eastern Oregon, but local populations within this general area appear to be isolated from each other by either natural or human induced habitat disruptions. The largest local population of spotted frogs in Idaho occurs in Owyhee County in the Rock Creek drainage. The largest local population of spotted frogs in Oregon occurs in Malheur County in the Dry Creek Drainage (USFWS 2002c).

Columbia Spotted Frog Population, Status, and Abundance Trends

Nevada

Declines of Columbia spotted frog populations in Nevada have been recorded since 1962 when it was observed that in many Elko County localities where spotted frogs were once numerous, the species was nearly extirpated (Turner 1962). Extensive loss of habitat was found to have occurred from conversion of wetland habitats to irrigated pasture and spring and stream dewatering by mining and irrigation practices. In addition, there was evidence of extensive impacts on riparian habitats due to intensive livestock grazing. Recent work by researchers in Nevada have documented the loss of historically known sites, reduced numbers of individuals within local populations, and declines in the reproduction of those individuals (Hovingh 1990; Reaser 1996a, 1996b, 1997). Surveys in Nevada between 1994 and 1996 indicated that 54 percent of surveyed sites known to have frogs before 1993 no longer supported individuals (Reaser 1997; USFWS 2002c).

Little historical or recent data are available for the largest subpopulation area in Nevada, the Jarbidge-Independence Range. Presence/absence surveys have been conducted by Stanford University researchers and the Forest Service, but dependable information on numbers of breeding adults and trends is unavailable. Between 1993 and 1998, 976 sites were surveyed for the presence of spotted frogs in northeastern Nevada, including the Ruby Mountains subpopulation area (Shipman and Anderson 1997; Reaser 2000). Of these, 746 sites (76 percent) that were believed to have characteristics suitable for frogs were unoccupied. For these particular sites there is no information on historical presence of spotted frogs. Of 212 sites that were known to support frogs before 1992, 107 (50 percent) sites no longer had frogs, while 105 sites did support frogs. At the occupied sites, surveyors observed more than 10 adults at only 13 sites (12 percent). Frogs in this area appear widely distributed (Reaser 1997). No monitoring or surveying has taken place in northeastern Nevada since 1998. The Forest Service is planning on surveying the area during the summer of 2002 (USFWS 2002c).

Lack of standardized or extensive monitoring and routine surveying has prevented dependable determinations of frog population numbers or trends in Nevada (USFWS 2002c).

Idaho and Oregon

Extensive surveys since 1996 throughout southern Idaho and eastern Oregon, have led to increases in the number of known spotted frog sites. Although efforts to survey for spotted frogs have increased the available information regarding known species locations, most of these data suggest the sites support small numbers of frogs. Of the 49 known local populations in southern Idaho, 61 percent had 10 or fewer adult frogs and 37 percent had 100 or fewer adult frogs (Engle 2000; Idaho Conservation Data Center (IDCDC) 2000). The largest known local population of spotted frogs occurs in the Rock Creek drainage of Owyhee County and supports under 250 adult frogs (Engle 2000). Extensive monitoring at 10 of the 46 occupied sites since 1997 indicates a general decline in the number of adult spotted frogs encountered (Engle 2000; Engle and Munger 2000; Engle 2002). All known local populations in southern Idaho appear to be functionally isolated (Engle 2000; Engle and Munger 2000) (USFWS 2002c).

Of the16 sites that are known to support Columbia spotted frogs in eastern Oregon, 81 percent of these sites appear to support fewer than 10 adult spotted frogs. In southeastern Oregon, surveys conducted in 1997 found a single population of spotted frogs in the Dry Creek drainage of Malheur County. Population estimates for this site are under 300 adult frogs (Munger et al. 1996). All of the known local populations of spotted frogs in eastern Oregon appear to be functionally isolated (USFWS 2002c).
Legal Status

In 1989, the U.S. Fish and Wildlife Service (USFWS) was petitioned to list the spotted frog (referred to as Rana pretiosa) under ESA (Federal Register 541989:42529). The USFWS ruled on April 23, 1993, that the listing of the spotted frog was warranted and designated it a candidate for listing with a priority 3 for the Great Basin population, but was precluded from listing due to higher priority species (Federal Register 5887:27260). The major impetus behind the petition was the reduction in distribution apparently associated with impacts from water developments and the introduction of nonnative species.

On September 19, 1997 (Federal Register 62182:49401), the USFWS downgraded the priority status for the Great Basin population of Columbia spotted frogs to a priority 9, thus relieving the pressure to list the population while efforts to develop and implement specific conservation measures were ongoing. As of January 8, 2001 (Federal Register 665:1295- 1300), however, the priority ranking has been raised back to a priority 3 due to increased threats to the species. This includes the Great Basin DPS Columbia spotted frog populations

Factors Affecting Columbia Spotted Frog Population Status Key Factors Inhibiting Populations and Ecological Processes

The present or range destruction, modification, or curtailment of its habitat or range Spotted frog habitat degradation and fragmentation is maybe a combined result of past and current influences of heavy livestock grazing, spring development, agricultural development and mining activities. These activities can eliminate vegetation necessary to protect frogs from predators and UV-B radiation; reduce soil moisture; create undesirable changes in water temperature, chemistry and water availability; and can cause restructuring of habitat zones through trampling, rechanneling, or degradation which in turn can negatively affect the available invertebrate food source (IDFG et al. 1995; Munger et al. 1997; Reaser 1997; Engle and Munger 2000; Engle 2002). Over time habitat occurs in the same areas where these activities are likely to take place or where these activities occurred in the past and resulting habitat degradation has not improved over time. Natural fluctuations in environmental conditions tend to magnify the detrimental effects of these activities, just as the activities may also magnify the detrimental effects of natural environmental events (USFWS 2002c).

Springs provide a stable, permanent source of water for frog breeding, feeding, and winter refugia (IDFG et al. 1995). Springs provide deep, protected areas which serve as hibernacula for spotted frogs in cold climates. Springs also provide protection from predation through underground openings (IDFG et al. 1995; Patla and Peterson 1996). Spring developments that result in the installation of a pipe or box to fully capture the water source and direct water to another location such as a livestock watering trough may result in a loss of aquatic habitat in desert ecosystems. This can lead to the loss of available spotted frogs habitat. Developed spring pools could be functioning as attractive nuisances for frogs, concentrating them into isolated groups, increasing the risk of disease and predation (Engle 2001). Many of the springs in southern Idaho, eastern Oregon, and Nevada have been developed (USFWS 2002c).

The reduction of beaver populations has been noted as an important feature in the reduction of suitable.habitat for spotted frogs. Beaver are important in the creation of small pools with slow-moving water that function as habitat for frog reproduction and create wet meadows that provide foraging habitat and protective vegetation cover, especially in the dry interior western United States (St. John 1994). Horticultural planning is still common in Idaho and harvest is unregulated in most areas (IDFG et al. 1995). In some areas, beavers are removed because of a perceived threat to water for agriculture or horticultural plantings. As indicated above, permanent ponded waters are important in maintaining spotted frog habitats during severe drought or winter periods. Removal of a beaver dam in Stoneman Creek in Idaho is believed to be directly related to the decline of a spotted frog subpopulation there. Intensive surveying of the historical site where frogs were known to have occurred has documented only one adult spotted frog (Engle 2000) (USFWS 2002c).

Fragmentation of habitat may be one of the most significant barriers to spotted frog recovery and population persistence. Recent studies in Idaho indicate that spotted frogs exhibit breeding site fidelity (Patla and Peterson 1996; Engle 2000; Munger and Engle 2000; J. Engle, IDFG, pers. comm., 2001). Movement of frogs from hibernation ponds to breeding ponds may be impeded by zones of unsuitable.habitat. If movement corridors become more fragmented due to loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000; Engle 2001). Vegetation and surface water along movement corridors provide relief from high temperatures and arid environmental conditions, as well as protection from predators. Loss of vegetation and/or lowering of the water Table 2.2.as a result of the above mentioned activities can pose a significant threat to frogs moving from one area to another. Likewise, fragmentation and loss of habitat can prevent frogs from colonizing suitable.sites elsewhere (USFWS 2002c).

