Draft
Owyhee
Subbasin Summary

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Prepared for the
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DRAFT: This document has not yet been reviewed or approved by the Northwest Power Planning Council

Owyhee Subbasin Summary

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Introduction

The Owyhee subbasin summary has been generated as part of the Northwest Power Planning Council's (NWPPC) Rolling Provincial Review Process. The NWPPC developed this process in February 2000 in response to recommendations by the Independent Scientific Review Panel (ISRP) and the Columbia Basin Fish and Wildlife Authority (CBFWA). This document is an attempt to summarize all the pertinent research and information currently available on fish and wildlife resources and their habitats in the Owyhee subbasin, including limiting factors and needs. The summary will provide context for project proposals during the provincial reviews while a more extensive subbasin plan is developed.

The development of this subbasin summary was initiated at an August 2, 2001 meeting in Boise, Idaho. A series of meetings were held in Boise between August 2nd and October 4, 2001. Representatives from interested agencies and groups participated in planning and providing feedback on this document. Agencies in Nevada, Idaho and Oregon provided information and reports and participated in the review process.

The Owyhee River drains large areas of Nevada, Idaho and Oregon. Three states, five counties and a multitude of federal and state agencies are involved in managing fish and wildlife resources (Figure 1). This summary is the first attempt to synthesize information from all management and jurisdictional units in order gain a comprehensive understanding of fish and wildlife issues and needs in the subbasin.

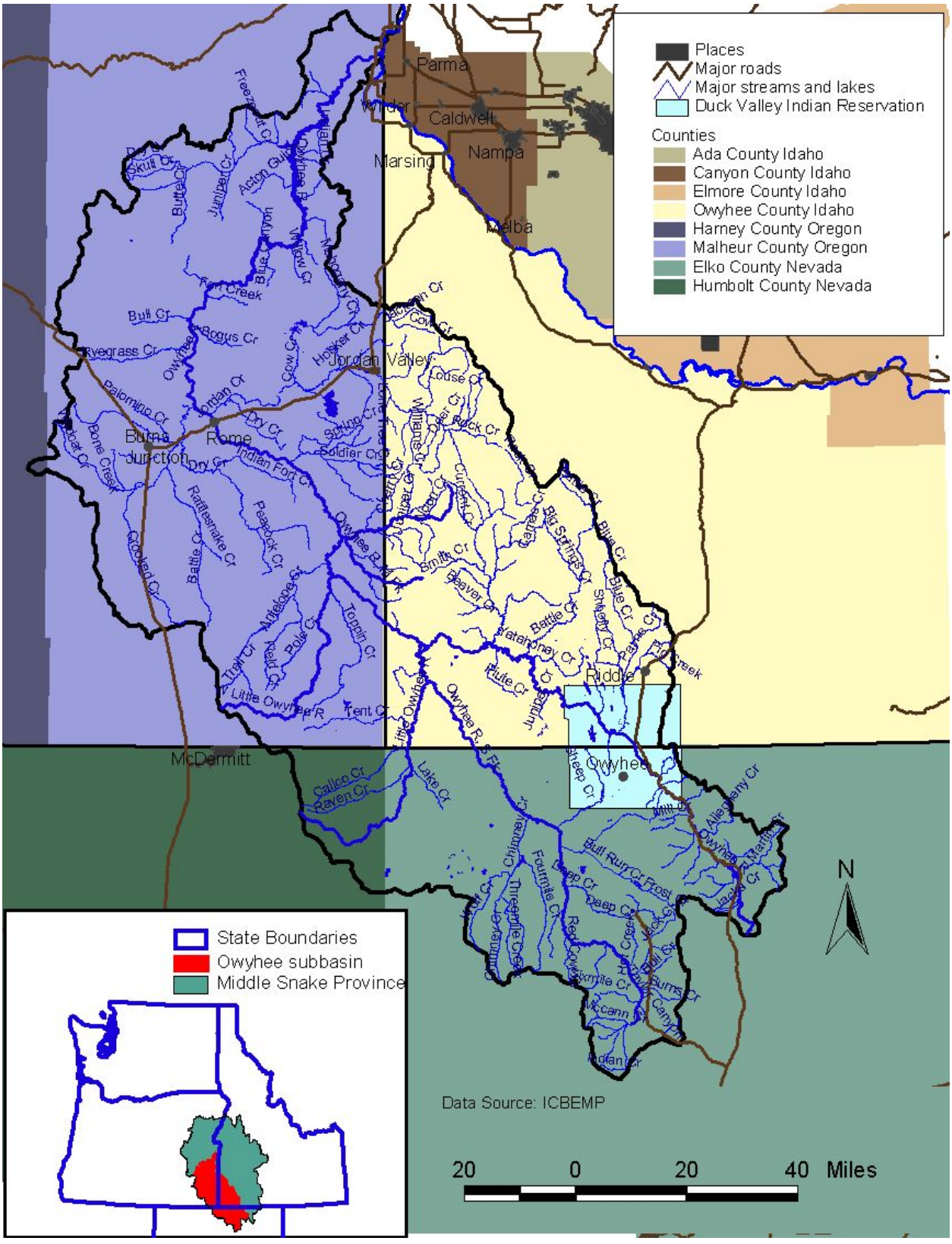

Figure 1. Location and major features, Owyhee subbasin

Subbasin Description

General Description

Subbasin Location

The Owyhee subbasin encompasses 11,049 square miles (7,070,976 acres) of southwestern Idaho, southeastern Oregon, and north central Nevada (Figure 1). The Idaho portion of the subbasin is bordered to the east by the Owyhee Mountains. 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 Sheeps head Mountains in the west define the Oregon portion of the subbasin. 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).

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. Colorful rocks and cliffs, volcanic spires, pinnacles and other formations give the area a stark beauty. 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 3). 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 3).

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.

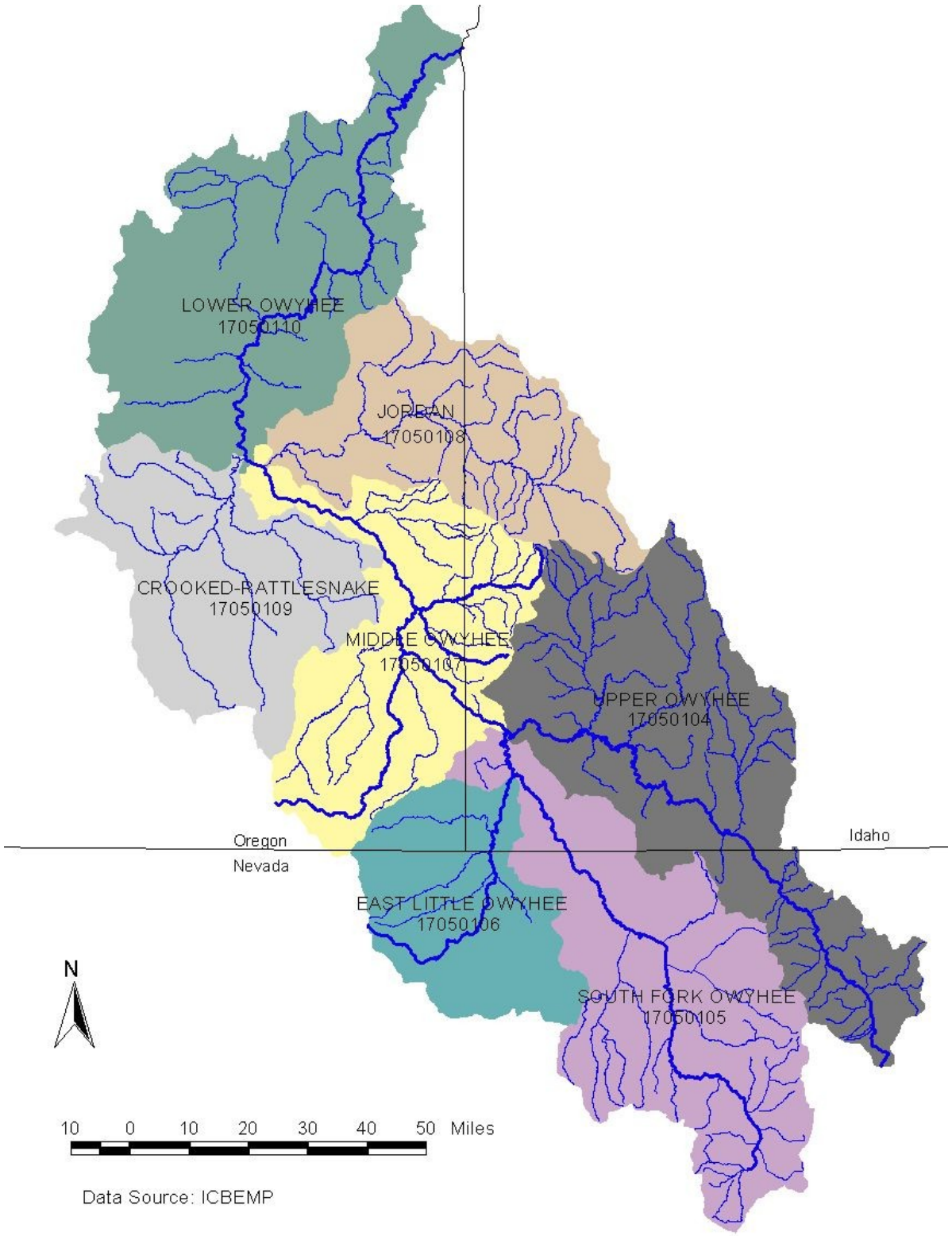

Figure 2. Fourth-field hydrologic unit codes (HUCs) in the Owyhee subbasin

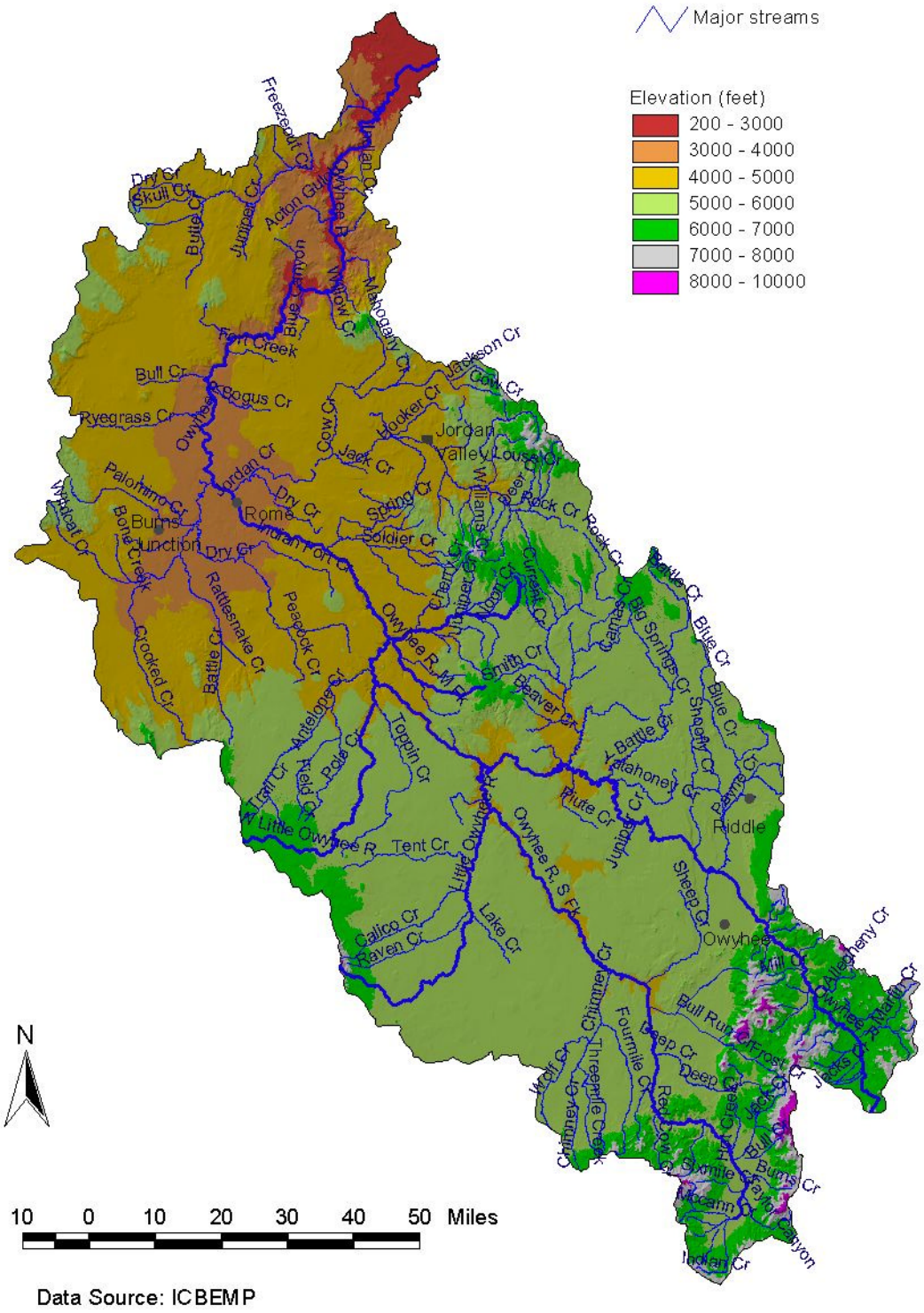

Figure 3. Elevation and topography, Owyhee subbasin

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 4, 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). An average of 64 days each year have temperatures of 90˚F or above.

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 5) (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 150 miles long and 50 miles wide lake 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).