A direct correlation between spotted frog declines and livestock grazing has not been studied. The effects of improper grazing on riparian areas are will documented (Kauffman et al. 1982; Kauffman and Kreuger 1984; Skovlin 1984; Kauffman et al. 1985; Schulze and Leininger 1990).

The effects of mining on Great Basin Columbia spotted frogs, specifically, have not been studied, but the adverse effects of mining activities on water quality and quantity, other wildlife species, and amphibians in particular have been addressed in professional scientific forums (Chang et al. 1974; Birge et al. 1975; Greenhouse 1976; Khangarot et al. 1985) (USFWS 2002c). More research is necessary to determine the impacts of mining activities on SCF.

Disease or predation

Predation by fishes is likely an important threat to spotted frogs. The introduction of nonnative salmonid and bass species for recreational fishing may have negatively affected frog species throughout the United States. The negative effects of predation of this kind are difficult to document, particularly in stream systems. However, significant negative effects of predation on frog populations in lacustrine systems have been documented (Hayes and Jennings 1986; Pilliod et al. 1996, Knapp and Matthews 2000). One historic site in southern Idaho no longer supports spotted frog although suitable.habitat is available. This may be related to the presence of introduced bass in the Owyhee River (IDCDC 2000). The stocking of nonnative fishes is common throughout waters of the Great Basin. The Nevada Division of Wildlife (NDOW) has committed to conducting stomach sampling of stocked nonnative and native species to determine the effects of predation on spotted frogs. However, this commitment will not be fulfilled until the spotted frog conservation agreements are signed. To date, NDOW has not altered fish stocking rates or locations in order to benefit spotted frogs (USFWS 2002c).

The bull frog (Rana catesbeiana), a nonnative ranid species, occurs within the range of the spotted frog in the Great Basin. Bullfrogs are known to prey on other frogs (Hayes and Jennings 1986). They are rarely found to co-occur with spotted frogs, but whether this is an artifact of competitive exclusion is unknown at this time (USFWS 2002c).

Although a diversity of microbial species is naturally associated with amphibians, it is generally accepted that they are rarely pathogenic to amphibians except under stressful environmental conditions. Chytridiomycosis (chytrid) is an emerging panzootic fungal disease in the United States (Fellers et al. 2001). Clinical signs of amphibian chytrid include abnormal posture, lethargy, and loss of righting reflex. Gross lesions, which are usually not apparent, consist of abnormal epidermal sloughing and ulceration; hemorrhages in the skin, muscle, or eye; hyperemia of digital and ventrum skin, and congestion of viscera. Diagnosis is by identification of characteristic intracellular flask-shaped sporangia and septate thalli within the epidermis. Chytrid can be identified in some species of frogs by examining the oral discs of tadpoles which may be abnormally formed or lacking pigment (Fellers et al. 2001) (USFWS 2002c).

Chytrid was confirmed in the Circle Pond site, Idaho, where long term monitoring since 1998 has indicated a general decline in the population (Engle 2002). It is unclear whether the presence of this disease will eventually result in the loss of this subpopulation. Two additional sites may have chytrid, but this has yet to be determined (J. Engle, pers. comm., 2001). Protocols to prevent further spread of the disease by researchers were instituted in 2001. Chytrid has also been found in the Wasatch Columbia spotted frog distinct population segment (K. Wilson, pers comm., 2002). Chytrid has not been found in Nevada populations of spotted frogs (USFWS 2002c).

The spotted frog occurrence sites and potential habitats occur on both public and private lands. This species is included on the Forest Service sensitive species list; as such, its management must be considered during forest planning processes. However, little habitat restoration, monitoring or surveying has occureed on Forest Service Lands (USFWS 2002c).

BLM policies direct management to consider candidate species on public lands under their jurisdictional. To date, BLM efforts to conserve spotted frogs and their habitat in Idaho, Oregon, and Nevada have not been adequate to address threats (USFWS 2002c).

The status of local populations of spotted frogs on Yomba-Shoshone or Duck Valley Tribal lands is unknown.

The Nevada Division of Wildlife classifies the spotted frog as a protected species, but they are not afforded official protection and populations are not monitored. Though the spotted frog is on the sensitive species list for the State of Idaho, this species is not given any special protection by the State. Columbia spotted frogs are not on the sensitive species list for the State of Oregon. Protection of wetland habitat from loss of water to irrigation or spring development is difficult because most water in the Great Basin has been allocated to water rights applicants based on historical use and spring development has already occurred within much of the known habitat of spotted frogs. Federal lands may have water rights that are approved for wildlife use, but these rights are often superceded by historic rights upstream or downstream that do not provide for minimum flows. Also, most public lands are managed for multiple use and are subject to livestock grazing, silvicultural activities, and recreation uses that may be incompatible with spotted frog conservation without adequate mitigation measures (USFWS 2002c).

Other natural or manmade factors affecting its continued existence

Multiple consecutive years of less than average precipitation may result in a reduction in the number of suitable.sites available to spotted frogs. Local extirpations eliminate source populations from habitats that in normal years are available as frog habitat (Lande and Barrowclough 1987; Schaffer 1987; Gotelli 1995). These climate events are likely to exacerbate the effects of other threats, thus increasing the possibility of stochastic extinction of subpopulations by reducing their size and connectedness to other subpopulations (see Factor A for additional information). As movement corridors become more fragmented, due to loss of flows within riparian or meadow habitats, local populations will become more isolated (Engle 2000). Increased fragmentation of the habitat can lead to greater loss of populations due to demographic and/or environmental stochasticity (USFWS 2002c).

2.2.2.7 American Beaver[9]

Focal Habitat – Species Box
Riparian and wetlands
Columbia Spotted Frog
American Beaver
Yellow Warbler
Bald Eagle
White-faced Ibis

[9] This species account is based in part on a draft by Paul Ashley and Stacey Stovall. 2004. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment.

Image 2.15. American beaver; photo credits Mark Wallner.

The American beaver (*Castor canadensis*) is a large, highly specialized aquatic rodent found in the immediate vicinity of aquatic habitats (Hoffman and Pattie 1968). The species occurs in streams, ponds, and the margins of large lakes throughout North America, except for peninsular Florida, the Arctic tundra, and the southwestern deserts (Jenkins and Busher 1979). Beavers construct elaborate lodges and burrows and store food for winter use. The species is active throughout the year and is usually nocturnal in its activities. Adult beavers are nonmigratory.

The American Beaver occurs in ten habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.12); the Beaver is present in the following four habitats:

- Upland Aspen Forest
- Western Juniper and Mountain Mahogany Woodlands
- Agriculture, Pastures, and Mixed Environs
- Urban and Mixed Environs

The Beaver is closely associated with the following three habitats:

- Open Water - Lakes, Rivers, and Streams
- Herbaceous Wetlands
- Interior Riparian-Wetlands

And the beaver is generally associated with the following three habitats:

- Montane Mixed Conifer Forest
- Interior Mixed Conifer Forest
- Montane Coniferous Wetlands

Table 2.12. American Beaver (Castor canadensis) association with all habitats occurring in the OWYHEE Subbasin: (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Feeds	High	none
Interior Mixed Conifer Forest	Generally Associated	Feeds	High	none
Upland Aspen Forest	Present	Feeds	High	May use this habitat if not too far from water.
Western Juniper and Mountain Mahogany Woodlands	Present	Feeds	Low	none
Agriculture, Pastures, and Mixed Environs	Present	Feeds	Moderate	none
Urban and Mixed Environs	Present	Feeds	Moderate	none
Open Water - Lakes, Rivers, and Streams	Closely Associated	Reproduces	High	none
Herbaceous Wetlands	Closely Associated	Feeds and Breeds	High	none
Montane Coniferous Wetlands	Generally Associated	Feeds and Breeds	High	none
Interior Riparian-Wetlands	Closely Associated	Feeds and Breeds	High	none
Total Habitat Associations with American Beaver:	10			

All wetland cover types (e.g., herbaceous wetland and deciduous forested wetland) must have a permanent source of surface water with little or no fluctuation in order to provide suitable beaver habitat (Slough and Sadleir 1977). Water provides cover for the feeding and reproductive activities of the beaver. Lakes and reservoirs that have extreme annual or seasonal fluctuations in the water level will be unsuitable habitat for beaver. Similarly, intermittent streams, or streams that have major fluctuations in discharge (e.g., high spring runoff) or a stream channel gradient of 15 percent or more, will have little year-round value as beaver habitat. Assuming that there is an adequate food source available, small lakes < 8 ha (20 acres) in surface area are assumed to provide suitable habitat. Large lakes and reservoirs > 8 ha (20 acres) in surface area must have irregular shorelines (e.g., bays, coves, and inlets) in order to provide optimum habitat for beaver.

Beavers can usually control water depth and stability on small streams, ponds, and lakes; however, larger rivers and lakes where water depth and/or fluctuation cannot be controlled are often partially or wholly unsuitable for the species (Murray 1961; Slough and Sadleir 1977). Rivers or streams that are dry during some parts of the year are assumed to be unsuitable beaver habitat. Beavers are absent from sizable portions of rivers in Wyoming, due to swift water and an absence of suitable dwelling sites during periods of high and low water levels (Collins 1976b).

In riverine habitats, stream gradient is the major determinant of stream morphology and the most significant factor in determining the suitability of habitat for beavers (Slough and Sadleir 1977). Stream channel gradients of 6 percent or less have optimum value as beaver habitat. Retzer et al. (1956) reported that 68 percent of the beaver colonies recorded in Colorado were in valleys with a stream gradient of less than 6 percent, 28 percent were associated with stream gradients from 7 to 12 percent, and only 4 percent were located along streams with gradients of 13 to 14 percent. No beaver colonies were recorded in streams with a gradient of 15 percent or more. Valleys that were only as wide as the stream channel were unsuitable beaver habitat, while valleys wider than the stream channel were frequently occupied by beavers. Valley widths of 46 m (150 ft) or more were considered the most suitable. Marshes, ponds, and lakes were nearly always occupied by beavers when an adequate supply of food was available.

Much of the food ingested by a beaver consists of cellulose, which is normally indigestible by mammals. However, these animals have colonies of microorganisms living in the cecum, a pouch between the large and small intestine, and these symbionts digest up to 30 percent of the cellulose that the beaver takes in. An additional recycling of plant food occurs when certain fecal pellets are eaten and run through the digestive process a second time (Findley 1987).

Woody and herbaceous vegetation comprise the diet of the beaver. Herbaceous vegetation is a highly preferred food source throughout the year, if it is available. Woody vegetation may be consumed during any season, although its highest utilization occurs from late fall through early spring. It is assumed that woody vegetation (trees and/or shrubs) is more limiting than herbaceous vegetation in providing an adequate food source.

Denney (1952) summarized the food preferences of beavers throughout North America:

- Aspen (*Populus tremuloides*)
- Willow (*Salix spp.*),
- Cottonwood (*P. balsamifera*)
- Alder (*Alnus spp*.)

Although several tree species have often been reported to be highly preferred foods, beavers can inhabit, and often thrive in, areas where these tree species are uncommon or absent (Jenkins 1975). Aspen and willow are considered preferred beaver foods; however, these are generally riparian tree species that may be more available for beaver foraging but are not necessarily preferred over all other deciduous tree species (Jenkins 1981). Beavers have been reported to subsist in some areas by feeding on coniferous trees, generally considered a poor quality source of food (Brenner 1962; Williams 1965).The types of food species present may be less important in determining habitat quality for beavers than physiographic and hydrologic factors affecting the site (Jenkins 1981).

Aquatic vegetation are preferred foods when available:

- Duck potato (*Sagittaria spp.)*
- Duckweed (*Lemna spp.)*
- Dondweed (*Potamogeton spp.)*
- Water weed (Elodea spp.)

Limiting Factors affecting the American Beaver is agriculture. Sources for beavers along many water ways has been removed in order to plant agricultural crops, thus removing important habitat and food sources for beaver. Limited water in the subbasin makes pools created by beavers undesirable to many local farmers and irrigation districts. Increased debris from beaver dams also causes a problem for many irrigation systems. This has led to continued beaver trapping in may of the agricultural areas.

2.2.2.8 Yellow Warbler[10]

Focal Habitat – Species Box
Riparian and wetlands
Columbia Spotted Frog
American Beaver
Yellow Warbler
Bald Eagle
White-faced Ibis

[10] This species account is based in part on a draft by Paul Ashley and Stacey Stovall. 2004. Grasshopper Sparrow. Southeast Washington Subbasin Planning Ecoregion Wildlife Assessment. Appendix F: Focal Species Accounts.

Image 2.16 Yellow Warbler; photo credits Brian E. Small.

The Yellow Warbler (Dendroica petechia) is a common species strongly associated with riparian and wet deciduous habitats throughout its North American range. In the Owyhee Subbasin it is found in many areas, generally at lower elevations. It occurs along most riverine systems, where appropriate riparian habitats exist. The Yellow Warbler is a good indicator of functional subcanopy/shrub habitats in riparian areas.

The Yellow Warbler is a riparian obligate species most strongly associated with wetland habitats and deciduous tree cover. Yellow Warbler abundance is positively associated with deciduous tree basal area, and bare ground; abundance is negatively associated with mean canopy cover, and cover of:

- Douglas-fir (Pseudotsuga menziesii)
- Oregon grape (Berberis nervosa)
- Mosses
- Swordfern (Polystuchum munitum)
- Blackberry (Rubus discolor)
- Hazel (Corylus cornuta)
- Oceanspray (Holodiscus discolor) (Rolph 1998).

The Yellow Warbler occurs in two habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.13); the Yellow Warbler is closely associated in the following habitat:

- Interior Riparian Wetlands

And the Yellow Warbler is generally associated with the following habitat:

- Upland Aspen Forest

Table 2.13. Yellow Warbler (Dendroica petechia) association with all habitats occurring in the OWYHEE Subbasin:

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Upland Aspen Forest	Generally Associated	Feeds and Breeds	High	none
Interior Riparian-Wetlands	Closely Associated	Feeds and Breeds	High	none
Total Habitat Associations with Yellow Warbler:	2			

Partners in Flight have established biological objectives for this species in the lowlands of western Oregon and western Washington. These include providing habitats that meet the following definition: >70 percent cover in shrub layer (<3 m) and subcanopy layer (>3 m and below the canopy foliage) with subcanopy layer contributing >40 percent of the total; shrub layer cover 30-60 percent (includes shrubs and small saplings); and a shrub layer height >2 m. At the landscape level, the biological objectives for habitat included high degree of deciduous riparian heterogeneity within or among wetland, shrub, and woodland patches; and a low percentage of agricultural land use (Altman 2001).

The Yellow Warbler breeds across much of the North American continent, from Alaska to Newfoundland, south to western South Carolina and northern Georgia, and west through parts of the southwest to the Pacific coast (AOU 1998). Browning (1994) recognized 43 subspecies. This species is a long-distance migrant and has a winter range extending from western Mexico south to the Amazon lowlands in Brazil (AOU 1998). Neither the breeding nor winter ranges appear to have changed (Lowther et al. 1999).

The Yellow Warbler breeds in riparian habitats within the subbasin. It is a locally common breeder along rivers and creeks in the Columbia Basin, where it is declining in some areas.