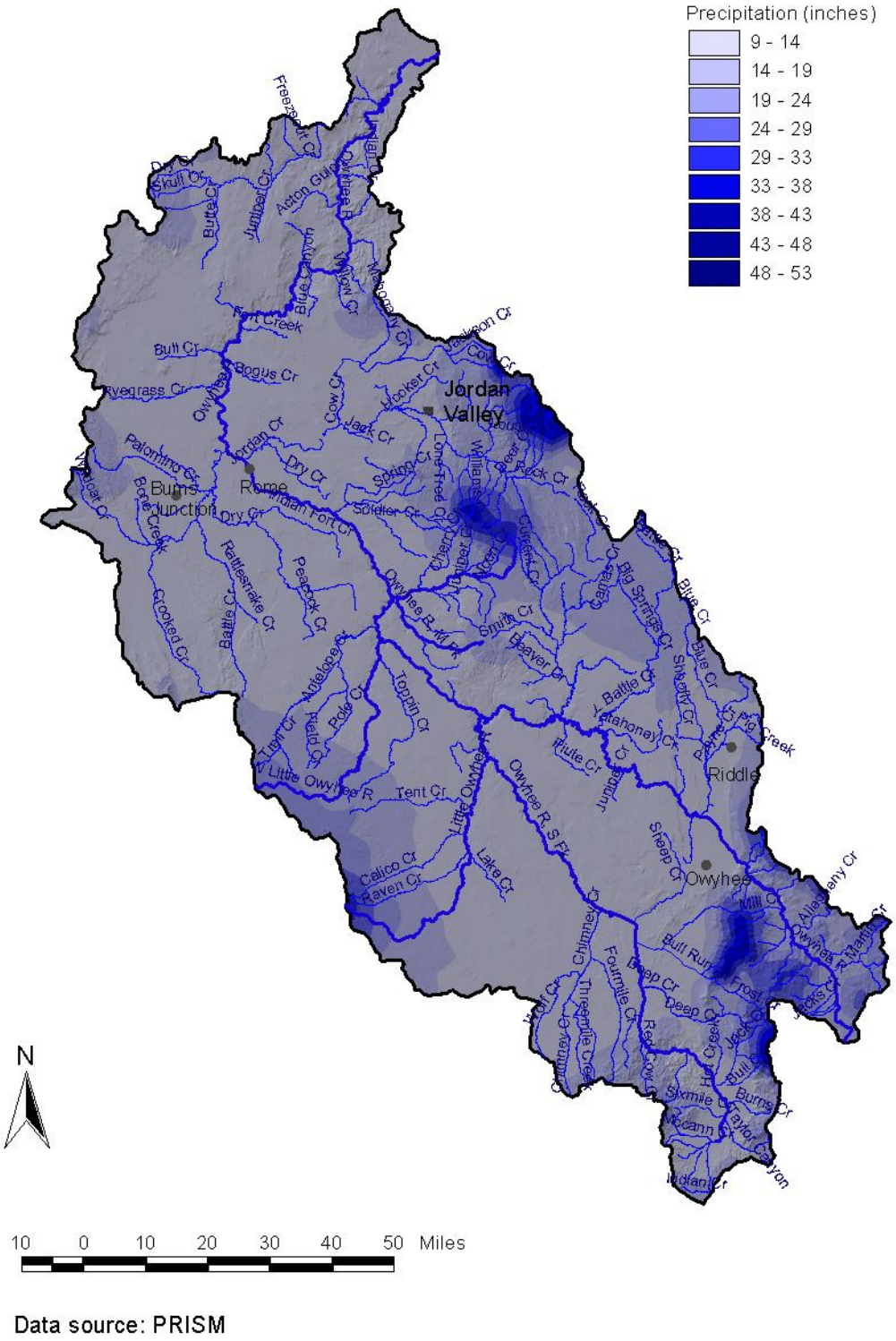

Figure 4. Precipitation patterns in the Owyhee subbasin

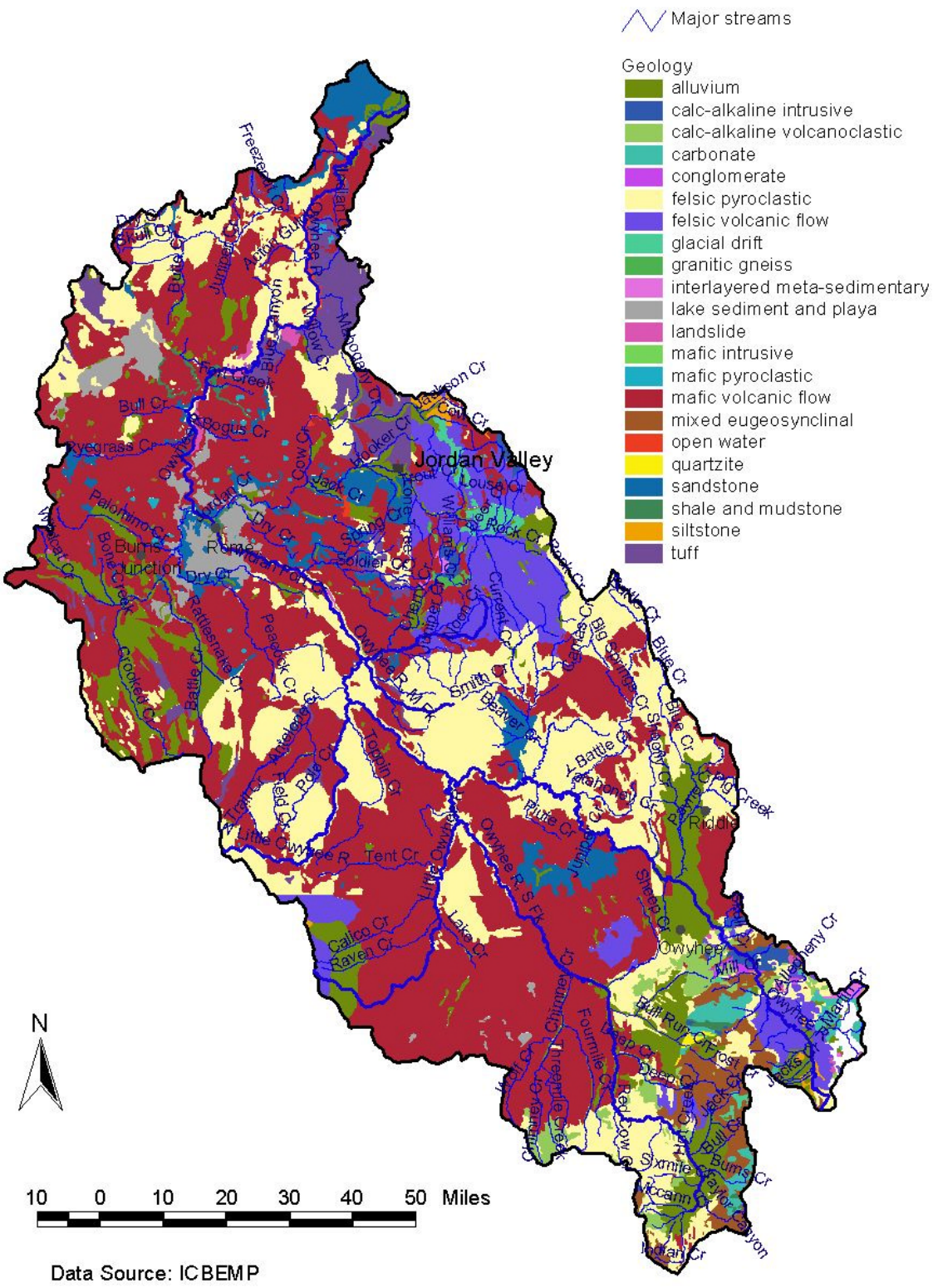

Figure 5. Geologic patterns of the Owyhee subbasin

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 1).

Table 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). 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 6 and Figure 7).

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 6; Figure 7). In the western part of the subbasin and in areas near the mouth of the Owyhee River, saltbush-greasewood plant communities occur (Kuchler 1964).

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).

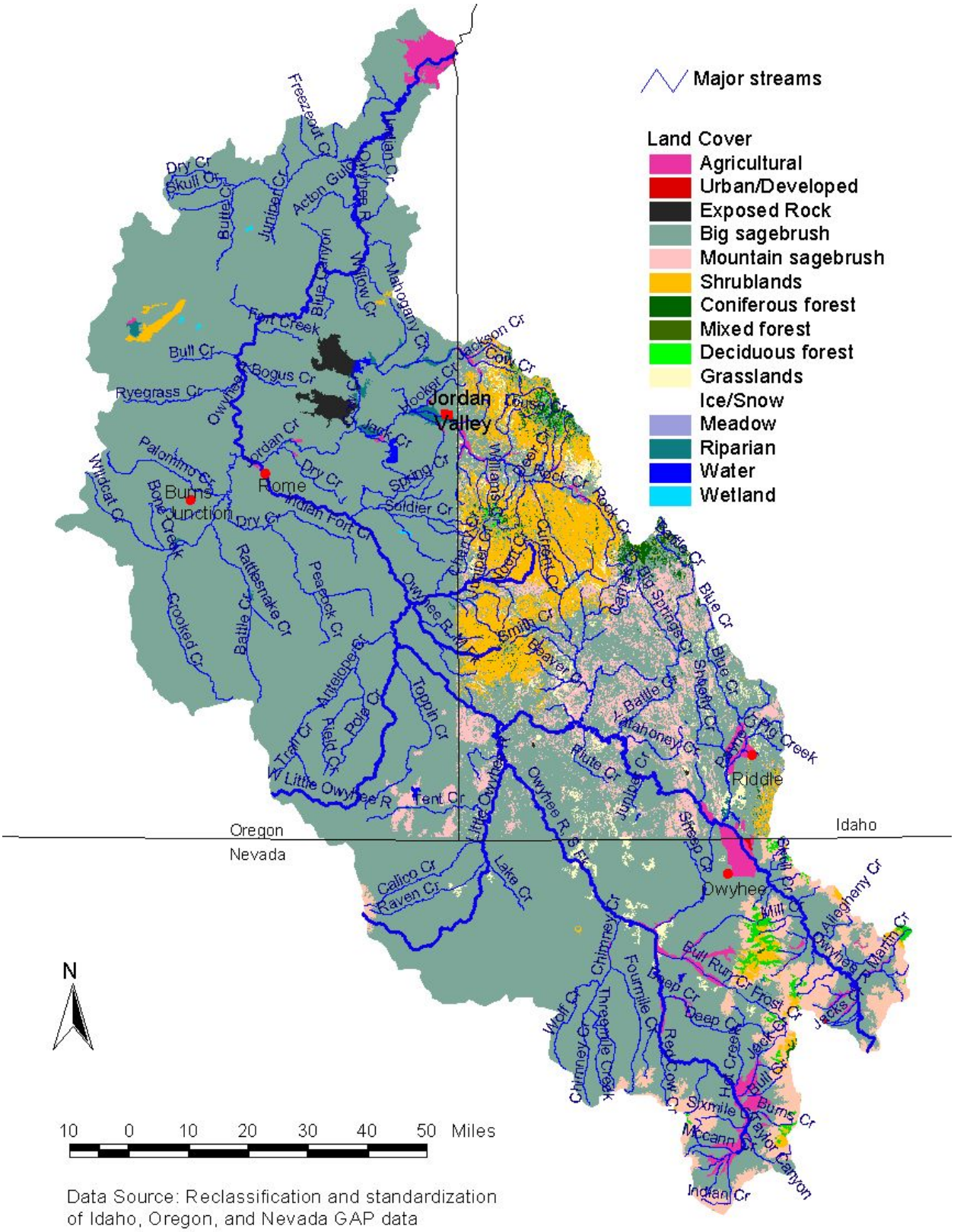

Figure 6. Vegetation in the Owyhee subbasin

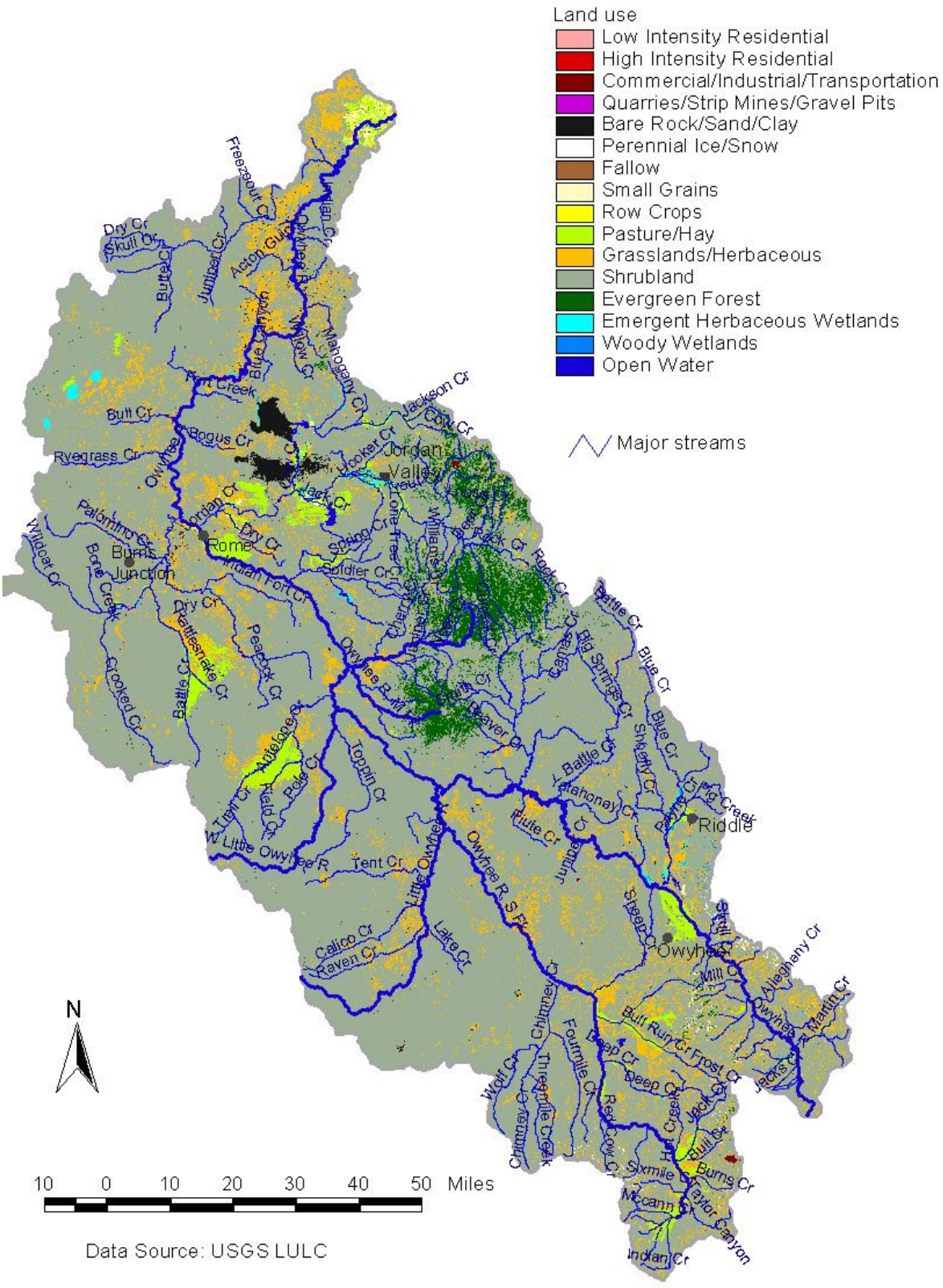

Figure 7. Land cover patterns in the Owyhee subbasin

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 southern portion of the subbasin, support aspen *(Populus* spp.*)*, Douglas fir (*Pseudotsuga menziesii)* and sub-alpine fir *(Abies lasiocarpa)* (Figure 6). 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, heavy grazing and other land use practices have facilitated the dispersion and expansion of juniper into former big sagebrush communities (USDI 1998; 1999). 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[1] 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 1983). 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 (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, heavily 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.

Table 2. Sensitive Plants in the Owyhee (ONHP 2001; ICDC 2001; NNHP 2001a; NNHP 2001b)

Scientific Name	Common Name	NVE[1]	NVH	OR	ID
Allenrolfea occidentalis	Iodine bush			x	
Allium bisceptrum	Two-stemmed onion			x	
Amsinckia carinata	Malheur Valley fiddleneck			x	
Angelica kingii	Nevada angelica				x
Antennaria arcuata	Meadow pussytoes	x			
Arabis falcatoria	Grouse Creek rockcress	x			
Arabis falcifructa	Elko rockcress	x			
Argemone munita	Prickly-poppy			x	
Artemisia packardiae	Packard's artemisia			x	
Artemisia papposa	Owyhee sagebrush			x	
Astragalus alvordensis	Alvord milkvetch			x	
Astragalus anserinus	Good Creek milkvetch	x			
Astragalus atratus var. owyheensis	Owyhee milkvetch			x	
Astragalus calycosus	King's rattleweed			x	
Astragalus calycosus var. monophyllidius	One-leaflet torrey milkvetch	x			
Astragalus jejunus var. jejunus	Starveling milkvetch	x			
Astragalus lentiginosus var. latus	Broad-pod freckled milkvetch	x			
Astragalus mulfordiae	Mulford's milkvetch			x	x
Astragalus newberryi var. castoreus	Newberry's milkvetch				x
Astragalus purshii var. ophiogenes	Snake River milkvetch			x	x
Astragalus robbinsii var. occidentalis	Lamoille Canyon milkvetch	x			
Astragalus solitarius	Lonesome milkvetch		x		
Astragalus sterilis	Barren milkvetch				x
Astragalus sterilis var. cusickii	Sterile milkvetch			x	