Limiting factors that can affect the status of the Yellow Warbler are:

- habitat loss due to hydrological diversions and control of natural flooding regimes (e.g., dams) resulting in reduction of overall area of riparian habitat;
- conversion of riparian habitats;
- inundation from impoundments;
- cutting and spraying for ease of access to water courses; and,
- gravel mining

The following may contribute to habitat degradation from: loss of vertical stratification in riparian vegetation, lack of recruitment of young cottonwoods, ash, willows, and other subcanopy species; which bank stabilization (e.g., riprap) which narrowing the narrows stream channel, reducing the flood zone, and reducing extent of riparian vegetation;

invasion of exotic species such as reed canary grass and blackberry; overgrazing which can reduce understory cover; reductions in riparian corridor widths which may decrease suitability of the habitat and may increase encroachment of nest predators and nest parasites to the interior of the stand.

2.2.2.9 Bald eagle[11]

Focal Habitat – Species Box
Riparian and wetlands
Columbia Spotted Frog
American Beaver
Yellow Warbler
Bald Eagle
White-faced Ibis

Image 2.17. Bald eagle; photo credits Michael H. Francis.

The Bald Eagle occurs in eleven habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.14): Bald Eagles are closely associated with the following habitat:

- Open Water - Lakes, Rivers, and Streams

[11] This species account is based in part on a draft by Paul, Keith. 2004. Owyhee Subbasin Planning, Technical Team. February, 2004

And Bald Eagles are generally associated with the following 6 habitats:

- Montane Mixed Conifer Forest
- Interior Mixed Conifer Forest
- Agriculture, Pastures, and Mixed Environs
- Urban and Mixed Environs
- Herbaceous Wetlands
- Interior Riparian-Wetlands

Table 2.14. Bald Eagle (Haliaeetus leucocephalus) association with all habitats occurring in the OWYHEE Subbasin: (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Reproduces	High	Could breed in this habitat where near open water habitats.
Interior Mixed Conifer Forest	Generally Associated	Reproduces	High	Could breed in this habitat where near open water habitats.
Alpine Grasslands and Shrublands	Present	Feeds	Low	Known to occur in sub-alpine and alpine areas on Vancouver Island, B.C.
Shrub-steppe	Present	Reproduces	High	Could breed in this habitat where near open water habitats, and if suitable.nest structures are available.
Dwarf Shrub-steppe	Present	Reproduces	High	Could breed in this habitat where near open water habitats, and if suitable.nest structures are available.
Desert Playa and Salt Scrub Shrublands	Present	Feeds	High	Wintering.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds	High	none
Urban and Mixed Environs	Generally Associated	Feeds and Breeds	High	Could breed in this habitat where near open water habitats, and if suitable.nest structures are available.
Open Water - Lakes, Rivers, and Streams	Closely Associated	Feeds	High	none
Herbaceous Wetlands	Generally Associated	Feeds	High	none
Interior Riparian-Wetlands	Generally Associated	Feeds and Breeds	High	none
Total Habitat Associations with Bald Eagle:	11			

Bald eagles in the lower 48 states were first protected in 1940 by the Bald Eagle Protection Act and then were federally listed as endangered in 1967. In 1995, the bald eagle was reclassified as threatened in all of the lower 48 States. The bald eagle was proposed for delisting on July 6, 1999; a decision on whether to delist the bald eagle is pending (64 FR 36453). No critical habitat has been designated for the bald eagle (USFWS 2003).

The bald eagle is one of eight species of sea-eagle (genus Haliaeetus) worldwide (Brown 1977), and the only sea eagle found throughout North America (Stalmaster 1987). Large size, wingspan of 6.6-8.0 ft (200-243 cm) (Stalmaster 1987), and the contrast of white head and tail, and yellow eyes, beak, and legs, to dark brown body and wings make the adult bald eagle one of our most distinctive raptors (Isaacs and Anthony 2003a).

Bald Eagle Life History, Key Environmental Correlates, and Habitat Requirements

Life History
As our national symbol, the bald eagle is widely recognized. Its distinctive white head and tail do not appear until the bird is four to five years old. These large powerful raptors can live for 30 or more years in the wild and even longer in captivity (USFWS 2003).

Diet
Bald eagles consume a variety of prey that varies by location and season. Prey are taken alive, scavenged, and pirated (Frenzel 1985, Watson et al. 1991). Fish were the most frequent prey among 84 species identified at nest sites in south-central Oregon, and a tendency was observed for some individuals or pairs to specialize in certain species (Frenzel 1985). Wintering and migrant eagles in eastern Oregon fed on large mammal carrion, especially road-killed mule deer, domestic cattle that died of natural causes, and stillborn calves, as well as cow afterbirth, waterfowl, ground squirrels, other medium-sized and small rodents, and fish. Proportions varied by month and location. Food habitats are unknown for nesting eagles over much of the state (Isaacs and Anthony 2003a).

Reproduction
Bald eagles are most abundant in Oregon in late winter and early spring, because resident breeders (engaged in early nesting activities), winter residents, and spring transients are all present. Nest building and repair occur any time of year, but most often observed from February to June (Isaacs and Anthony unpublished data). Bald eagles are territorial when breeding but gregarious when not (Stalmaster 1987). They exhibit strong nest-site fidelity (Jenkins and Jackman 1993), but “divorce” has been documented (Frenzel 1985, Garrett et al 1993). Cooperative nesting by three adults was reported (Garcelon et al. 1995). Both sexes build the nest, incubate eggs, and brood and feed young (Stalmaster 1987). Egg laying occurs mid-February to late April; hatching late March to late May; and fledging late June to mid-Aug (Isaacs and Anthony unpublished data) (Isaacs and Anthony 2003a).

Bald eagles lay one to four eggs in late March or early April and both adults incubate the eggs for about 35 days until hatching. During the nest building, egg laying and incubating periods, eagles are extremely sensitive and will abandon a nesting attempt if there are excessive disturbances in the area during this time. The eaglets are able to fly in about three months and then, after a month, they are on their own. The first year is particularly difficult for young eagles. Only half may survive the first year due to disease, lack of food, bad weather, or human interference (USFWS 2003).

Migration
Bald eagles can be resident year-round where food is available; otherwise they will migrate or wander to find food. When not breeding, eagles may congregate where food is abundant, even away from water (Stalmaster 1987). Migrants passing through Glacier National Park generally followed north-south flyways similar to those of waterfowl (McClelland et al. 1994). In contrast, juveniles and subadults form California traveled north to Oregon, Washington, and British Columbia in late summer and fall (D. K. Garcelon p.c., R. E. Jackman p.c.) (Isaacs and Anthony 2003a).

Mortality
Reviews of published literature (Harmata et al. 1999., Jenkins et al. 1999) suggested that survival varies by location and age; hatch-year survival was usually >60%, and survivorship increased with age to adulthood. However, recent work by Harmata et al. (1999) showed survival lowest among 3- and 4-year old birds (Isaacs and Anthony 2003a).

The major factor leading to the decline and subsequent listing of the bald eagle was disrupted reproduction resulting from contamination by organochlorine pesticides. Other causes of death in bald eagles have included shooting, electrocution, impact injuries, and lead poisoning (USFWS 2003).

Habitat Requirements

General
Bald eagles are generally associated with large bodies of water, but can occur in any habitat with available prey (Isaacs and Anthony 2003a)

Nesting Habitat
Bald eagles nest in forested areas near the ocean, along rivers, and at estuaries, lakes, and reservoirs (Isaacs and Anthony 2001). Consequently, shoreline is an important component of nesting habitat; 84% of Oregon nests were within 1 mi (1.6 km) of water (Anthony and Isaacs 1989). Live trees are usually used for nest trees, although nests will continue to be used if the tree dies. Nest trees are usually large and prominent (Anthony et al. 1982). Large old trees have large limbs and open structure required for eagle access and nest territory. Some use has been made of artificial platforms placed in trees modified for Osprey (Witt 1996, Isaacs and Anthony unpublished data, R. Opp p.c.). Cliff nesting is thus unknown, but possible, especially in sparsely forested areas of southeast Oregon (Isaacs and Anthony 2003a).

Wintering Habitat
Wintering eagles in the Pacific Northwest perch on a variety of substrates; proximity to a food source is probably the most important factor influencing perch selection by bald eagles (Steenhof et al. 1980). Favored perch trees are invariably located near feeding

areas, and eagles consistently use preferred branches (Stalmaster 1976). Most tree perches selected by eagles provide a good view of the surrounding area (Servheen 1975, Stalmaster 1976), and eagles tend to use the highest perch sites available (Stalmaster 1976) (USFWS 1986).

Eagles use a variety of tree species as perch sites, depending on regional forest types and stand structures. Dead trees are used by eagles in some areas because they provide unobstructed view and are often taller than surrounding vegetation (Stalmaster 1976). Artificial perches may be important to wintering bald eagles in situations where natural perches are lacking. (Fielder, p.c.) in Washington, where perch trees are not available, eagles regularly use artificial perches, including both crossarm perches and a tripod perch (Fielder, p.c.) (USFWS 1986).

Habitat requirements for communal night roosting are different form those for diurnal perching. Communal roosts are invariably near a rich food resource and in forest stands that are uneven-aged and have at least a remnant of the old-growth forest component (Anthony et al. 1982). Close proximity to a feeding area is not the only requirement for night roosting sites, as there are minimum requirements for forest stand structure. In open areas, bald eagles also use cottonwoods and willows for night roosting (Isaacs and Anthony 1983). Most communal winter roosts used by bald eagles offer considerably more protection from the weather than diurnal habitat. Roost tree species and stand characteristics vary considerably throughout the Pacific Northwest (Anthony et al 1982) (USFWS 1986).

Isolation is an important feature of bald eagle wintering habitat. In Washington, 98% of wintering bald eagles tolerated human activities at a distance of 300 m (328 yards) (Stalmaster and Newman 1978). However, only 50% of eagles tolerated disturbances of 150 m (164 yards) (USFWS 1986).

Factors Affecting Bald Eagle Population Status

Currently, loss of habitat and human disturbance are still potential threats. Habitat loss results from the physical alteration of habitat as well as from human disturbance associated with development or recreation (i.e., hiking, camping, boating, and ORV use). Activities that can and have negatively impacted bald eagles include logging, mining, recreation, overgrazing (particularly in riparian habitats), road construction, wetland filling, and industrial development.

These activities, as well as suburban and vacation home developments are particularly damaging when they occur in shoreline habitats. Activities that produce increased siltation and industrial pollution can cause dissolved oxygen reductions in aquatic habitats, reduction s in bald eagle fish prey populations followed by reductions in the number of eagles. Not all developments in floodplain habitats are detrimental to bald eagles, as some reservoirs and dams have created new habitat with dependable food supplies (USFWS 2003). The Owyhee Reservoir is one example of this.

Although habitat loss and residual contamination remain a threat to the bald eagle's full recovery, breeding populations in most areas of the country are making encouraging progress. The following continue to be important conservation measures (USFWS 2003):
Avoid disturbance to nests during the nesting season: January – August.
Avoid disturbance to roosts during the wintering season: November – March.
Protect riparian areas from logging, cutting, or tree clearing.
Protect fish and waterfowl habitat in bald eagle foraging areas.
Development of site-specific management plans to provide for the long-term availability of habitat

2.2.2.10 White-faced ibis[12]

Focal Habitat – Species Box
Riparian and wetlands
Columbia Spotted Frog
American Beaver
Yellow Warbler
Bald Eagle
White-faced Ibis

Image 2.18. White-faced ibis; photo credits Tom J. Ulrich.

[12] This species account is based in part on a draft by Tim Dykstra, Shoshone-Paiute Tribes, 3-23-2004.

The white-faced ibis (*Plegadis chihi*) is a highly mobile, long-legged wading bird with a distinctively long, decurved bill. They are highly gregarious colony nesters that can also be found foraging in flocks (Ryder and Manry 1994). White-faced ibises have been identified by some ranchers as detrimental to alfalfa crops due to trampling and soil compaction.

The majority of recent North American works consider white-faced ibis a full species with no recognition of subspecies. White-faced ibises are associated with wetland areas such as reservoirs and irrigated fields during breeding and migration. During the breeding season, birds are usually found at inland, shallow marshes with "islands" of emergent vegetation. If regular nesting areas are dry from drought or human drainage, white-faced ibis will find new areas for nesting. During the nesting period, birds may forage 3 – 6 km from the breeding colony but have been documented traveling as far as 18 km. Towards the end of the breeding season, adults in Idaho were documented traveling 40 – 48 km between daytime feeding areas and nighttime roosts in tall emergents.

The White-faced ibis occurs in four habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.15) the White-faced ibis is closely associated with the following habitat:

- Herbaceous Wetlands

And they are generally associated with the following three habitats:

- Desert Playa and Salt Scrub Shrublands
- Agriculture, Pastures, and Mixed Environs
- Open Water - Lakes, Rivers, and Streams

Table 2.15. White-faced Ibis (Plegadis chihi) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Desert Playa and Salt Scrub Shrublands	Generally Associated	Feeds	Moderate	In wet areas.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds	High	Associated with irrigated fields on the Eastside.
Open Water - Lakes, Rivers, and Streams	Generally Associated	Feeds	Moderate	none
Herbaceous Wetlands	Closely Associated	Feeds and Breeds	High	none
Total Habitat Associations with White-faced Ibis:	4			

The White faced ibis is most closely associated with the Herbaceous Wetlands habitat -- where it feeds and breeds. This habitat may be found on permanently or seasonally flooded wetlands. In general, this habitat is flat, usually with stream or river channels or open water present. Herbaceous wetlands are found in all terrestrial habitats except Subalpine Parkland, Alpine Grasslands, and Shrublands habitats (Crawford et al. nwhi.org/ibis 2004). Herbaceous wetland habitat is generally a mix of emergent herbaceous plants with a grass-like life form (graminoids). Various wetland communities are found in mosaics or in nearly pure stands of single species. Herbaceous cover varies from open to dense.

The breeding range of U.S. populations includes northern California, eastern Oregon, southern Idaho, northern Nevada, southern Alberta, Montana, eastern North and South Dakota, and northwest Iowa south to the Mexican states of Durango and Jalisco (Ryder and Manry 1994). Coastal Texas and Louisiana also support breeding white-faced ibis. Northernmost populations regularly migrate north-south to coastal Texas and Louisiana and Mexico. Birds may also be found wintering in southern California and the lower Colorado River Valley of Arizona. Birds in the Owyhee subbasin usually arrive on the breeding grounds in April and leave between September and October. In the Great Basin, the largest nesting colonies are usually in stands of hardstem bulrush (*Scirpus acutus*), Olney's bulrush (*S. olneyi*), and alkali bulrush (*S. paludosus*). Nests have been observed at Carson Lake, Nevada, and Malheur National Wildlife Refuge, Oregon, in hardstem bulrush. Although data are lacking, white-faced ibises are presumed to be monogamous and produce one clutch a year. Nests are usually constructed in emergent vegetation or low trees and shrubs over shallow water although they may be found on the ground on small islands. Nesting may be delayed by high water or habitat degredation (i.e., vegetation damaged by fire or herbivorous mammals). If an early nesting attempt fails, they may attempt to renest, but second clutches have been documented as less successful. Two to five eggs may be laid per clutch, and in Nevada, a mean clutch size of 3.21 (n = 140, Henny and Herron 1989) was calculated. Eighty-three percent (n = 42) of nests in the same area produced ≥ one 7-day-old chick. Annual reproductive success was 2.54 per successful nest (n = 150), but lifetime reproductive success is unknown. The oldest bird known in the wild was 14.5 yr-old but band recoveries in Utah (n = 111) documented all birds dying by nine years of age (Ryder and Manly 1994).