Scientific Name	Common Name	NVE[1]	NVH	OR	ID
Astragalus tetrapterus	Four-wing milkvetch			x	x
Astragalus tiehmii	Tiehm milkvetch		x		
Astragalus yoder-williamsii	Osgood Mountains/Mud Flat milkvetch	x	x		x
Atriplex powellii	Powell's saltbush			x	
Bergia texana	Texas bergia			x	
Blepharidachne kingii	King's desertgrass				x
Camissonia palmeri	Palmer's evening primrose			x	x
Camissonia pterosperma	Winged-seed evening primrose				x
Carex hystericina	Porcupine sedge			x	
Carex tumulicola	Foothill sedge				x
Castilleja pallescens var. inverta	Inverted pale paintbrush			x	
Caulanthus barnebyi	Barneby stemflower		x		
Caulanthus pilosus	Hairy wild cabbage			x	
Chaenactis cusickii	Cusick's false yarrow/Cusick's chaenactis			x	x
Chaenactis macrantha	Large-flowered chaenactis			x	
Chaenactis stevioides	Desert pincushion				x
Cleomella plocasperma	Alkali cleomella				x
Collomia renacta	Barren Valley collomia	x		x	
Coryphantha vivipara	Cushion cactus				x
Cryptantha humilis	Low cryptantha				
Cryptantha propria	Malheur cryptantha				
Cryptantha schoolcraftii	Schoolcraft catseye		x		
Cymopterus acaulis var. greeleyorum	Greeley's cymopterus/Greeley's wavewing			x	x
Cymopterus longipes ssp. Ibapensis	Ibapah wavewing				
Cyperus rivularis	Shining flatsedge				x
Damasonium californicum	Fringed waterplantain				x
Dimeresia howellii	Dimeresia				x
Downingia bacigalupii	Bacigalupi's downingia				x
Downingia insignis	Downingia				x
Dryopteris filix-mas	Male fern				
Eatonella nivea	White eatonella				x
Epipactis gigantea	Giant helleborine				x
Erigeron latus	Broad fleabane	x		x	
Eriogonum anemophilum	Windloving buckwheat		x		
Eriogonum argophyllum	Sulphur Springs buckwheat	x			
Eriogonum chrysops	Golden buckwheat			x	
Eriogonum crosbyae	Crosby buckwheat		x		
Eriogonum lewisii	Lewis buckwheat	x			
Eriogonum ochrocephalum	Ochre-flowered buckwheat			x	
Eriogonum salicornioides	Playa buckwheat			x	
Eriogonum shockleyi var. packardiae	Packard's buckwheat				x
Eriogonum shockleyi var. shockleyi	Matted cowpie buckwheat				x
Glyptopleura marginata	White-margined wax plant				x
Hackelia cronquistii	Cronquist's stickseed			x	
Hackelia ophiobia	Rattlesnake stickseed/Three Fork's stickseed			x	x
Hackelia patens var. patens	Spreading stickseed			x	
Heliotropium curassavicum	Salt heliotrope			x	

Scientific Name	Common Name	NVE[1]	NVH	OR	ID
Hymenoxys cooperi var. canescens	Cooper's goldenflower			x	
Ipomopsis polycladon	Spreading gilia				x
Ivesia rhypara var. rhypara	Grimy ivesia	x	x	x	
Ivesia shockleyi var. shockleyi	Shockley's ivesia			x	
Juncus torreyi	Torrey's rush			x	
Langloisia setosissima spp. punctata	Punctate langloisa			x	
Lathyrus grimesii	Grimes' vetchling	x			
Lepidium davisii	Davis' peppergrass	x		x	x
Lepidium montanum var. nevadense	Pueblo Valley peppergrass		x		
Lepidium papilliferum	Slick spot peppergrass				x
Leptodactylon glabrum	Bruneau River prickly phlox	x	x		x
Lipocarpha aristulata	Aristulate lipocarpha			x	
Lomatium foeniculaceum var. fimbriatum	Fringed desert-parsley			x	
Lomatium packardiae	Succor Creek parsley (Packards' desert parsley)		x	x	x
Lomatium ravenii	Raven's lomatium			x	
Lupinus biddlei	Biddle's lupine			x	
Lupinus uncialis	Inch-high lupine				x
Lygodesmia juncea	Rush-like skeletonweed			x	
Malacothrix torreyi	Torrey's malacothrix			x	
Melica stricta	Nodding melic			x	
Mentzelia mollis	Smooth stickleaf/Smooth mentzelia		x	x	x
Mentzelia packardiae	Packard stickleaf/Packard's mentzelia	x		x	
Mirabilis bigelovii var. retrorsa	Bigelow's four-o'clock			x	
Muhlenbergia minutissima	Annual dropseed			x	
Nemacladus rigidus	Rigid threadbush				x
Oryctes nevadensis	Oryctes		x		
Oxytropis sericea var. sericea	White locoweed			x	
Pediocactus simpsonii	Simpson's hedgehog cactus			x	x
Penstemen floribundus	Cordelia beardtongue		x		
Penstemon janishiae	Janish's penstomen			x	x
Penstemon kingii	King's penstemon			x	
Penstemon perpulcher	Beautiful penstemon			x	
Penstemon pratensis	White-flowered penstemon			x	
Penstemon seorsus	Short-lobed penstemon			x	
Penstomen procerus var. modestus	Small flower beardtongue	x			
Peteria thompsoniae	Spine-noded milkvetch				x
Phacelia gymnoclada	Naked-stemmed phacelia			x	
Phacelia inundata	Playa phacelia		x		
Phacelia lutea var. calva	Malheur yellow phacelia				x
Phacelia lutea var. mackenzieorum	Mackenzie's phacelia			x	
Phacelia minutissima	Least phacelia	x			x
Physaria chambersii	Chambers twinpod			x	
Plantago eriopoda	Hairy-foot plantain			x	
Polystichum kruckebergii	Kruckeberg's holly fern			x	
Potentilla basaltica	Soldier Meadow cinquefoil		x		
Potentilla cottamii	Cottam cinquefoil	x			
Primula capillaris	Ruby Mountains primrose	x			

Scientific Name	Common Name	NVE[1]	NVH	OR	ID
Psathyrotes annua	Annual brittlebrush				x
Psorothamnus kingii	Lahontan indigobush		x		
Pyrrocoma radiata	Snake River goldenweed			x	
Rafinesquia californica	California chicory			x	
Senecio ertterae	Ertter's senecio			x	
Silene nachlingerae	Nachlinger catchfly	x			
Smelowskia holmgrenii	Holmgren smelowskia		x		
Stanleya confertiflora	Biennial princesplume/Biennial stanleya			x	x
Stylocline filaginea	Stylocline				x
Stylocline psilocarphoides	Malheur stylocline			x	
Teucrium canadense var. occidentale	American wood sage				x
Thelypodium howellii spp. spectabilis	Howell's spectacular thelypody			x	
Trifolium leibergii	Leiberg clover	x			
Trifolium owyheense	Owyhee clover			x	x
Viola lithion	Rock violet	x			
Lichens					
Aspicilia fruticulosa	Rim Lichen		x		
Catapyrenium congestum	(no common name)				x

[1]ID = Idaho Conservation Data Center
NVH = Nevada Natural Heritage Program Humboldt County
NVE = Nevada Natural Heritage Program Elk County
OR = Oregon Natural Heritage Program

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 throughout many portions of the Owyhee subbasin is compromised and considered marginal for domestic, industrial and agricultural uses (BLM 1999). High concentrations of fluoride (mean fluoride content = 10.6 mg/l) and sodium have been measured in groundwater samples throughout the Owyhee Resource Area (BLM 1999). Fluoride creates a problem for domestic consumption and high sodium concentrations make the water unsuitable for irrigation.

Water quality impairment can be linked to historic and present land use activities. Livestock grazing, mining, and agricultural activities have all negatively impacted water quality.

Prolonged and intense grazing that results in the removal or elimination of riparian vegetation contributes 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).

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.

Current management practices in the subbasin are not contributing to the improvement of water quality. Of particular concern is the condition of riparian areas (Perkins and Bowers 2000; USDI 1997, 1997b, 1997c, 1998, 1999, 2000, 2000b). 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 also occur from improperly placed roads and poorly vegetated uplands (Perkins and Bowers 2000).

303(d) Listed Stream Segments

Section 303(d) of the Clean Water Act (CWA) requires that water bodies violating State or Tribal water quality standards be identified and placed on a 303(d) list. Nevada, Oregon and Idaho have streams on USEPA's 303(d) list for impaired water bodies. The Shoshone-Paiute Tribes water quality standards were submitted to USEPA in 2000 and are currently being reviewed by state and federal water quality agencies (Shoshone-Paiute Tribes 2000).

In 1988 the Oregon Department of Environmental Quality (ODEQ) rated portions of the subbasin as being moderately to severely water quality impaired (USDI-BLM 1993). Some of the problems identified include: sediment, nutrient loading, low dissolved oxygen (DO), turbidity, streambank structure, and low flow volumes. Most of the impacts originated from nonpoint sources and were related to vegetation removal, surface erosion, and changes in stream flow pattern (USDI-BLM 1993).

South Fork Owyhee River (HUC 17050105)

The South Fork Owyhee River was listed on Idaho's 303(d) list in 1996 as water quality limited primarily for temperature and sediment. Beneficial uses for the river include cold water biota, salmonid spawning, primary contact and secondary contact recreation, agriculture, domestic water supply, wildlife habitat, aesthetics, and industrial uses (Ingham 1999). Water quality impairment is the result of nonpoint sources.

Warm water temperatures are the primary limiting factor for trout production in the South Fork Owyhee in Idaho (Ingham 1999). The South Fork meets all other water quality standards in Idaho (Ingham 1999). Physical habitat appears sufficient for cold-water species, as indicated by the presence of sculpins, pollution-intolerant macroinvertebrate species, and redband trout *(Oncorhynchus mykiss gairdneri)*. Turbidity meets water quality standards, little siltation occurs in riffle areas and complexity in pool habitats appears adequate (Ingham 1999).

The Nevada Department of Environmental Quality (NDEQ) has determined that water quality standards are being met in the South Fork of the Owyhee in Nevada. Three water quality parameters, however, may exceed standards: water temperature in the afternoons during the summer (commonly exceed25ºC), turbidity during spring runoff, and total phosphorus during spring runoff (BLM 2000).

North and Middle Fork Owyhee (HUC 17050107)

Beneficial uses of North Fork Owyhee tributaries include spawning and rearing of redband trout, other coldwater biota, secondary contact recreation, and agricultural water supply. These uses

(plus primary contact recreation, domestic water supply, and special resource waters) also pertain to mainstem portions of the Middle Fork and North Fork Owyhee (IDEQ DU).

In 1998, six water bodies within the Idaho portion of the North and Middle Fork Owyhee watersheds were listed as water quality limited under section 303(d) of the Clean Water Act (IDEQ DU). Excessive sediment, temperature, and flow modification impair water quality in the Middle Fork Owyhee, Squaw Creek, Noon Creek, Juniper Creek, and Pleasant Valley Creek (IDEQ DU). State standards for bacteria were exceeded in the North Fork Owyhee River in July of 1997. However, this violation was based on only one sampling event. Bacteria data collected on Cabin, Big Spring and Squaw Creeks indicate that these streams may not support secondary contact recreation under Idaho water quality standards. Woodruff (1999) suggested that the EPA list Cabin Creek, Corral Creek, and the North Fork Owyhee for water temperature violations (cited in IDEQ DU).

High stream temperatures throughout the North and Middle Fork Owyhee watersheds threaten water quality. The high temperatures result from a lack of stream shading by riparian vegetation (IDEQ DU). IDEQ (DU) contends that increased riparian shade would significantly reduce stream temperatures.

The Oregon portion of the Middle Owyhee HUC is scheduled for TMDL completion between 2006-2013 (ODEQ 2001).

Other areas of the subbasin

The Lower Owyhee (HUC 17050110), Crooked-Rattlesnake (HUC 17050109), Jordan (HUC 17050108) watersheds are scheduled for TMDL completion between 2006 and 2013 (ODEQ 2001). Completion of a TMDL for the Upper Owyhee (HUC 17050104) is scheduled for 2001 (IDEQ 2001)

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%) (Table 3; Figure 8).

Table 3. 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

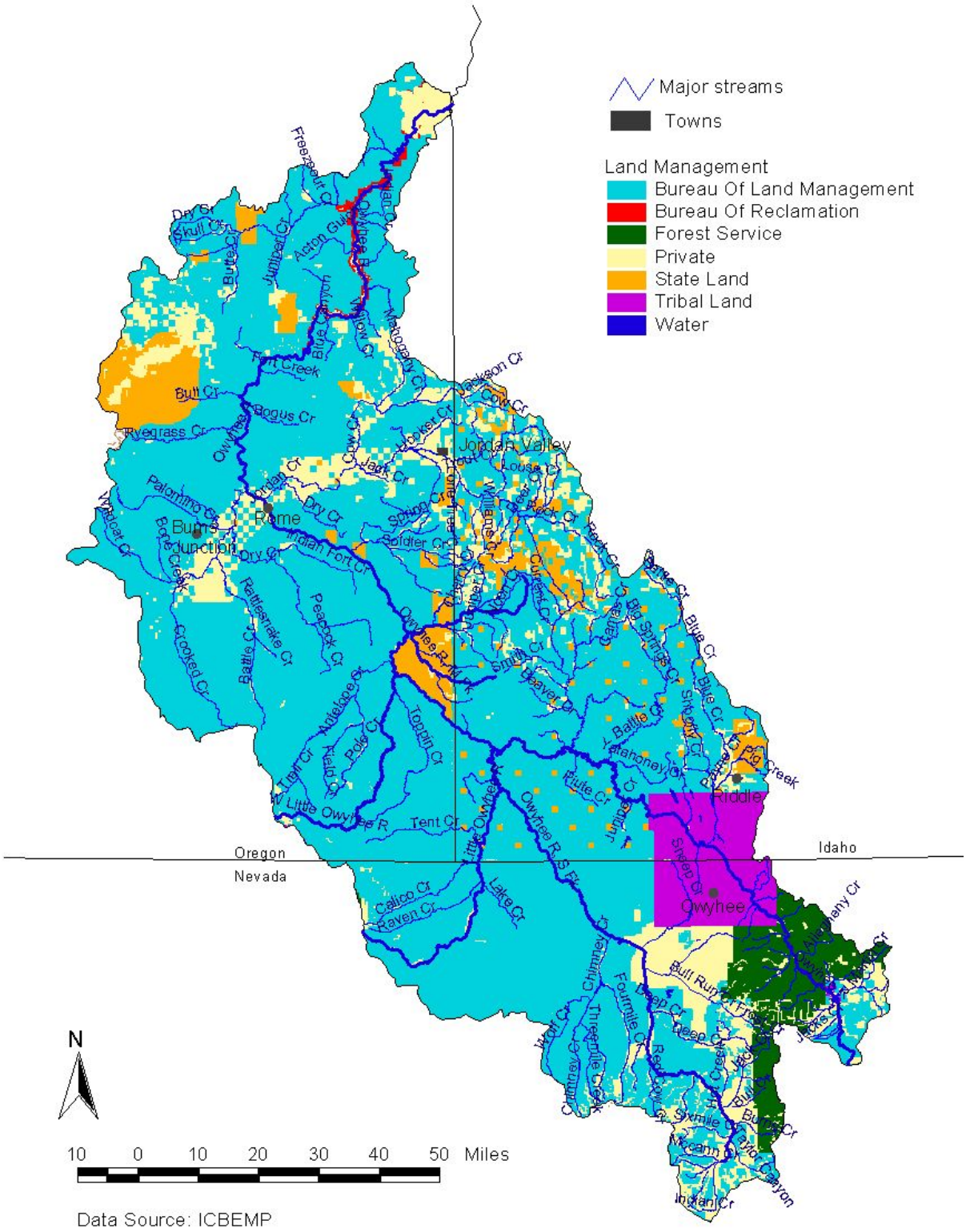

Figure 8. Land management of the Owyhee subbasin

Land Use

Pre-European Settlement

Prior to European settlement, the Northern Shoshone, Northern Paiute and Bannock (a Northern Paiute subgroup) Tribes occupied a territory that extended across most of southern Idaho into western Wyoming and down into Nevada and Utah, a portion of which is now referred to as the Middle and Upper Snake Provinces of the Columbia River Basin.

The Tribes moved with the seasons. The annual subsistence cycle began in the spring, when some bands moved into the mountains to hunt large game and collect roots. Other bands moved to fishing locations on the Snake and Columbia Rivers. During the summer, large groups traveled to Wyoming and Western Montana to hunt bison.

The summer months were a time of inter-tribal gatherings. Tribes met along the Snake River to trade, hunt, fish, and to collect seeds, nuts and berries.

Late fall was a time of intensive preparation for winter. Meats and various plant foods were cached for later use and winter residences along the Snake River were readied (Idaho Army National Guard 2000).

The Tribes utilized fish and wildlife resources across the region. Using implements such as spears, harpoons, dip nets, seines, and weirs, they fished for chinook salmon (*Oncorhynchus tschawytscha*), steelhead (*Oncorhynchus mykiss*), Pacific lamprey (*Entosphenus tridentatus*), white sturgeon (*Acipenser transmontanus*), cutthroat trout *(Oncorhynchus clarki)*, and mountain whitefish (*Coregonus williamsoni*). They hunted antelope, deer, elk, bighorn sheep, rabbits, bears and certain types of waterfowl (Idaho Army National Guard 2000).

Current land use

Predominant current land uses in the subbasin are ranching, irrigated agriculture and mining (Table 4).

Table 4. Land uses in the Owyhee subbasin (USGS LULC data)

Description	Acres	Kilometers^2	Miles^2	Percent
Open Water	26,300	106	41	0.373
Perennial Ice/Snow	13	0	0	0.000
Low Intensity Residential	176	1	0	0.002
High Intensity Residential	6	0	0	0.000
Commercial/Industrial/Transportation	5,503	22	9	0.078
Bare Rock/Sand/Clay	48,995	198	77	0.696
Quarries/Strip Mines/Gravel Pits	193	1	0	0.003
Transitional	129	1	0	0.002
Deciduous Forest	12,969	52	20	0.184
Evergreen Forest	243,839	987	381	3.462
Mixed Forest	306	1	0	0.004
Shrubland	5,806,647	23,499	9,073	82.439
Grasslands/Herbaceous	686,788	2,779	1,073	9.751
Pasture/Hay	188,049	761	294	2.670
Row Crops	3,934	16	6	0.056
Small Grains	14,259	58	22	0.202
Urban/Recreational Grasses	60	0	0	0.001
Woody Wetlands	5,441	22	9	0.077
Totals	7,043,605	28,505	11,006	100.000

Ranching and Grazing

Cattle and sheep ranching are the dominant land uses in the subbasin. Ranching has occurred since the mid-1800s and peaked around the turn of the 20th century (USDI 1993). All areas of the subbasin that are accessible to cattle have been grazed historically and most areas are currently grazed. The BLM, U.S. Forest Service, Shoshone-Paiute Tribes and Department of Lands oversee grazing allotments throughout the subbasin.

Transportation

State Highway 51 in the northeast/southeast portion of the subbasin and U.S. Highway 95 in Oregon are the two paved highways in the subbasin. There are many gravel and dirt roads on BLM lands, private ranches and farmed areas near the river's confluence with the Snake.

Road density is often an indicator of the intensity of land use. While the subbasin does not contain any large urban areas, it does have moderate to high road densities in some areas (Figure 9).

Mining

Idaho has a rich mining history that dates back to the 1860s. As the gold strikes in the Clearwater and Salmon River subbasins panned out, prospectors worked their way south and east in search of gold. The development of the most significant gold mining district in Idaho, the Boise Basin, occurred in 1862. Once gold was discovered along Jordan Creek, mining activities spread throughout the subbasin. Unlike many placer mining districts, millions of dollars were invested in Owyhee underground mines and mills, assuring a long future for mining in the area (Idaho Mining Association 1998). Mining activities were concentrated in the upper watershed and in the Jordan Creek area (Figure 10). Silver City is the best-known mining district in the subbasin. This district was a major gold and silver producer, generating more than $60 million in precious metals by 1899 (D.A. Wright; B Tompkins web pages).

In addition to gold and silver, a wide variety of products were extracted, including gemstones, metals, minerals, geothermal resources and mercury (Figure 10). Current mining activities (producing mines) are concentrated in the lower and central portions of the subbasin. Sand and gravel are the primary products extracted. Gold mining still occurs in the Nevada portion of the subbasin (USDI 1998).

One of the larger active mines in the subbasin is located in the historic DeLamar Mining District. The mine has operated continuously since 1976. On average, 35,000 tons of rock are mined daily, and an average of 3,000 tons of ore is milled and treated with cyanide onsite for the recovery of gold and silver. Ore from a satellite mine at nearby Florida Mountain is transported to and milled at the DeLamar site (BLM 1999).

Information collected to-date indicates that there are no economically recoverable oil or gas reserves in the subbasin (USDI 1999, USDI 1998). The geothermal potential of the area is considered to be high, but for direct use only, because water temperatures are not high enough for electricity generation (USDI 1999). Mineral materials such as sand, rock, and gravel are present in enormous quantities within the subbasin, with known reservoirs covering 45,000 acres (BLM 1999). The use of these materials is expected to grow in response to the rapidly expanding population of the Boise/Treasure Valley metropolitan area.

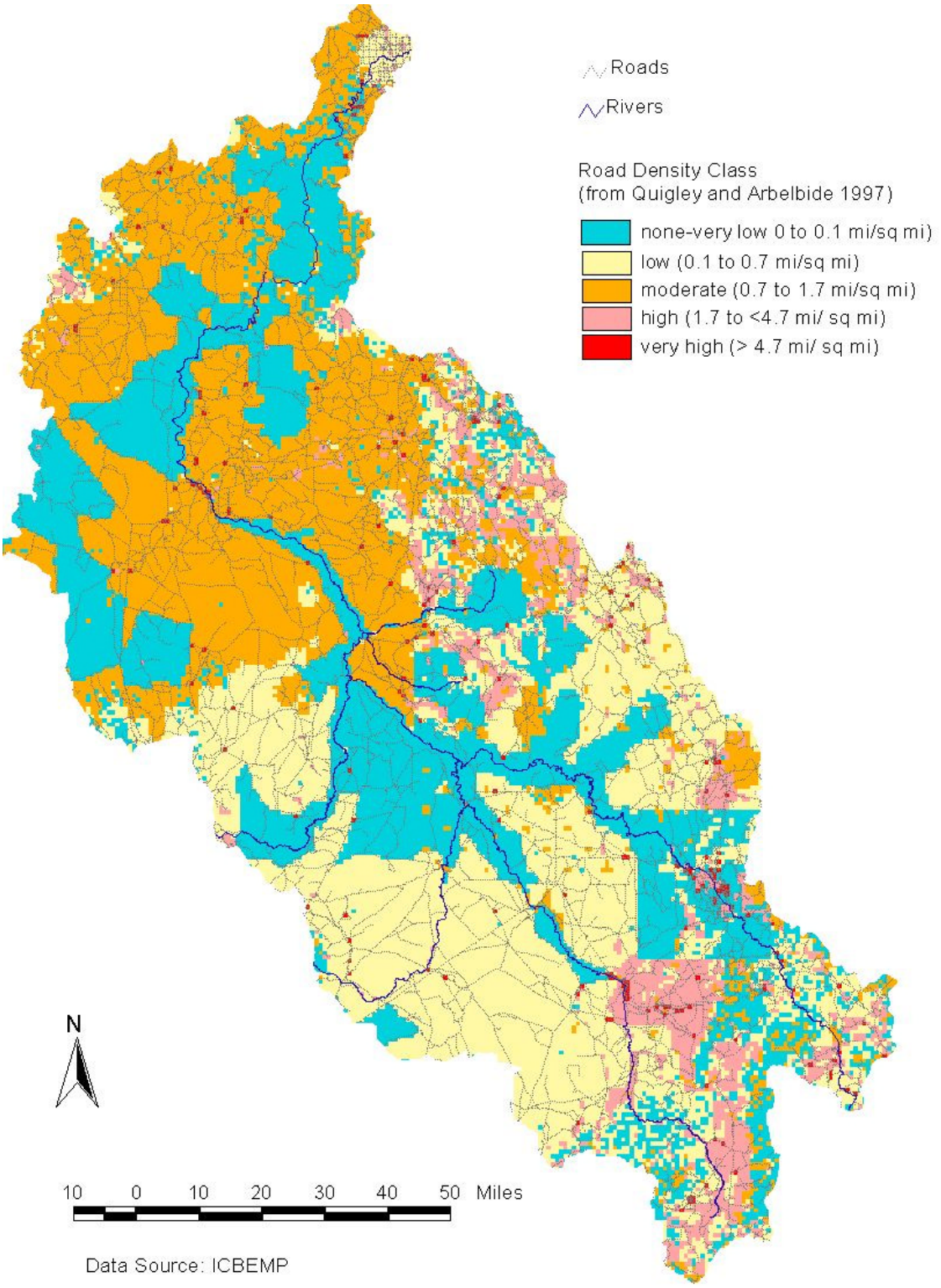

Figure 9. Road densities in the Owyhee subbasin

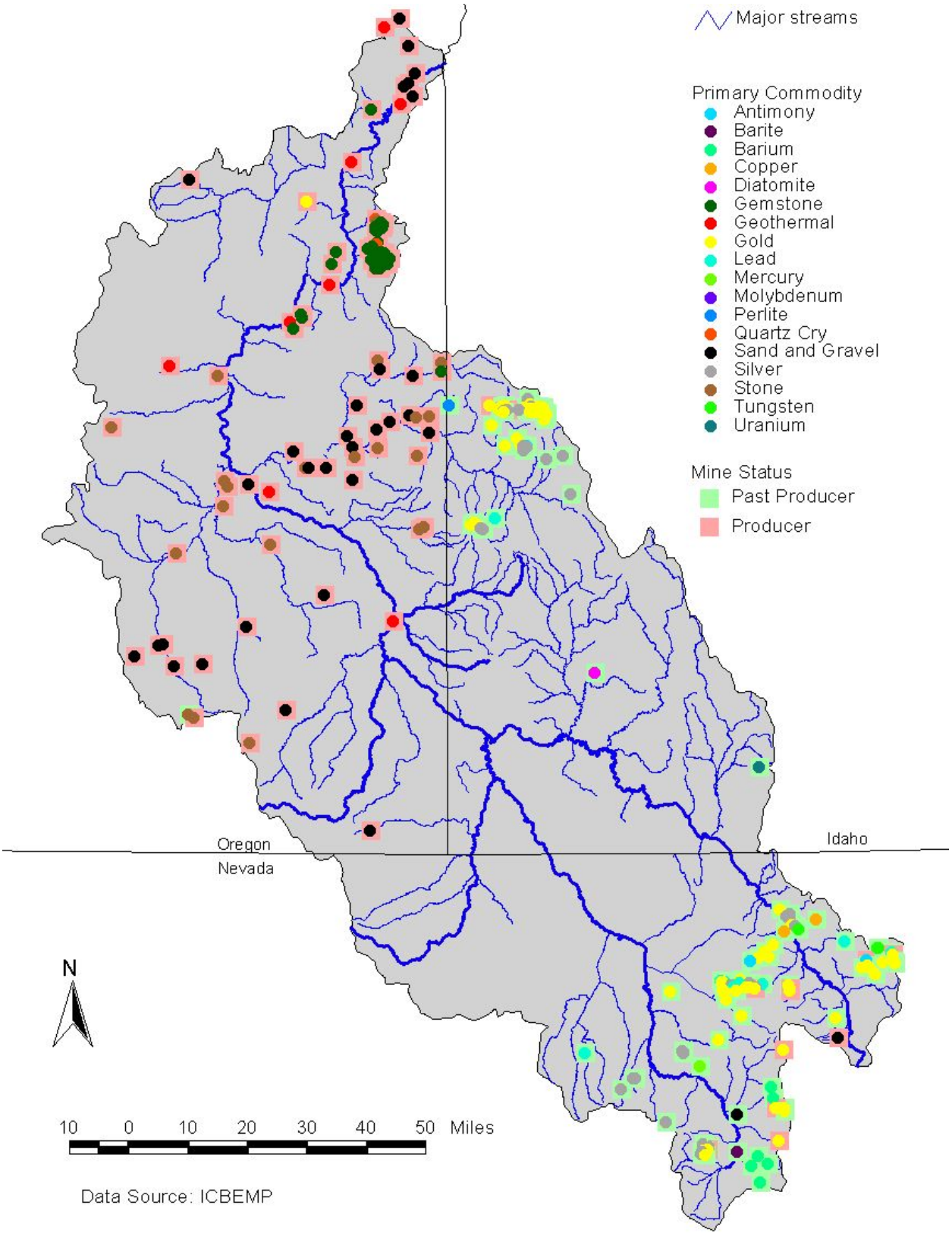

Figure 10. Current and historic mines in the Owyhee subbasin

Impacts of mining activities on natural resources are variable and depend on mine size and location, mining methods, products being mined, and a number of other factors. Some species (e.g. bats) may benefit from the creation of mines. Typically, both aquatic and terrestrial biota are negatively affected. The most common influences of mining activities on aquatic resources involve the production of acidic wastes, toxic metals, and sediment (Nelson et al. 1991).

Recreation

Recreational opportunities in the Owyhee subbasin include hunting, fishing, hiking, rock climbing, and camping. More than 41,000 people use the area annually according to a 1991 study by Boise State University.

Rafting on the Owyhee River is becoming increasingly popular. River use has increased ten-fold in the past decade, according to the BLM. In 1996, 3,252 visited the Owyhee-Bruneau Canyonlands (Owyhee-Bruneau Canyonlands Coalition accessed 10-7-01).

Recreation use in the Owyhee Resource Area in Idaho was estimated at 162,682 visits in 1995 (BLM 1999). Recreational use is projected to increase by 70% by 2018 (BLM 1999).

Urban Development

There is no urban development in the subbasin.

Agriculture

Agriculture is confined primarily to the Duck Valley Indian Reservation, the area around the confluence of the Owyhee and Snake Rivers, Jordan Valley and Jordan Creek Basin. Irrigated hay farming for cattle feed is the dominant crop. Row crop farming occurs in the northern portion of the subbasin near the confluence with the Snake River (Perkins and Bowers 2000).

Diversions, Impoundments, and Irrigation Projects

Instream diversions are common throughout the subbasin, and represent a limiting factor to fish production due to flow reduction and fish entrainment (Perkins and Bowers 2000). From a flow perspective, diversions reduce the amount of available fish habitat and decrease water quality. Many of the existing diversions in the Owyhee are old and in disrepair. Most lack headgates, and/or monitoring or measuring devices (Perkins and Bowers 2000). None of the diversions are screened, which represents a possible source of mortality to game fish that become stranded when a diversion is shut down (Perkins and Bowers 2000). Oregon State statutes (ORS 498.248 and 509.615) now require screens on all diversions that affect movement of game fish.

The historic scarcity of natural stream flows in the Owyhee River prompted the construction of three storage reservoirs. The Owyhee, Wildhorse, and Antelope Reservoirs were constructed in the early 20th century to store flows for irrigation, but are also used for recreational purposes (and hydroelectric power generation in the case of the Owyhee). Information on two of these reservoirs is given below.

The Owyhee Reservoir

The Owyhee Reservoir covers 12,740 surface acres at full pool and has a storage capacity of 1,120,000 acre-feet (USBR 1993). Approximately 715,000 acre-feet of water are allocated to 1,845 farm units and eight towns in Oregon and Idaho. The Owyhee Dam and Irrigation Works are licensed and operated by the Owyhee Irrigation District and South Board of Control. Irrigation from this project began about 1935.

Wildhorse Reservoir

The Wildhorse Reservoir is located near the headwaters of the East Fork of the Owyhee River. It was constructed specifically to provide irrigation water to the Shoshone-Paiute Tribes of Duck Valley Indian Reservation. The original dam, with a storage capacity of 32,000 acre-feet, was constructed in 1936-1937. In the mid 1960s construction of a new dam began when the original dam was found to be deteriorating. The new dam, with a storage capacity of 72,000 acre-feet, was completed in 1969.

Barriers and Structures

The most significant migration barrier for salmon and resident fish on the Owyhee River mainstem is the Owyhee Dam (RM 28.5) and Reservoir in Oregon. The Bureau of Reclamation built the dam to create water storage for irrigation in the lower Owyhee and middle Snake River valleys (USBR 1979). The Bureau of Reclamation completed construction of the dam in 1932, and irrigation withdrawals began in 1935. Even if salmon could get past the dams on the Snake and lower Columbia Rivers, the Owyhee Dam would prevent further passage. The dam and reservoir are part of the Owyhee Project, which supplies water for more than 118,000 acres along the west side of the Snake River in Oregon and Idaho (USBR 1993).

Water Rights

In Nevada there has been considerable controversy over the allocation of water from the Wildhorse Reservoir between the Shoshone-Paiute Tribes and non-Indian irrigation interests upstream of the reservation. This matter is now in the adjudication process.

In the state of Oregon all water is publicly owned and laws pertaining to its usage are based on prior appropriation (USDI-BLM 1993). The State of Oregon recognizes instream water rights to protect aquatic biota, recreation potential and other uses. Due to a court decision the State of Oregon must approve all new water withdrawals within the Oregon portion of the subbasin after determining that such withdrawals will not adversely impact the system.

Protected Areas

Many areas in the Owyhee subbasin are recognized for their wild and scenic qualities, and are protected using a conservation-based strategy (Figure 11). This a reflection of the many unique biological, cultural and geologic features the subbasin contains.