Threats to survival include exposure (particularly small nestlings) and predation (Ryder and Manry 1994). Predation on adults is probably negligible but on the feeding grounds, large raptors (e.g. peregrine falcons or red-tailed hawks) will occasionally take them. Eggs and small nestlings are at risk to avian and terrestrial nest predators. The main foods consumed by white-faced ibises include aquatic and moist-soil insects, crustaceans, and earthworms. Feeding sites are typically shallowly flooded pond margins, reservoirs, marshes, or flooded agricultural fields where vegetation is <5 to 90 cm high. Plant materials and seeds that have been consumed by white-faced ibis are believed to have been incidentally ingested. In Idaho, the importance of mudflats as a source of highly concentrated earthworms and chironomid larvae was stressed by Taylor et al. (1989). These areas enable ibises to increase fat reserves prior to fall migration.

White-faced ibises are highly mobile and will shift breeding areas between years, making population census efforts difficult in the absence of coordinated surveys with standardized techniques repeated at regular intervals (Ryder and Manry 1994). Annual or biannual censusing of breeding colonies occurs in Nevada, Oregon, and Texas but is sporadic and incomplete in Idaho and other states. Population surveys and status assessments require coordinated efforts between states, agencies, and other relevant parties. White-faced ibis surveys in the western BBS region (+22.3%, $P < 0.001$, n = 36) indicate populations have been increasing between 1966 and 2002 (Sauer et al. 2003). The Donabahba Yogee marsh on the Duck Valley Indian Reservation and within the Owyhee subbasin has a large colony of nesting white-faced ibis (>2000 birds in 1993, John Doremus pers. Com.). A pair of white-faced ibises was observed near the USAF Grasmere Study Area in 1996. Potential breeding habitat exists in Wickahoney and China Ponds near Grasmere (USAF 1998). Ibis also can be found in irrigated fields throughout the subbasin. White-faced ibis have been observed in areas near the Owyhee subbasin such as the Cedar Mesa Reservoir, Heil Reservoir, and Camas Slough Reservoir in the spring (BLM Jarbidge Resource Area, Klott 1996)(Table 2.2). White-faced ibis is protected by Idaho and Nevada and is classified as a type 4 sensitive species by the Idaho BLM (ICDC 2003). The heritage ranking of G5S2B qualifies white-faced ibis as globally secure but as a rare breeder in Idaho (ICDC 2003).

Limiting factors for white-faced ibis include pesticides and habitat deterioration. DDT continues to be used on the wintering grounds in Mexico, and contaminant concentrations (DDE) remain high in Great Basin white-faced ibis populations which can contribute to a decrease in productivity. Cattle grazing and trampling of nesting habitat, prescribed burning of emergent vegetation to enhance habitat for waterfowl, drought, and human disturbance to nesting colonies can all impact nesting success (Ryder and Manry 1994). Areas successfully mitigated by allocating limited water resources to prioritized breeding area(s).

2.2.2.11 California quail

Focal Habitat – Species Box
Agricultural Lands
California Quail

The California quail was selected by the Owyhee Subbasin planning group to be representative of agricultural lands (Image 2.19).

Image 2.19. California quail; photo credits Hugh P. Smith Jr.

The California quail and introduced species, is a small, plump bird with a short black beak. The male has a gray chest and brown back and wings. It has a black throat with white stripes and a brown cap on its head. The female has a gray or brown head and back and a lighter speckled chest and belly. Both the male and the female have a curved black crown feather on their foreheads. The male's crown feather is larger than the females. The California quail is sometimes called the valley quail.

The California quail occurs in seven habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.16): The California Quail is generally associated with the following seven habitats:

- Western Juniper and Mountain Mahogany Woodlands
- Interior Canyon Shrublands
- Interior Grasslands
- Shrub-steppe
- Agriculture, Pastures, and Mixed Environs
- Urban and Mixed Environs
- Interior Riparian-Wetlands

Table 2.16.California Quail (Callipepla californica) association with all habitats occurring in the OWYHEE Subbasin: (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Western Juniper and	Generally	Feeds	High	none

Mountain Mahogany Woodlands	Associated	and Breeds		
Interior Canyon Shrublands	Generally Associated	Feeds and Breeds	High	none
Interior Grasslands	Generally Associated	Feeds and Breeds	High	Uses this habitat if adjacent to urban, agriculture, or Eastside Riparian habitats.
Shrub-steppe	Generally Associated	Feeds and Breeds	High	Uses this habitat if adjacent to urban, agriculture, or eastside riparian habitats.
Agriculture, Pastures, and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Urban and Mixed Environs	Generally Associated	Feeds and Breeds	High	none
Interior Riparian-Wetlands	Generally Associated	Feeds and Breeds	High	Uses this habitat where adjacent to more open habitats.
Total Habitat Associations with California Quail:	7			

Habitat:
Grasslands, foothills, woodlands, canyons and the edge of deserts are area California Quail are associated with. They like areas with lots of brush. California quail are most commonly found in the west coast regions of the United States. California quail prefer living in open woodlands, bushy foothills, valleys with streams, and suburbs. They can also live in brushland and agricultural land (National Geographic 1999; Handbook of the Birds of the World, Volume 2).

Range:
The California quail can be found from southern Oregon to southern California and east into Nevada. Within the Owyhee Subbasin, populations exist in abundance on agricultural lands located below the Owyhee dam.

2.2.2.12 Grasshopper sparrow[13]

Focal Habitat – Species Box
Grasslands

[13] This species account is based in part on a draft by Paul Ashley, Stacy Stoval, Southeast Washington Ecoregional Assessment., January 2004.

Grasshopper Sparrow

The grasshopper sparrow (Image 2.20) was selected by the Owyhee Subbasin planning group to be representative of grasslands.

Image 2.20. Grasshopper sparrow; photo credits Alvin E. Staffan.

Grasshopper sparrows are active ground or low shrub searchers. Vickery (1996) states that exposed bare ground is the critical microhabitat type for effective foraging. Bent (1968) observed that grasshopper sparrows search for prey on the ground, in low foliage within relatively dense grasslands, and sometimes scratch in the litter.

Many of these steppe, grassland, species are declining in our area. BBS data (Robbins et al. 1986) have shown a decreasing long term trend for the grasshopper sparrow (1966-1998) (Sauer *et al.* 1999). Throughout the U.S., this sparrow has experienced population declines throughout most of its breeding range (Brauning 1992, Brewer *et al.* 1991, Garrett and Dunn 1981). In 1996, Vickery (1996) reported that grasshopper sparrow populations have declined by 69% across the U.S. since the late 1960s. In Oregon it is considered as a naturally rare, vulnerable species, and a state Heritage program status as imperiled.

The Grasshopper Swallow occurs in four habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.17): The Grasshopper Swallow is closely associated with the following two habitats:

- Interior Grasslands
- Agriculture, Pastures, and Mixed Environs

Table 2.17. Grasshopper Sparrow (Ammodramus savannarum) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Interior Grasslands	Closely Associated	Feeds and Breeds	High	none
Shrub-steppe	Generally Associated	Feeds and Breeds	High	none
Dwarf Shrub-steppe	Generally Associated	Feeds and Breeds	High	none
Agriculture, Pastures, and Mixed Environs	Closely Associated	Feeds and Breeds	High	none
Total Habitat Associations with Grasshopper Sparrow:	4			

Habitat Requirements

Grasshopper sparrows prefer grasslands of intermediate height and are often associated with clumped vegetation interspersed with patches of bare ground (Bent 1968, Blankespoor 1980, Vickery 1996). Other habitat requirements include moderately deep litter and sparse coverage of woody vegetation (Smith 1963; Bent 1968; Wiens 1969, 1970; Kahl et al. 1985; Arnold and Higgins 1986). In east central Oregon grasshopper sparrows occupied relatively undisturbed native bunchgrass communities dominated by *Agropyron spicatum* and/or *Festuca idahoensis*, particularly north-facing slopes on the Boardman Bombing Range, Columbia Basin (Holmes and Geupel 1998).

In portions of Colorado, Kansas, Montana, Nebraska, Oklahoma, South Dakota, Texas, Wisconsin, and Wyoming, abundance of grasshopper sparrows was positively correlated with percent grass cover, percent litter cover, total number of vertical vegetation hits, effective vegetation height, and litter depth; abundance was negatively correlated with percent bare ground, amount of variation in litter depth, amount of variation in forb or shrub height, and the amount of variation in forb and shrub heights (Rotenberry and Wiens 1980).

Grasshopper sparrows have also been found breeding in Conservation Reserve Program (CRP) fields, pasture, hayland, airports, and reclaimed surface mines (Wiens 1970, 1973; Harrison 1974; Ducey and Miller 1980; Whitmore 1980; Kantrud 1981; Renken 1983; Laubach 1984; Renken and Dinsmore 1987; Bollinger 1988; Frawley and Best 1991; Johnson and Schwartz 1993; Klute 1994; Berthelsen and Smith 1995; Hull et al. 1996; Patterson and Best 1996; Delisle and Savidge 1997; Prescott 1997; Koford 1999; Jensen 1999; Horn and Koford 2000). In Alberta, Manitoba, and Saskatchewan, grasshopper sparrows are more common in grasslands enrolled in the Permanent Cover Program

(PCP) than in cropland (McMaster and Davis 1998). PCP was a Canadian program that paid farmers to seed highly erodible land to perennial cover; it differed from CRP in that haying and grazing were allowed annually in PCP.

Grasshopper sparrows occasionally inhabit cropland, such as corn and oats, but at a fraction of the densities found in grassland habitats (Smith 1963, Smith 1968, Ducey and Miller 1980, Basore et al. 1986, Faanes and Lingle 1995, Best *et al.* 1997). Grasshopper sparrows are also included as members of shrub-steppe communities, occupying the steppe habitats.

Limiting Factors for the Grasshopper Sparrow

The principal post-settlement conservation issues affecting bird populations include: habitat loss and fragmentation resulting from conversion to agriculture; and habitat degradation and alteration from historic improper livestock grazing, invasion of exotic vegetation, and alteration of historic fire regimes. Conversion of shrub-steppe lands to agriculture adversely affects landbirds in two ways:

- Native habitat is in most instances permanently lost, and
- Remaining shrub-steppe is isolated and embedded in a highly fragmented landscape of multiple land uses, particularly agriculture.

Fragmentation resulting from agricultural development or large fires fueled by cheatgrass can have several negative effects on landbirds. These include: insufficient patch size for area-dependent species, and increases in edges and adjacent hostile landscapes, which can result in reduced productivity through increased nest predation, nest parasitism, and reduced pairing success of males. Additionally, fragmentation of shrub-steppe has likely altered the dynamics of dispersal and immigration necessary for maintenance of some populations at a regional scale. In a recent analysis of neotropical migratory birds within the Interior Columbia Basin, most species identified as being of "high management concern" were shrub-steppe species (Saab and Rich 1997) which includes the grasshopper sparrow.

Approximately 6 million hectares of shrub-steppe have been converted to wheat fields, row crops, and orchards in the interior Columbia Basin (Quigley and Arbelbide 1997). Large scale reduction and fragmentation of sagebrush habitats have occurred due to a number of activities, including land conversion to tilled agriculture, urban and suburban development, and road and power-line rights of way. Range improvement programs remove sagebrush by burning, herbicide application, and mechanical treatment, replacing sagebrush with annual grassland.

2.2.2.13 California Bighorn sheep

Focal Habitat – Species Box
Canyon / Gorge

California bighorn sheep
Peregrine falcon

The California bighorn sheep is one of two species selected by the Owyhee Subbasin planning group to be representative of the Canyon / Gorge habitat (Image 2.21):

Image 2.21. California bighorn sheep; photo credits Michael H. Francis.

At one time, bighorn sheep roamed much of the western portion of North America. They existed in several subspecies and occupied from the Canadian Rockies of Alberta south to the mountain ranges of Mexico including portions of Oregon. In the mid-1800's they were quite numerous with an estimated population between 1.5 and 2 million (Seton 1953, Buechner 1960). As a result of the expansion of civilization without management protection, by 1900 they had been reduced to thousands and were extirpated from much of their former range (Oregon Department of Fish and Wildlife 2003)

Rocky Mountain bighorn sheep were extirpated from the Subbasin in the mid-1940's. As a result of transplant efforts, populations have been re-established. The Bighorn Sheep occurs in six habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.18):

Bighorn Sheep are most closely associated with the following two habitats:

- Alpine Grasslands and Shrublands
- Interior Canyon Shrublands

Table 2.18. Bighorn Sheep (Ovis canadensis) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Present	Feeds	Moderate	none
Interior Mixed Conifer Forest	Present	Feeds	Moderate	none
Alpine Grasslands and Shrublands	Closely Associated	Feeds and Breeds	High	none
Interior Canyon Shrublands	Closely Associated	Feeds and Breeds	High	none
Interior Grasslands	Generally Associated	Feeds and Breeds	High	none
Agriculture, Pastures, and Mixed Environs	Present	Feeds	High	May use unimproved pastures.
Total Habitat Associations with Bighorn Sheep:	6			

California bighorns historically were and still are the most abundant in Oregon (Toweill and Geist 1999).

Grasses are the major item in bighorn diets throughout most of the year. However, forbs and shrubs are seasonally important depending on type and availability. Bighorn sheep generally are not competitors for forage with domestic cattle and other big game species because they typically occupy rugged habitats not used by other big game species. Domestic sheep can compete with bighorn sheep for forage because open range operations frequently include trailing through remote, rugged habitat. (Oregon Department of Fish and Wildlife 2003).

Bighorn sheep habitat typically is comprised of rugged habitat that is used by the sheep for security from predation. This habitat can be in the form of Canyons characterized by rim rocks with grass interspersed in the steep slopes between the rocky outcrops, alpine habitat which can be high elevation lush meadows or rocky security cover, or steep grass covered slopes as winter habitat (Oregon Department of Fish and Wildlife 2003). Rocky Mountain bighorn sheep occupying alpine habitat generally use it for summer range and migrate to lower elevation grassy slopes or canyon habitat to winter. Bighorns living in canyon habitat most often occupy that same habitat year-round. In many cases, canyon habitat grasses dry out during August and September. As a result, sheep in these areas may become stressed for nutrition during autumns with little rainfall (Oregon Department of Fish and Wildlife 2003).

Currently there are three key factors which threaten the Rocky Mountain bighorn sheep:

- The continuing threat of disease transmission from domestic sheep and goats both in the high elevation areas of the subbasin and in the privately owned river bottom farmsteads that are oriented below the bighorn sheep habitat.
- A large portion of the core bighorn sheep habitat not being in protected status and vulnerable to land management changes negative to bighorn sheep.
- The continued threat of noxious weed invasion.

2.2.2.14 Peregrine falcon[14]

Focal Habitat – Species Box
Canyon / Gorge
California bighorn sheep
Peregrine falcon

Although the peregrine falcon (Image 2.22) occurs in all habitat types in the Owyhee Subbasin, it was one of two species selected by the Owyhee Subbasin planning group to be representative of the Canyon / Gorge habitat:

Image 2.22. Peregrine falcon; photo credits Tom McHugh.

The peregrine was described by Peterson (1988), as "the most efficient flying machine, the best-designed bird, and the fiercest and fastest bird – all these superlatives have been

[14] This species account is based on a draft by Keith Paul, US Fish & Wildlife Service, 04/13/04.

claimed for the peregrine." They are described as the fastest animal on the planet, reaching speeds in excess of 240 mi/hr (380 km/hr) in dives after prey (Henny and Pagel 2003). Pagel (Henny and Pagel 2003), notes that "they are one of Oregon's boldest raptors, and have been observed usurping active golden eagle nest sites, stealing fish from osprey and ground squirrels from red-tailed hawks, as well as regularly driving away adult bald eagles who stray into their territories."