Wilderness Study Areas (WSA)

Forty areas are being considered for designation as wilderness under the Wilderness Act of 1964. These areas were selected due to their unique wilderness characteristics. The areas were reviewed and accepted by the President in 1992 but have not been designated as such by Congress. Until Congress determines the ultimate status of these lands, they are being managed to prevent impairment of their wilderness qualities (BLM 1998).

Wild and Scenic Rivers

Numerous segments of the Owyhee River have special protection designations (Table 5). Some sections have been designated as Wild and Scenic. In 1984, a 120-mile reach from Three Forks to China Gulch was designated wild under the Wild and Scenic Act. In 1988, a 9.6-mile reach from the Oregon-Idaho state line to its confluence with the Owyhee River was also designated wild (http://www.nps.gov/rivers/owyhee.html)

Table 5. Protected streams in the Owyhee subbasin based on reviews conducted by the Northwest Power Planning Council (NWPPC 1989)

Stream	Protected Category	Total Stream Miles	Total Stream Miles Protected
Owyhee mainstem	Resident fish and wildlife	75.9	75.9
Paiute Creek	Wildlife only	12.9	12.9
Current Creek	Resident fish only	9.7	9.7
Beaver Creek	Wildlife only	9.3	9.3
Red Canyon Creek	Resident fish and wildlife	13.3	13.3
Owyhee River, North Fork	Resident fish only	22.7	22.7
Louisa Creek	Resident fish only	8.3	8.3
Josephine Creek	Resident fish only	8.4	8.4
Combination Creek	Resident fish only	9.2	9.2
Owyhee River, South Fork	Wildlife only	23.6	23.6
Boulder Creek	Resident fish only	36.6	36.3
Battle Creek	Resident fish and wildlife	52.6	52.6
Unnamed trib of Juniper Creek	Wildlife only	6.8	6.8
Unnamed trib of Paiute Creek	Wildlife only	6.9	6.9
Unnamed trib of Deep Creek	Wildlife only	12.5	12.5
Dickshooter Creek	Resident fish and wildlife	9.2	9.2
Spring Creek	Wildlife only	7.8	7.8
Jordan Creek	Resident fish and wildlife	38.2	27.9
Rock Creek	Resident fish only	22.5	18.8
Rose Creek	Resident fish only	9.4	9.4
Juniper Creek	Wildlife only	20.1	4.3
Deep Creek	Resident fish and wildlife	29.7	29.7
East Little Owyhee River	Wildlife only	15.1	11.3
Pole Creek	Resident fish and wildlife	20.7	7.8
Totals		481.4	434.6

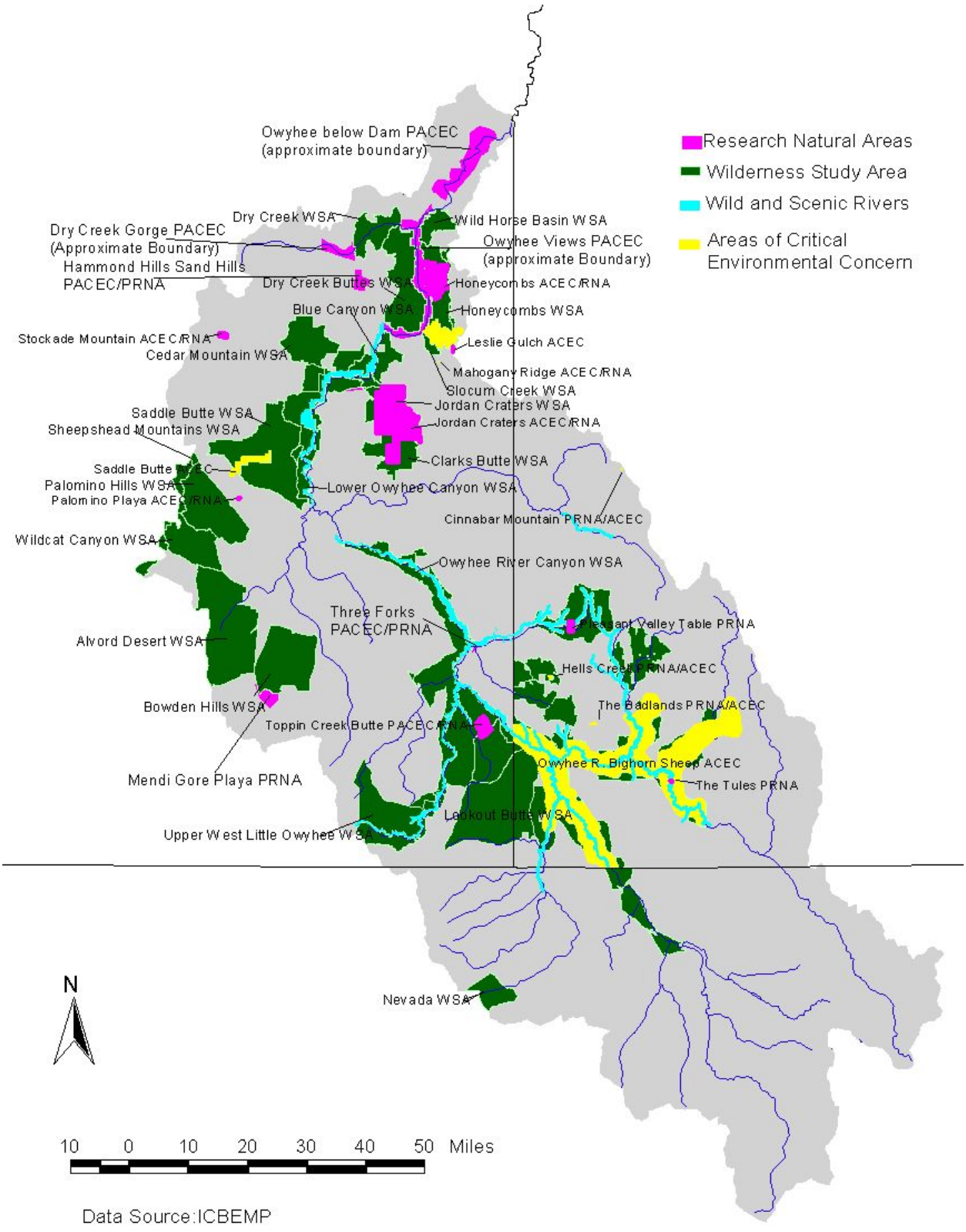

Figure 11. Protected areas in the Owyhee subbasin

RNAs contain natural resource values of scientific interest and are managed primarily for research and educational purposes. ACECs are areas of public land that require special management attention to protect important historic, cultural, or scenic values, fish, wildlife, or other natural resources, or human life and safety. Six RNAs and eight ACECs occur in the subbasin. Four other areas are under consideration for designation as an RNA and seven are under consideration for ACEC status. The special features of some of the RNAs and ACECs in the subbasin are discussed below.

Honeycombs ACEC/RNA

The Honeycombs ACEC/RNA is located on the east edge of the Owyhee Reservoir. The area has high scenic value due to its unusual geologic structure and colorful desert soils of volcanic origin. The following special status plant species occur in the area: sterile milkvetch (*Astragalus sterilis*), Ertter's groundsel (*Senecio ertterae*), grimy ivesia (*Ivesia rhypara*), and Owyhee clover (*Trifolium owyheense*). The Honeycombs ACEC also contains a big sagebrush/needle and thread grass on cinders plant community. The presence of California bighorn sheep (*Ovis canadensis californiana*) contributes to the value of the area as an ACEC/RNA.

Leslie Gulch ACEC

The Leslie Gulch ACEC is located near the southeastern part of Owyhee Reservoir. The area has colorful ash talus cliffs, bighorn sheep, and five special status plant species: Packard's blazing star, grimy ivesia, sterile milkvetch, Ertter's groundsel, and Owyhee clover.

Mahogany Ridge ACEC/RNA

The Mahogany Ridge ACEC/RNA contains undisturbed stands of mountain mahogany and high quality neotropical bird habitat.

Dry Creek Gorge ACEC

Dry Creek Gorge is located west of Owyhee Reservoir. The deep canyon of Dry Creek contains a variety of landforms, highly colorful soils, and dark basaltic forms along its length. The elongated pools along the stream course are a unique geologic phenomenon resulting from the preferential erosion of vitrophyre from the surrounding rhyolite. Genetically pure redband trout (*Oncorhynchus mykiss gairdneri*) and Columbia spotted frogs (*Rana luteiventris*) inhabit the area.

Jordan Craters ACEC/RNA

The Jordan Craters ACEC/RNA is located 5 miles southeast of the Owyhee River. The area is defined by a geologically recent extrusive olivine basalt lava flow. Research on plant succession on barren rock, and plant communities in kipukas (relict islands of soil and plants that the lava flow missed) is conducted in the area. Distinctive plant communities in the area include a three-tip sagebrush (*Artemisia tripartata*) community with a near climax bunchgrass understory and numerous desert fern species. Townsend's big-eared bats *(Corynorhinus townsendii*) use the lava tubes in the Jordan Craters area as maternal roost sites (BLM 1998).

Saddle Butte ACEC

The Saddle Butte ACEC contains an 8.5 mile-long lava tube created during a late Pleistocene volcanic eruption. Much of the original system has collapsed but caves up to 3,620 feet long, 80 feet wide and 47 feet tall remain. How lava tubes are created, and how they deteriorate has

been the focus of scientific research in the area. A population of Townsend's big-eared bats inhabits the caves (BLM 1998).

Owyhee below the Dam ACEC (Potential)

This potential ACEC includes the land bordering the Owyhee River for approximately 13 miles below Owyhee Dam. This area provides access to the Owyhee Reservoir and Snively Hot Springs. It contains the special status plant species, Mulford's milkvetch (*Astragalus mulfordiae*), a rare riverine cottonwood gallery, and a diverse assemblage of wildlife species (BLM 1998).

Three Forks ACEC/RNA (Potential)

The potential Three Forks ACEC/RNA is located in the Owyhee River Canyon 30 miles south of Jordan Valley. It contains a rare riparian community comprised of bitter cherry, sandbar willow, and Pacific willow (BLM 1998).

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Currently, 49 species of fish inhabit the Owyhee subbasin, including 25 native and 11 sensitive species (Table 6 and Table 7). Cyprinids are the most abundant family in the subbasin. Salmonids and centrarchids represent common coldwater and warmwater families (respectively).

Table 6. Sensitive fish species in the Owyhee subbasin (ICDC 2001; NNHP 2001a; NNHP 2001b; Wayne Bowers, Personal Communication, October 2001)

Common Name	*Scientific Name*	ID[1]	NVH	NVE
Independence Valley tui chub	*Gila bicolor isolata*	x		
Leatherside chub	*Gila copei*	x		
Interior Columbia Basin redband trout	*Oncorhynchus mykiss gairdneri*	x		x
Relict dace	*Relictus solitarius*	x		
Longnose dace	*Rhinichthys cataractae*	x		
Independence Valley speckled dace	*Rhinichthys osculus lethoporus*	x		
Clover Valley speckled dace	*Rhinichthys osculus oligoporus*	x		
Desert dace	*Eremichthys acros*		x	

[1]ID = Idaho Conservation Data Center
NVH = Nevada Natural Heritage Program Humboldt County
NVE = Nevada Natural Heritage Program Elko County

Table 7. Additional fish species in the Owyhee subbasin (Perkins and Bowers 2000; Bowers, Personal Communication, October 2001; Walt VanDyke, Personal Communication, October 2001; USDI 1999)

Common Name	Species	Origin[1]	Location[2]	Status[3]	Comments
Black crappie	*Pomoxis nigromaculatus*	E	OR	C	
Bluegill	*Lepomis macrochirus*	E	OR		
Bridgelip sucker	*Catostomus columbianus*	N	BD, R, AB	C	Numerous in larger tributaries
Brook trout	*Salvenlinus fontinalis*	E	OR, BD		None in Oregon portion of basin; Seen once or twice in Jordan Creek
Brown trout	*Salmo trutta*	E	BD	C	Establish in 1990
Bullhead, black	*Ictalurus melas*	E	OR, AD		
Bullhead, brown	*Ictalurus nebulosus*	E	OR, AD	C	
Channel catfish	*Ictalurus punctatus*	E	OR, AD	C	
Chiselmouth	*Acrocheilus alutaceus*	N	R and BD	C	Common in Idaho
Coho	*Oncorhynchus kisutch*			E	Extinct
Common carp	*Cyprinus carpio*	E	BD, R, AD	A	Up to junction of EF and SF Owyhee
Fall chinook	*Oncorhynchus tshawytscha*	N		E	Extinct
Fathead minnow	*Pimephales promelas*	E		C	Irrigation ditches in lower subbasin
Interior Redband trout	*O. mykiss gairdneri*	N	AD and T		
Kokanee	*Onchorhynchus nerka kennerlyi*	E		E	
Largemouth bass	*Micropterus salmoides*	E	OR		None in Oregon portion of subbasin
Lahontan tui chub	*Siphateles bicolor*	E		A	Infest Wildhorse Reservoir
Largescale sucker	*Catostomus macrocheilus*	N	BD, OR and AD	A	Very numerous in Owyhee Reservoir; abundant in Idaho
Leopard dace	*Rhinichthys falcatus*	N	AD	C	
Longnose dace	*Rhinichthys cataractae*	N	All	C	Common in Idaho
Mottled sculpin	*Cottus bairdi semicaber*	N	AD, T	C	Abundant within Idaho and Nevada
Mountain whitefish	*Prosopium williamsoni*	N	BD and AD	C	Uncommon in Idaho
Northern pikeminnow	*Ptychocheilus oregonensis*	N	BD, OR and AD	C	Common in Idaho
Oriental weatherfish	*Misgurnus anguillicaudatus*	E	BD	U	Found in ditches in lower subbasin
Paiute sculpin	*Cottus beldingi*	N	T	A	Collected in NF Owyhee River
Peamouth	*Mylocheilus caurinus*	N	R and BD	U	
Pumpkinseed	*Lepomis gibbosus*	E	BD		
Rainbow trout	*Oncorhynchus mykiss*	E	BD, AD, R	C	
Redside shiner	*Richardsonius balteatus*	N	All	A	
Shorthead sculpin	*Cottus confusus*	N		C	
Smallmouth bass	*Micropterus dolomieui*	E	OR, BD	U	Uncommon in Idaho

Common Name	Species	Origin[1]	Location[2]	Status[3]	Comments
Speckled dace	*Rhinichthys osculus*	N	T	A	Most abundant in upper subbasin Tributaries
Spring chinook	*Oncorhynchus tshawytscha*	N	All	E	
Tadpole madtom	*Noturus gyrinus*	E			
Torrent sculpin	*Cottus rhotheus*	N	T	U	Deep Creek in Idaho
Steelhead	*Oncorhynchus mykiss gairdneri*	N	All	E	
Umatilla dace					Collected in North Fork Owyhee River in Idaho. Wayne Bowers, ODFW suggests this was a misidentification
Utah chub	*Gila atraria*	E	BD	U	Several found in ditches in lower subbasin
Warmouth	*Lipomisgulosus*	E	BD		
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	E		E	
White crappie	*Pomoxis annularis*	E	OR	C	
Yellow perch	*Perca flavescens*	E	OR	C	

[1/] Origin: N=Native stock, E=exotic

[2/] Location: OR=Owyhee Reservoir, BD=River below Owyhee Dam, AD=River above Owyhee Reservoir T= small tributaries

[3]Fish status abundance based on average number of fish per 100m^2: A=abundant, R=rare, U=uncommon, C=common, and I=insufficient data, E=extinct; ESA T=listed threatened under Endangered Species Act; ESA E=listed endangered under Endangered Species Act

Historic Anadromous Species

The Owyhee subbasin once supported an anadromous fishery that included runs of spring and fall chinook salmon (*Oncorhynchus tshawytscha*), possibly coho salmon (*Oncorhynchus kisutch*), and summer steelhead (*Oncorhynchus mykiss*). These species, which are extinct in the Owyhee, occupied mainstem and/or tributary habitat throughout the majority of the drainage during various portions of the year. Spring chinook are known to have migrated up the Owyhee River into Nevada (Perkins and Bowers 2000), and occurred in the South Fork Owyhee River, Indian Creek, Jordan Creek and Cow Creek (Perkins and Bowers 2000). Fall chinook occurred in the Snake River in the Ontario area. Their use of the lower Owyhee is unknown. Juvenile chinook salmon were collected below Owyhee Dam in the mid 1950s (Perkins and Bowers 2000). Coho salmon historically occurred in the Snake River near Ontario, and possibly used the lower Owyhee River for spawning and/or rearing. Steelhead are thought to have migrated into the South and East Forks of the Owyhee River (Perkins and Bowers 2000). Salmon, presumably chinook, were common in the upper South Fork Owyhee River in Nevada during spring in the late 1800s (USDI 1997b). Anadromous use of the Owyhee River ended in 1932 with the completion of Owyhee Dam.

Current Fisheries

Fish species below the Owyhee Dam are distinct from those in the reservoir, and from those above the reservoir.

The tailrace fishery is primarily comprised of non-game and game species that have been planted, recruited from the reservoir through entrainment, or have accessed the reach via the mainstem Snake River. Common species include smallmouth bass (*Micropterus dolomieui*), hatchery brown trout (*Salmo trutta*), hatchery rainbow trout (*Oncorhynchus mykiss*), carp (*Cyprinus carpio*), largescale sucker (*Catostomus macrocheilus*), and northern pikeminnow (*Ptychocheilus oregonensis*). From the confluence of the Owyhee upstream to RM 18 the fish population consists primarily of warmwater species such as bass (*Micropterus* spp.) and catfish (*Ictalurus* spp.). From the diversion at RM 18 upstream to the dam at RM 28, cold water drafted from the reservoir provides temperatures suitable for trout. However, due to a lack of spawning habitat in this section of the river, no natural reproduction occurs. Hatchery reared trout must be planted each year.

The Owyhee Reservoir fishery represents the largest fishery in the subbasin in terms of anglers and angler hours per year (Perkins and Bowers 2000). Warmwater gamefish were first introduced in 1933 (refer to artificial production section). Species harvested include black crappie (*Pomoxis nigromaculatus*), largemouth bass (*Micropterus salmoides*), smallmouth bass, and channel catfish (*Ictalurus punctatus*).

Fish species occurring above Owyhee Reservoir differ by subwatershed. Warmwater communities are common in the mainstem above the reservoir, and include species such as smallmouth bass, crappie, and channel catfish. Oregon tributaries to the Owyhee contain redband trout, northern pikeminnow, redside shiners (*Richardsonius balteatus*), and other non-game species (Perkins and Bowers 2000). Fish species in the Idaho portion of the subbasin include redband trout, dace (*Rhinichthys* spp.), redside shiners, sculpin (*Cottus* spp.), and suckers (IDEQ 1999). Nevada fish communities are similar to those in Idaho but may also include northern pikeminnow and chub.

Variations in community composition are due in part to habitat conditions. Current conditions above the Owyhee Reservoir are poor for trout, but suitable for warmwater game fish species. Attempts to establish trout by stocking have failed. Factors limiting trout populations in the Owyhee River above the reservoir include competition from non-game fish, high turbidity, and temperature and extreme variations in flow. The same conditions occur in Jordan and Crooked Creeks. An exception is that rainbow trout can be caught in most years between Three Forks and Rome (Wayne Bowers, Personal Communication, October 2001).

Numerous reservoirs and ponds throughout the subbasin are managed as put-and-take fisheries. Fish communities inhabiting these water bodies are predominately warmwater but may also include cool or coldwater species. Some of the more important reservoirs in the subbasin include Sheep Creek, Mountain View, Cow Lakes, Dunaway Pond, Wildhorse, Wilson Creek, Dry Creek, and Wilson Sink.

Redband trout

Redband trout (*Oncorhynchus mykiss gairdneri*) are thought to represent the resident form of steelhead trout in areas where they coexisted historically, although the subspecies also exists in areas outside the historic range of anadromy (Behnke 1992). In the Owyhee subbasin, native redband populations are grouped with the Interior Columbia Basin redband/steelhead group and with populations upstream of Hells Canyon Dam. These groups may act collectively as a metapopulation (Perkins and Bowers 2000). Redband trout are a USFS and BLM sensitive species and a species of special concern in the States of Idaho, Oregon and Nevada (IDEQ 1999; Quigley and Arbelbide 1997). Although the USFWS considers them a C2 species (candidate for

threatened/endangered), redband are not listed under the ESA, despite a petition filed to the USFWS in 1995 (IDEQ 1999).

Snake River steelhead historically inhabited the Owyhee subbasin and likely had genetic interaction with resident redband trout (Perkins and Bowers 2000). Behnke (1992) suggests that the majority of steelhead originally ascending the Columbia River must have been redband steelhead due to the small proportion of the basin that lies west of the Cascades. The loss of steelhead runs in 1932 (Bureau of Outdoor Recreation 1977) represents a loss of interaction between anadromous and resident forms, and may represent a potential limiting factor to population stability and genetic diversity of Owyhee subbasin redband. Behnke (1992) genetically distinguishes the redband trout occurring in Oregon desert basins as belonging to a more primitive form of redband derived from the Columbia River Basin, as distinguished by the presence of the *LDH-B2*100* allele. The presence of the **100* allele makes the group a phenotypically "correct" form of redband trout. This particular form of redband has evolved adaptations to live in extremely harsh environments characterized by great extremes of water temperature and flow (Behnke 1992; Wallace 1981 cited in Schnitzspahn et al. 2000). Other genetic work has established the uniqueness of the Owyhee form from other subbasins. Wishard (et al. 1984) found no evidence of hatchery introgression in Owyhee redband sampled from Idaho tributaries (Jordan Creek, Little Boulder, Cabin Creek, and Current Creek), and indicates that genetic similarity between populations decreased with an increase in linear stream distance. In the neighboring Bruneau subbasin, Williams (et al. 1991) found that the Little Jack Creek redband population appears to be predominantly native interior rainbow, showing only minimal evidence of hybridization with hatchery rainbow trout. Genetic analysis of redband trout in tributaries to the East Fork of the Owyhee River is presently being conducted (V. Pero, Shoshone-Paiute Tribe, personal communication, October 4, 2001).

Redband trout are the most widespread salmonid species in the subbasin (Table 8; Figure 12). Although their life history has not been studied, it is assumed they follow a similar history to inland redband populations in nearby Blitzen and Malheur river basins: the fish mature at age 3 or 4, spawn from April through July (water temperatures permitting), and then die (Perkins and Bowers 2000). Growth of redband in the Oregon portion of the subbasin has not been studied, but few individuals in tributaries attain sizes over 10 inches. Trout in the mainstem may reach up to 18 inches in length (Perkins and Bowers 2000).

The current status of Owyhee redband is largely unknown but has been estimated by the ICBEMP (Quigley and Arbelbide 1997). Figure 12 shows that "stronghold" (refer to Appendix A for status definitions) redband populations exist in Idaho and Nevada portions of the subbasin. The largest stronghold population of redband occurs in the Idaho portion of the subbasin in the Jordan and Deep Creek subwatersheds. Stronghold tributaries to Jordan Creek include Trout Creek, Louse Creek, Mammoth Creek, North Fork of Boulder Creek, Rock Creek, Combination Creek, and the South Fork of Boulder. Current Creek, also a stronghold, is a tributary to Deep Creek in the northernmost portion of the subwatershed. In Nevada, Fawn Creek, a tributary to the mainstem, and Jack Creek and Marsh Creek, tributaries to the South Fork, are stronghold areas (Figure 12).

The small number of stronghold populations and large areas of known absence suggests that redband trout in the Owyhee are limited. Sampling efforts have documented fish in several portions of the subbasin, but the populations are consistently described as "isolated" or "fragmented." Drought conditions, land use, and impoundments have acted to confine redband populations to stream reaches near perennial springs in tributaries or to areas that become

disconnected at low flow (V. Pero, Shoshone-Paiute Tribe, personal communication, October 10, 2001). While Owyhee redband are resilient, often persisting in extreme conditions, the absence of multiple year classes in BLM sampling data (e.g. Allen et al. 1995; 1996; 1997; 1998) suggests that spawning is not successful on an annual basis. Redd desiccation or lack of sufficient flows are likely sources of mortality to incubating fish or fry.

Baseline redband data in the subbasin is limited. The Idaho BLM has conducted trout surveys for the past 20 years (Figure 13). Allen (et al. 1996) studied redband in the South Fork Owyhee, Little Owyhee, and mainstem Owyhee in 1995 and found redband in only one of six electro-fishing locations. Densities of fish in the Owyhee segment were 0.32 trout/100m^2. In 1996, Allen (et al. 1997) conducted further redband studies and found that 12 of 14 sample sites in the Owyhee subbasin contained redband trout. BLM surveys of Idaho tributaries in 1997 established redband presence in 10 of 17 stream segments (Allen et al. 1998). Trout densities in 1997 ranged from 0 to 31 fish/100$m^{2.}$ Although this latest sampling effort represented a dramatic increase in fish densities from prior sampling, the lack of baseline information and year-to-year variation prohibits an accurate assessment of population condition.

Redband trout presence is strongly tied to habitat conditions. The "stronghold" designation for populations in the Idaho and Nevada portions of the Owyhee subbasin suggest that adequate habitat conditions exist to sustain multiple life history phases (see Figure 12). Studies by Meyer (2000) in 1999 documented redband trout in 23 (64%) of the 36 randomly distributed stream sites in the Idaho portion of the subbasin. Meyer (2000) found that the sites containing redband trout had more individual pieces and aggregates of woody debris, a higher percentage of pool habitat (especially scour pools), a higher gradient, higher specific conductivity, and were at higher elevations than sites void of redband trout.

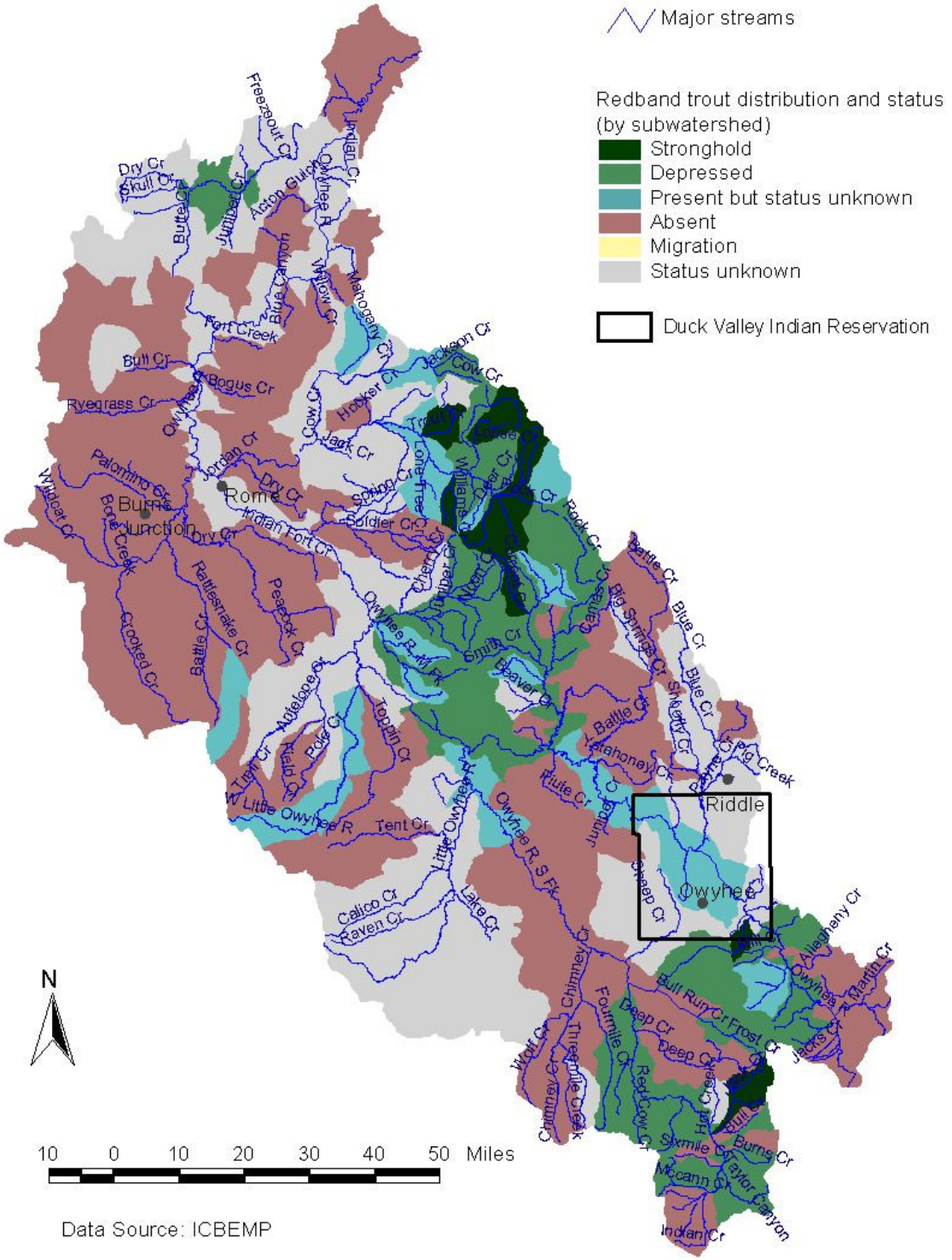

Figure 12. Redband trout distribution within the Owyhee subbasin (See Appendix for status definitions)

Table 8. Redband distribution, density and genetics (Perkins and Bowers 2000; USDI 1999)

Location	State	Miles of habitat	Density estimate (fish/100m^2)/Year	Genetic testing
Battle Creek	Idaho	103		
Blue Creek	Idaho	139		
Boulder Creek	Idaho	-	7.3/1996-54/1977	
Cabin Creek	Idaho	-	6/1977-52.3/1996	
Combination Creek	Idaho	-	36/1976-52/1977	
Corral Creek	Idaho	-	1/1977	
Cow Creek	Idaho	-	6/1977-32.8/1996	
Deep Creek	Idaho	142	13/1977-0/1997	
Flint Creek	Idaho	-	11.7/1977-104.1/1997	
Jordan Creek	Idaho	-	10.2/1976-40.7/1997	Redband
Josephine Creek	Idaho	-	0/1996	
Juniper Creek	Idaho	-	4/1996	
Little Boulder Creek	Idaho	-	63	
Little Owyhee River	Idaho	-	Dry/1995	
Mainstem E.F. Owyhee	Idaho	239		
Mainstem S.F. Owyhee	Idaho	95		
Nip and Tuck Creek	Idaho	-	102/1993	
N.F. Owyhee River	Idaho	61	1.4/1996	
Owyhee River	Idaho	-	.32/1995	
Red Canyon Creek	Idaho	-	0/1993-29.4/1993	
South Mountain Creek	Idaho	-	14/1977-111.9/1996	
Williams Creek	Idaho	-	4-38	
Badger Creek	Nevada	7		
Beaver Creek	Nevada	9		
Bull Run Creek	Nevada	17		Hybrids
Burns Creek	Nevada	7		
California Creek	Nevada	14		
Deep Creek	Nevada	18		Redband (East Fork)
Fawn Creek	Nevada	5		
Hendricks Creek	Nevada	3		
Indian Creek	Nevada	24		Redband
Jack Creek	Nevada	32		Redband
Mainstem E.F. Owyhee	Nevada	46		
Mainstem S.F. Owyhee	Nevada	42		
Mill Creek	Nevada	13		Redband (East Fork)
Penrod Creek	Nevada	15		
Silver Creek	Nevada	10		
Slaughterhouse Creek	Nevada	19		
Smith Creek	Nevada	2		
Snow Canyon Creek	Nevada	11		

Location	State	Miles of habitat	Density estimate (fish/100m^2)/Year	Genetic testing
Van Duzer Creek	Nevada	27		
Antelope Creek	Oregon	1		
Dry Creek	Oregon	5		Redband
Jordan Creek	Oregon	5		Redband
N.F. Owyhee River	Oregon	1	1	-
Owyhee River	Oregon	159		
S.F. Carter Creek	Oregon	5		Redband
W.L. Owyhee River	Oregon	5		Redband
Totals		502		