Peregrines are medium-sized raptors, and share characteristics with all falcons: bill conspicuously toothed and notched, presence of a nasal cone, and pointed wings for swift flight (Henny and Pagel 2003). The male is smaller than the female (about the size of the American crow); the female about the size of a raven (Henny and Pagel 2003). The adult peregrine is described by Gabrielson and Jewett (1940) with sides of the head and neck black, in striking contrast to white or buffy throat and breast; the rest of the underparts deeper colored and spotted or barred with blackish color; lighter on rump, indistinctly barred with dusky color; wing quills blackish, inner webs of quills spotted regularly with buffy or yellowish brown; tail blackish, crossed by eight to ten light grayish bars, and with a narrow white tip.

The Peregrine Falcon occurs in sixteen habitat types in the Owyhee Subbasin -- based on current wildlife-habitat types (Table 2.19) the Peregrine Falcon is present in the following three habitats:

- Dwarf Shrub-steppe
- Desert Playa and Salt Scrub Shrublands
- Agriculture, Pastures, and Mixed Environs

The Peregrine Falcon is generally associated with the following thirteen habitats:

- Montane Mixed Conifer Forest
- Interior Mixed Conifer Forest
- Upland Aspen Forest
- Alpine Grasslands and Shrublands
- Western Juniper and Mountain Mahogany Woodlands
- Interior Canyon Shrublands
- Interior Grasslands
- Shrub-steppe
- Urban and Mixed Environs
- Open Water - Lakes, Rivers, and Streams
- Herbaceous Wetlands
- Montane Coniferous Wetlands
- Interior Riparian-Wetlands

Table 2.19 peregrine falcon (Falco peregrinus) association with all habitats occurring in the OWYHEE Subbasin (Source: nwhi.org/ibis).

Wildlife-Habitat Type	Association Type	Activity Type	Confidence Level	Comments
Montane Mixed Conifer Forest	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Interior Mixed Conifer Forest	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Upland Aspen Forest	Generally Associated	Feeds	Low	none
Alpine Grasslands and Shrublands	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Western Juniper and Mountain Mahogany Woodlands	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Interior Canyon Shrublands	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Interior Grasslands	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Shrub-steppe	Generally Associated	Feeds and Breeds	High	Requires suitable.cliffs for nesting.
Dwarf Shrub-steppe	Present	Feeds	Moderate	none
Desert Playa and Salt Scrub Shrublands	Present	Feeds	Moderate	none
Agriculture, Pastures, and Mixed Environs	Present	Feeds	High	none
Urban and Mixed Environs	Generally Associated	Feeds and Breeds	High	Requires suitable.buildings, bridges, or cliffs for nesting.
Open Water - Lakes, Rivers, and Streams	Generally Associated	Feeds	High	none
Herbaceous Wetlands	Generally Associated	Feeds	High	none
Montane Coniferous Wetlands	Generally Associated	Feeds	High	none
Interior Riparian-Wetlands	Generally Associated	Feeds and Breeds	High	Needs cliffs for nesting.
Total Habitat Associations with Peregrine Falcon:	16			

Diet

Peregrines hunt primarily at dusk and dawn. They strike and capture birds in mid-air, a strategy that requires open space. Thus, they often hunt over open water, marshes, valleys, fields, and tundra (WIDNR 2002).

A peregrine hunts from the wing or high from a perch. It spots prey with keen eyes and begins its stoop, a streamlined dive with tail and wings folded and feet lying back. The falcon hits its prey with its foot, stunning or killing it, and then swoops back around to catch it in mid-air. If they prey is too heavy to carry, the peregrine will let it fall to the ground and eat it there. Peregrines pluck their prey before eating it (WIDNR 2002).

Breeding Territory/Home Range

Cade (1960) found a minimum territory of about 300 ft (96 m) radius around nests in Alaska (CDFG 2004). White and Cade (1971) reported that mean spacing between nests was 6 mi (9.7 km) along Alaska rivers (CDFG 2004). Inland breeding site from California varied from 3-7 mi (5-12 km) apart (CDFG 2004). In the Rocky Mountains, home range included the area encompassed by a radius up to 14 mi (23 km) from cliff nests (CDFG 2004). In Sonoma County, California, home range was approximately 125 mi^2 (320 km^2) (CDFG 2004). Typically, territory and home range size depends upon suitable.nesting habitat and prey availability.

Habitat Requirements

Peregrines nest on cliffs ranging in height from a 75 ft (23m) escarpment at a reclaimed quarry to monolithic 1,500 ft (457 m) high cliffs, as well as on structural features of bridges. Average occupied cliff size in the Cascade Mountains is 229 ft (70 m), and in the Siskiyou Mountains of Oregon and northern California 135 ft (41 m). Pagel (Henny and Pagel 2003) also described nests as located on ledges and potholes with and without protective overhang. Stick nests originally constructed by common ravens, golden eagles, and red-tailed hawks were recorded at five Oregon locations (Henny and Pagel 2003). At some nest sites, a clear preference was shown for the same nest ledge in successive years, whereas at other locations resident pairs have selected different nest ledges each year (Henny and Pagel 2003). The smallest nest ledge was 6 in (15 cm) deep by 12 in (30 cm) wide; the largest was 22 ft (6.7 m) wide and 9 ft (2.7 m) deep (Henny and Pagel 2003). Nest ledges are usually located within 40-80% of total cliff height (Henny and Pagel 2003).

<u>Threats other than environmental contaminants</u>
Threats to the peregrine include loss of wetland habitat of primary prey, poachers robbing nests, and shooting by hunters (NatureServe 2004).

Factors Affecting Population Status

Local and regional data document the continued presence and effects of persistent chemical compounds in North American Peregrines. Many studies have documented the relationship between concentrations of DDE (a metabolite of DDT) and eggshell thinning (Morse 1994, Steidl et al. 1991, Court et al. 1990, Hickey and Anderson 1968). Studies in Alaska show that mercury may be at levels that affect peregrine reproduction and that these mercury levels are actually increasing over time (Ambrose et al. 2000). While the U.S. has implemented regulations on the use of DDT and other pesticides, peregrines that winter in other countries still using those chemicals may be at risk of accumulating contaminants from their avian prey (Banasch et al. 1992; Johnstone et al. 1996), some of which return to nest in the north and are a potential source of contaminants for both migratory and non-migratory peregrines (Fyfe et al. 1990). The 1997 North American Regional Action Plan, which recommends that the U.S., Canada, and Mexico cooperate in a phased reduction in the use and distribution of DDT across the continent, has been very successful in reducing DDT use in Mexico.

Although peregrines are still accumulating contaminants from their prey, the levels are currently low enough to allow for successful reproduction and expansion of the population. Nonetheless, the continual introduction of anthropogenic chemicals to the environment far outpaces research on their effects on wildlife.

Objective

The peregrine monitoring plan is primarily designed to detect declines in territory occupancy, nest success, and productivity is six regions across the United States.

2.3 Out-of-Subbasin Effects[15]

From a holistic "big picture" perspective, three "out-of-subbasin" effects have had a major impact on the Owyhee River ecosystem:

(1) Effects on Terrestrial Focal Species;
(2) Dam and reservoir construction to support a an agrarian culture; and,
(3) Climatic Changes and Catastrophic events.

2.3.1 Effects on Terrestrial Focal Species

A number of the terrestrial focal species spend a portion of their life cycle outside the Brueau River subbasin's designated boundaries. Although most are nongame avian species, at least one upland game species and several big game species potentially migrate between State jurisdictions. Depending on the extent, location, and timing of seasonal movements, out of subbasin effects may range from limited to potentially substantial. Potentially limiting factors encountered outside the subbasin including hunting, environmental toxins, and habitat degradation may influence species occurrence,

[15] This section id dervved in part from Vigg et al. (2002).