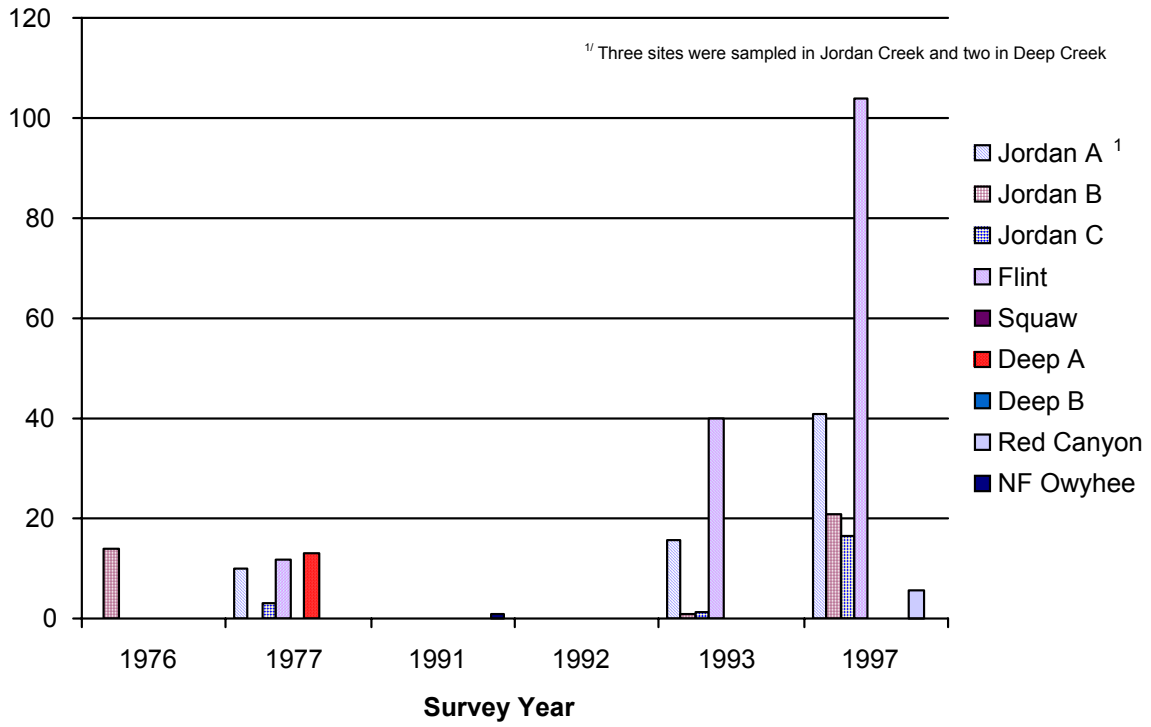

Figure 13. Redband trout density estimates for stream sites sampled in Owyhee County by the BLM (fish/100m^2)(from Allen et al. 1998)

Electro-fishing surveys conducted by the BLM in 1995 and 1999 failed to locate redband at any sites in the Idaho portion of the South Fork Owyhee (Allen et al. 1996). The absence of redband suggests that this portion of the South Fork does not meet the coldwater biota criteria designated by the State of Idaho (Ingham 1999). Ingham (1999) concluded that temperature is the limiting factor for redband in the South Fork, and notes that use may occur when water temperatures are lower. It is not known whether salmonid spawning occurs in this

portion of the river. Any significant redband use of the Idaho portion of the South Fork is extremely unlikely, since they are not present in the South Fork Owyhee River in Nevada, except in headwater areas (Figure 12; USDI 2000; USDI 1997b; USDI 1997c).

Mountain Whitefish

In Oregon, mountain whitefish have been observed in the Owyhee River downstream of the Owyhee Reservoir, in the reservoir, and in the Three Forks Area (Perkins and Bowers 2000). Mountain whitefish are more common in larger stream environments.

In a 1957 electro-shocking effort in the South Fork of the Owyhee River in Nevada, mountain whitefish were found to be common to abundant along certain portions of the river (USDI 1997b). Surveys in 1977 and 1995 failed to detect the species (USDI 1997b).

Hatchery Brown Trout

Hatchery brown trout occur in the Owyhee River downstream of Owyhee Dam (RM 28.5). The species was first introduced in 1990 to provide a quality or trophy trout fishery and to see if they would function as a predator on non-game fish populations that periodically spill through the dam or move in from the Snake River (Perkins and Bowers 2000). They were stocked every other year (2,000 yearlings) from 1990-2000. Stocking has been terminated, but brown trout continue to reproduce naturally below the dam (Wayne Bowers, Personal Communication, October 2001)

Brown trout were stocked in large number in the Owyhee River in Nevada until 1960. Electro-shocking efforts in the South Fork Owyhee in 1957 found abundant brown trout (USDI 1997b). No brown trout were found in the South Fork Owyhee by limited electro-shocking efforts conducted by NDOW in 1977 and 1995 (USDI 1997b).

Reservoir Fisheries

Owyhee Reservoir

Fish species in the Owyhee Reservoir are limited to warmwater communities and hatchery rainbow trout. The first warmwater gamefish were stocked into the reservoir in 1933, with subsequent releases in 1934 and 1935. Although stocking histories are unknown, black crappie, largemouth bass, bluegill, and bullheads were likely the first species to be introduced based on observations made in the 1950's (Perkins and Bowers 2000). Subsequent releases of channel catfish in 1962 and smallmouth bass in 1970 provided anglers with additional opportunities.

Black crappie represent the most common and sought after gamefish species in the reservoir (Perkins and Bowers 2000). The relative abundance of black crappie has been referred to as a "boom or bust" cycle, characterized by years with high relative abundance (based on CPUE) followed by years with low abundance (Perkins and Bowers 2000). Causes for this phenomenon are related to inflow, turbidity, nutrient loading, reservoir level, fry growth, predation, and overwinter survival (Scott and Crossman 1973 cited in Perkins and Bowers 2000). Currently, individuals less than 8 inches in length dominate the crappie population.

Relative abundance estimates of largemouth bass in the Owyhee Reservoir suggest that there were 0.1 and 0.2 largemouth bass greater than 12 inches (TL) per acre in 1991 and 1992 respectively (Perkins and Bowers 2000). In 1996, the largemouth proportional stock density (PSD) estimate was between 40 and 60, indicating that about half of the individuals were less than 12 inches in length (Perkins and Bowers 2000).

Smallmouth bass have been increasing in abundance since their introduction (Perkins and Bowers 2000). In 1991 the estimated abundance of smallmouth greater than 12 inches was

1,407. In 1992 this figure increased to 1,800 (Rien and Beamesderfer 1991; Rien 1992). Despite the upward trend in abundance, individuals between 7 and 11 inches dominate the size structure of the population (Perkins and Bowers 2000). Growth is somewhat higher in the reservoir than in comparable fisheries such as the Snake River (Perkins and Bowers 2000).

Similar to smallmouth, the channel catfish population has increased in abundance since their introduction in 1962. Individuals less than 16 inches in length continue to dominate the size structure of the population. The PSD has varied between 40 and 60 over 28 years of study (1969 – 1992) (Perkins and Bowers 2000).

Nevada Reservoirs

Wildhorse Reservoir has been managed as a trout fishery, and since the 1940s has been noted for high harvest rates and large trout. The fishery is entirely dependent upon stocking of hatchery fish; no natural reproduction is thought to occur. Other game fish include catfish, white crappie (*Pomoxis annularis*), and smallmouth bass (NDOW 1997a). An illegal introduction of Lahontan tui chub (*Siphateles bicolor*) occurred in the early 1980s. By the late 1980s the species had established dominance over all other species (Perkins and Bowers 2000). Attempts to eliminate the chub have been unsuccessful.

Josephine Reservoir is managed for largemouth bass. Introductions in 1963 and 1970 established a self-sustaining sport fishery, which was subsequently lost following drought in the late 1980s and early 1990s (NDOW 1997b). Nevada Division of Wildlife has documented suitable conditions for warmwater species (NDOW 1997b).

Dry Creek Reservoir is a rainbow trout and bass fishery. Constructed in 1961, the reservoir was initially stocked with rainbow trout (NDOW 1997c). Competition with non-game species limited the trout fishery and Nevada Division of Wildlife began stocking smallmouth bass as a piscivorous biological control (NDOW 1997c). Largemouth bass were introduced in 1994 to diversify and increase angler opportunities (NDOW 1997c).

Sheep Creek Reservoir, located on the Duck Valley Indian Reservation, is managed as a rainbow trout fishery. It is considered by many in the region to be a trophy level fishery.

Lake Billy Shaw, located on the Duck Valley Indian Reservation, was constructed in 1998-99 with Bonneville Power Administration funds as partial mitigation for loss of anadromous fish runs due to dam construction. Species to be stocked in lake are yet to be determined (Carol Perugini, Personal Communication, October 11, 2001).

Idaho Reservoirs

Mountain View Reservoir, located on the Duck Valley Indian Reservation, is a rainbow trout fishery.

Non-game fish species

Meyer (2000) found that speckled dace were the most common non-game species of fish (present in 50% of sites) in the Owyhee subbasin, followed by redside shiners (28%), mountain suckers (11%), Paiute sculpins (*Cottus beldingi*)(8%), bluehead suckers (8%), and northern pikeminnows (8%). Other non-game fish present were mottled sculpin (*Cottus bairdi semicaber*), shorthead sculpin (*Cottus confuses*), chiselmouth (*Acrocheilus alutaceus*), smallmouth bass, and brown bullhead (*Ictalurus nebulosus*).

Molluscs

The Owyhee subbasin provides habitat for a variety of sensitive molluscs (Table 9).

Table 9. Sensitive Molluscs in the Owyhee subbasin

Scientific Name	Common Name	Source[1]	Comments
Anodonta californiensis	California floater	ID	Found at several locations in the S.F. Owyhee in 1995 (USDI 1997b).
Physella spp.	Hotspring physa (snail)	NVE	
Pyrgulopsis bruneauensis	Owyhee hot springsnail	NVE, OR	
Pyrgulopsis spp.	Malheur springsnail	NVE	
Pyrgulopsis cruciglans	Transverse Gland springsnail	ID	
Pyrgulopsis hovinghi	Upper Thousand Spring springsnail	ID	
Pyrgulopsis humboldtensis	Humboldt springsnail	ID	
Pyrgulopsis imperialis	Kings River springsnail	NVH	
Pyrgulopsis lentiglans	Crittenden springsnail	ID	
Pyrgulopsis leporina	Elko springsnail	ID	
Pyrgulopsis limaria	Squat Mud Meadows springsnail	NVH	
Pyrgulopsis longiglans	Western Lahontan springsnail	NVH	
Pyrgulopsis militaris	Northern Soldier Meadow springsnail	NVH	
Pyrgulopsis millenaria	Twentyone Mile springsnail	ID	
Pyrgulopsis notidicola	Elongate Mud Meadows springsnail	NVH	
Pyrgulopsis sadai	Sada's springsnail	NVH	
Pyrgulopsis serrata	Northern Steptoe springsnail	ID	
Pyrgulopsis umbilicata	Southern Soldier Meadow springsnail	NVH	
Pyrgulopsis variegata	Northwest Bonneville springsnail	ID	
Pyrgulopsis vinyardi	Vineyard's springsnail	ID	

[1]ID = Idaho Conservation Data Center (ICDC 2001)
NVH = Nevada Natural Heritage Program Humboldt County (NNHP 2001b)
NVE = Nevada Natural Heritage Program Elko County (NNHP 2001a)
OR = Oregon Natural Heritage Program (ONHP 2001)

Wildlife

The diversity of habitats, plant community types and topographical features in the Owyhee subbasin contributes to a high diversity of wildlife species. Much of the Owyhee subbasin has been identified as a "Center of Biodiversity" by the ICBEMP. The subbasin is part of the largest contiguous center of shrub-steppe biodiversity in the Interior Columbia Basin (Quigely and Arbelbide 1997, Schnitzspahn et al. 2000) and has been identified by ICBEMP as having high ecological integrity (Quigley and Arbelbide 1997).

A list of vertebrate wildlife species thought to occur in the Owyhee subbasin is found in Appendix B. This list is a based on the availability of suitable habitat as determined by the Idaho Gap Analysis Draft Wildlife Habitat Relationship Models and the Oregon GAP Vertebrate Distribution Models. The list was modified based on the experience of local wildlife biologists. Many species are listed as potentially occurring, not because of documented observations, but because of expected habitat type use. For many species, basic information on distribution and population status has not been collected.. Even less information exists on the distribution of invertebrate species.

Due to the exceptional biodiversity of the area it was not possible to discuss populations and habitat use of all the wildlife species found in the subbasin. This document concentrates on summarizing the existing data on the fifty-seven wildlife species listed as candidate, sensitive, threatened, or endangered or identified as an important game species by one or more management entity in the subbasin (Table 10; Table 11; Table 12).

Birds

The Owyhee subbasin supports a diversity of bird species. The canyon walls along the lower portion of the mainstem Owyhee are important for nesting raptors. The wetland areas are used as breeding or migration by 70 species of birds. A number of habitats throughout the subbasin are important for neotropical bird species. Sagebrush-steppe habitats support many species that are declining in other regions of the Columbia River Basin (Schnitzspahn et al. 2000). Forty-three sensitive bird species are thought to occur in the subbasin (Table 10).

Table 10. Sensitive birds in the Owyhee subbasin (ONHP 2001; ICDC 2001; NNHP 2001a; NNHP 2001b)

Sensitive Wildlife Species	Scientific Name	ID	NVH	NVE	OR
Northern goshawk	*Accipiter gentilis*		x	x	
Clark's grebe	*Aechmophorus clarkii*	x			
Western grebe	*Aechmophorus occidentalis*	x			
Grasshopper sparrow	*Ammodramus savannarum*				x
Sage sparrow	*Amphispiza belli*				x
Black-throated sparrow	*Amphispiza bilineata*	x			x
Great egret	*Ardea alba*	x			
Western burrowing owl	*Athene cunicularia hypugaea*	x	x	x	x
Cattle egret	*Bubulcus ibis*	x			
Barrow's goldeneye	*Bucephala islandica*				x
Bufflehead	*Bucephala albeola*				x
Ferruginous hawk	*Buteo regalis*	x	x	x	x

Sensitive Wildlife Species	Scientific Name	ID	NVH	NVE	OR
Swainson's hawk	*Buteo swainsoni*		x	x	x
Northern sage grouse	*Centrocercus urophasianus phaios*		x	x	x
Western snowy plover	*Charadrius alexandrinus nivosus*		x		
Black tern	*Chlidonias niger*	x	x	x	x
Yellow-billed cuckoo	*Coccyzus americanus*	x	x	x	x
Common nighthawk	*Cordeiles minor*				x
Trumpeter swan	*Cygnus buccinator*	x		x	
Bobolink	*Dolichonyx oryzivorus*				x
Snowy egret	*Egretta thula*	x			
Eastern Oregon willow flycatcher	*Empidonax traillii adastus*				x
Horned lark	*Eremophila alpestris*				x
Peregrine falcon	*Falco peregrinus anatum*	x		x	x
Common loon	*Gavia immer*			x	
Greater sandhill crane	*Grus canadensis tabida*				x
Bald eagle	*Haliaeetus leucocephalus*	x		x	
Western least bittern	*Ixobrychus exilis hesperis*			x	
Loggerhead shrike	*Lanius ludovicianus*	x			x
Northern mockingbird	*Mimus polyglottos*	x			
Long-Billed curlew	*Numenius americanus*	x			x
Black-crowned night heron	*Nycticorax nycticorax*	x			
Mountain quail	*Oreortyx pictus*	x	x		x
Flammulated owl	*Otus flammeolus*		x	x	
American white pelican	*Peeicanus erythrorhynchos*				x
Double-crested cormorant	*Phalacrocorax auritus*	x			
White-faced ibis	*Plegadis chihi*	x	x	x	x
Eared grebe	*Podiceps nigricollis*	x			
Bank swallow	*Riparia riparia*				x
Broad-tailed hummingbird	*Selasphorus platycercus*				x
Western bluebird	*Sialia mexicana*				x
Forester's tern	*Sterna forsteri*	x			

ID = Idaho Conservation Data Center; NVH = Nevada Natural Heritage Program Humboldt County; NVE = Nevada Natural Heritage Program Elko County; OR = Oregon Natural Heritage Program

Peregrine Falcon

Peregrine falcon (*Falco peregrinus*) populations in the U.S. dramatically declined due to DDT-induced reproductive failure. Protection as an endangered species under the ESA and captive breeding programs led to recovery and delisting of the species in 1999. Peregrines nest almost exclusively on cliffs, often on a ledge overhang or in a small cave. The subbasin contains many ideal sites (Larson, 1993 cited in USBR 1998). Peregrine falcons are occasionally observed along the Owyhee Reservoir during fall or spring migration (BLM 1998). No recent nesting activity has been documented in the subbasin (BLM 1998).

Bald Eagles

Bald eagles (*Haliaeetus leucocephalus*) are listed as threatened by the USFWS and endangered in Idaho. Historically numerous in the area, their numbers declined as a result of declining salmon runs, pesticides, poisons, and illegal shootings. Bald eagles migrate along the Owyhee River during spring and fall and occasionally roost along the Owyhee Reservoir during the winter (USBR 1998a). Wintering eagles are attracted to Snively Hot Springs because of the ice-free water, available perches, and abundance of waterfowl. One-day vehicle surveys conducted by ODFW during January of 1994-1997 detected 0-1 bald eagles along the river downstream from Owyhee Dam (USBR 1998a).

Goshawk

Goshawks (*Accipiter gentilis*) nest in isolated aspen groves at higher elevations in Nevada (Younk and Bechard 1994). Goshawks and nests have been documented by BLM and Humboldt-Toiyabe National Forest personnel. . Fifty-four nests have been located on the National Forest. . Seven of these nests have not been used since the 1970s or 1980s, but the remainder were active in the 1990s (Humboldt-Toiyabe National Forest 2001).

Sage Grouse

Sage grouse (*Centrocercus urophasianus*) utilize sagebrush habitats for breeding, nesting, brood rearing and wintering. Sagebrush leaves comprise almost 100% of the species' diet in the fall and winter.

Sage grouse populations across the west have declined by 30% over the past 30-40 years (Northeast Nevada 2001). Oregon populations have declined from highs reported during the 1940-60s but have remained relatively stable since the early 1970s. Nevada reports a declining trend since data collection efforts started in 1986 (NNSG 2001). IDFG reports that sage grouse populations are currently stable in southwestern Idaho (IDFG 2001a), but 40 years of data collected from wing barrels (IDFG) suggests a long-term declining trend (Figure 15). IDFG has been monitoring sage grouse leks since the 1950s and have noted steep declines in lek attendance and number of leks since surveys began (Figure 14)..

Two studies are currently underway in the subbasin that will provide information about the life history and stability of local populations. A 2000-2001 study is concluding in the Owyhee County portion of the subbasin. Sage grouse were radio-tracked during spring and summer each year to determine habitat use, nest site selection, hen success and productivity. IDFG conducted aerial surveys during the fall and winter to determine habitat use and overwinter survival. A second study was initiated in the Cow Creek area of western Owyhee County in spring 2001. Sage grouse hens were captured and radio-tagged; nest success and brood survival were determined. In 2002 APHIS/ACD will control predators and hen nest success/brood survival will be recorded in an effort to evaluate the role of avian and mammalian predation on sage grouse populations.

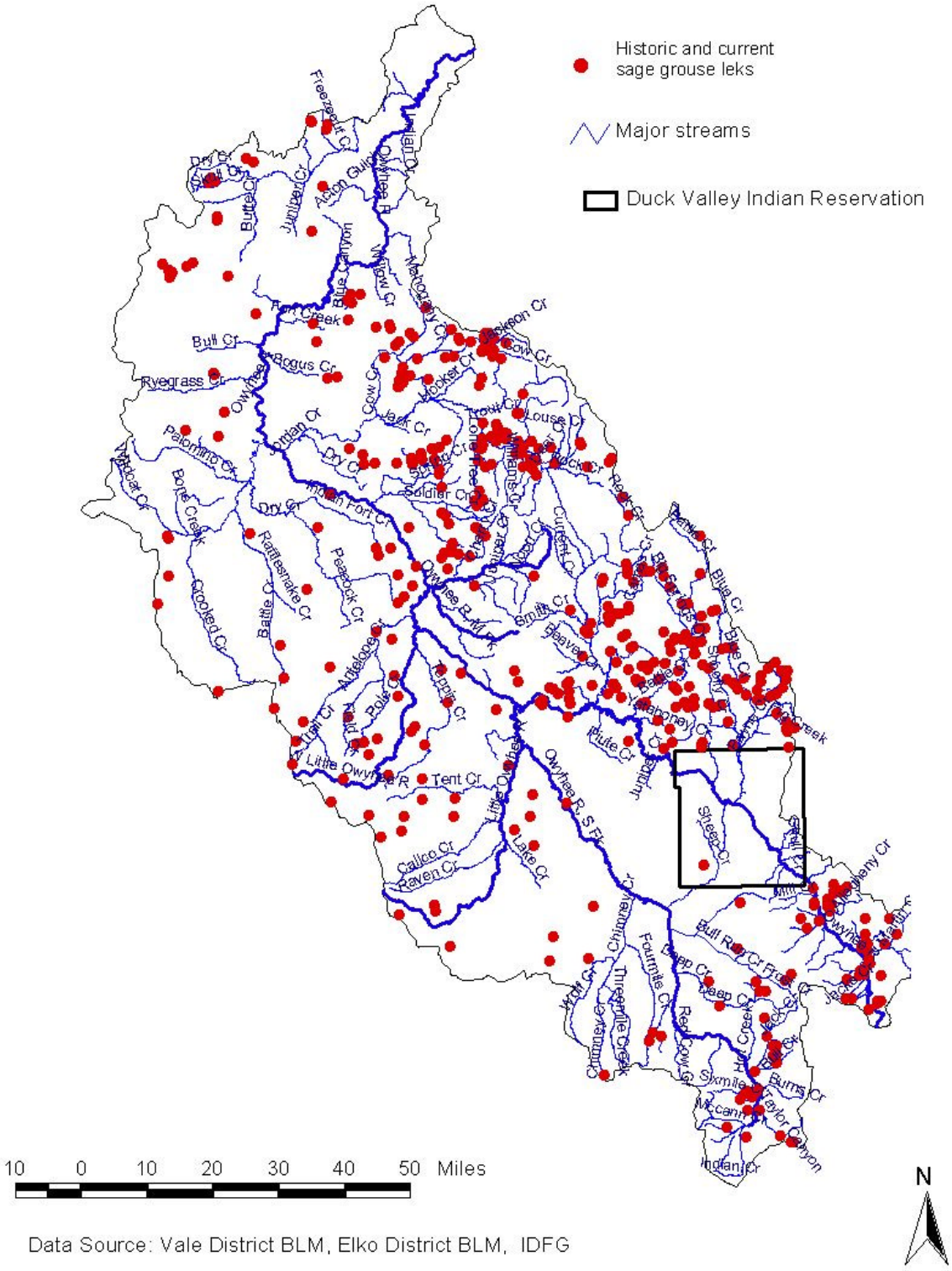

Figure 14. Historic and current sage grouse lek locations, Owyhee subbasin

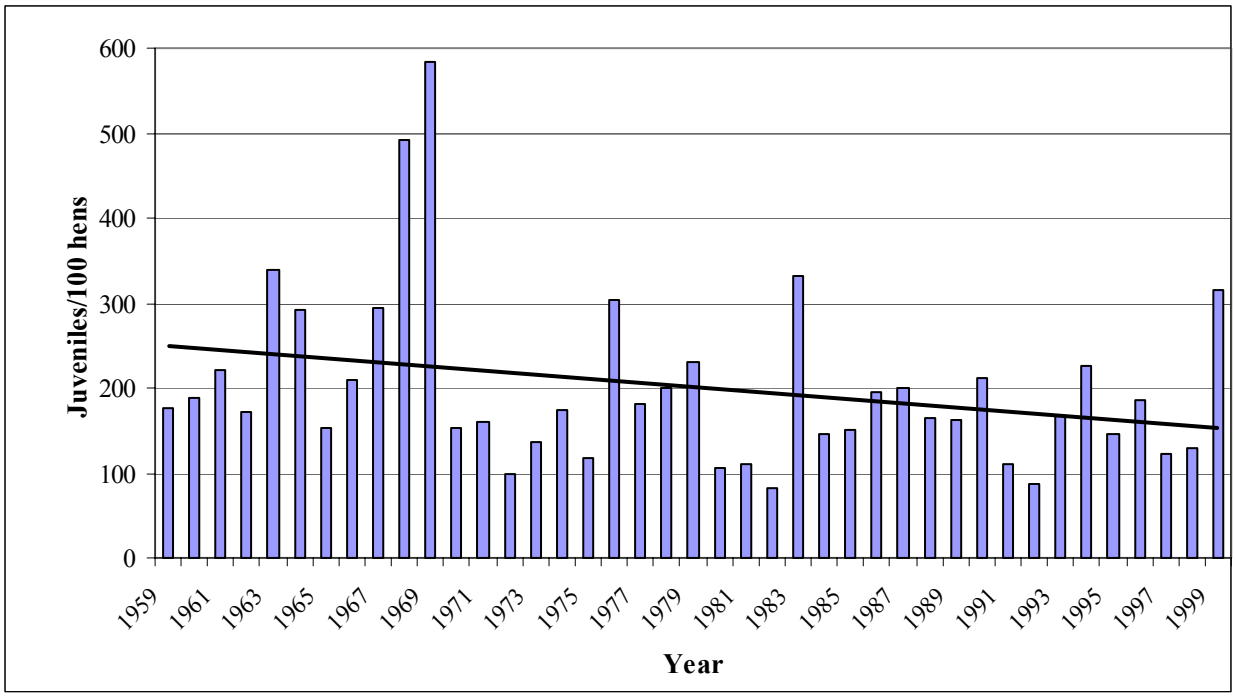

Figure 15. Juvenile sage grouse per 100 hens, Owyhee County Idaho (IDFG data)

Loggerhead shrike, black-throated sparrow, and sage sparrow

Loggerhead shrike (*Lanius ludovicianus*), black-throated sparrow (*Amphispiza bilineata*), and sage sparrow (*Amphispiza belli*) are sensitive sagebrush-steppe species. All have experienced rangewide population declines primarily due to habitat loss (Altman 2000). A broadscale analysis of terrestrial vertebrate habitat conducted by Wisdom et al. (2000) indicates that the availability of source habitats for sagebrush dependent species in the subbasin has not change drastically from that available in 1900. The analysis looked at changes in land cover types and did not address issues of sagebrush habitat quality. Many of the sagebrush habitats in the subbasin occur in direct juxtaposition to dense concentrations of riparian habitats, a rare combination that makes the area nationally significant in the effort to conserve shrub-steppe bird species (Schnitzspahn DU). Breeding bird survey routes in the area had higher counts for sage sparrows and sage thrashers than any other survey routes in the world. Loggerhead shrikes are locally abundant.

Game birds

Gray Partridge

Gray partridge (*Perdix perdix*) is an introduced game bird from Europe. A core population exists in the Idaho portion of the subbasin (IDFG 2001a) but few birds are found in the Oregon portion of the subbasin. This species benefits from wildfires because they forage in the resulting grasslands. Populations are probably limited by severe winters (Walt VanDyke, Personal Communication, October 2001).

Chukar

The Chukar (*Alectoris chukar*) is an introduced game bird. They are abundant throughout the subbasin and are found in rocky, arid, mountainous areas. The species is negatively affected by

severe winters with deep snow and by wet conditions during the nesting season. They are one of only a few species that utilize cheatgrass as a food item.

California Quail

California quail (*Callipepla californica*) are common in brushy foothills, stream valleys and agricultural areas. Quail populations in the Idaho portion of the subbasin appear to be in good condition (IDFG 2001a).

Ring-necked Pheasant

Ring-necked pheasants (*Phasianus colchicus*) are found at lower elevation agricultural sites. They utilize rangelands for cover and winter habitat. Populations continue to decline in southwestern Idaho due to loss of habitat (IDFG 2001a).

Sharp-tailed Grouse

The Owyhee subbasin is part of the historic range of the sharp-tailed grouse (*Tympanuchus phasianellus*), but they have been extirpated from the region. IDFG and NDOW are considering reintroducing the species near the Idaho/Nevada border (Steve Foree, NDOW, Personal Communication, September 2001).

Amphibians and Reptiles

Columbia Spotted Frogs

The Columbia spotted frog is a USFWS candidate species (Engle and Munger 1998). The BLM has conducted several surveys for the frogs and discovered 60 separate populations and 25 breeding sites. Long-term population trend is unknown (Munger et al. 1994, 1997). Munger et al. (1997) documented spotted frogs in Little Blue Creek, Cottonwood Creek, a tributary to Pleasant Valley Creek, Duck Creek, Johnston Reservoir, Camel Creek, Pole Creek, Rail Creek Reservoir, and Old Man Creek. Eggs and/or larvae were found at Camel Creek, Cottonwood Creek, Duck Creek, and Little Blue Creek (Munger et al. 1997). The Elko District of the BLM has detected spotted frog populations in the headwaters of the mainstem and South Fork Owyhee River.

Spotted frogs are associated with slow moving water bodies (rather than riffles), areas of warmer water temperatures, and stream segments with greater sinuosity and little or no downcutting (Munger et al. 1997). Munger et al. (1997) suggests that the best spotted frog habitat occurs on private lands, due to the lower stream gradients and broad valley bottoms that characterize these parcels.

The researchers noted that although frogs were found in areas of relatively high grazing, an inverse relationship existed between grazing intensity and frog abundance. Long-term overgrazing is associated with stream downcutting, lowered water tables, and loss of pool habitat, all of which are detrimental to spotted frogs (Munger et al. 1997).Frog populations across the subbasin are fragmented. This may increase the risk of sub and metapopulation extinction if gene flow does not occur. Engle and Munger (1998) are conducting two studies to assess gene flow between frog populations. A radio-tracking study is underway that examines frog movement patterns and habitat use. A genetics study will examine the genetic similarity of populations in the subbasin.

Other Amphibians and Reptiles

Little is known about the population dynamics and habitat use of other sensitive amphibian or reptile species in the subbasin. Woodhouse's toad (*Bufo woodhousii*) has been documented to

occur along the Owyhee River (Csuti et al. 1997) and was encountered during Munger's spotted frog surveys in 1993. Western toads (*Bufo boreas*) were observed in Dougal Reservoir, Rail Creek Reservoir, Pig Creek Pond and Stoneman Creek in the Owyhee Mountains (Munger et al. 1997). Surveys conducted by the Elko District of the BLM failed to detect western toads in the Nevada portion of the subbasin (Elko BLM GIS), but Leopard frogs (*Rana pipiens*) were found in Delaware Creek (a tributary to the mainstem Owyhee) (Elko BLM GIS). Long-nosed leopard lizards (*Gambelia wislizenii*) have been observed at Fossil Butte.

Table 11. Sensitive reptiles and amphibians in the Owyhee subbasin (ONHP 2001; ICDC 2001; NNHP 2001a; NNHP 2001b)

Sensitive Species	Scientific Name	Source	Comments
Amphibians			
Blotched tiger salamander	*Ambystoma mavortium melanostictum*	OR	
Western toad	*Bufo boreas*	ID, OR	
Woodhouse's toad	*Bufo woodhousii*	ID, OR	
Columbia spotted frog - Great Basin	*Rana luteiventris*	ALL	Documented South Fork Owyhee HUC
Northern leopard frog	*Rana pipiens*	OR	
Reptiles			
Western rattlesnake	*Crotalus viridis*	OR	
Mojave black-collared lizard	*Crotaphytus bicinctores*	ID, OR	
Desert collared lizard	*Crotaphytus insularis*	OR	
Sierra alligator lizard	*Elgaria coerulea palmeri*	NVH	
Long-nose leopard lizard	*Gambelia wislizenii*	OR	
Desert horned lizard	*Phrynosoma platyrhinos*	OR	
Longnose snake	*Rhinocheilus lecontei*	ID	
Northern sagebrush lizard	*Sceloporus graciosus graciosus*	OR	
Ground snake	*Sonora semiannulata*	ID, OR	

ID = Idaho Conservation Data Center; NVH = Nevada Natural Heritage Program Humboldt County; NVE = Nevada Natural Heritage Program Elko County; OR = Oregon Natural Heritage Program

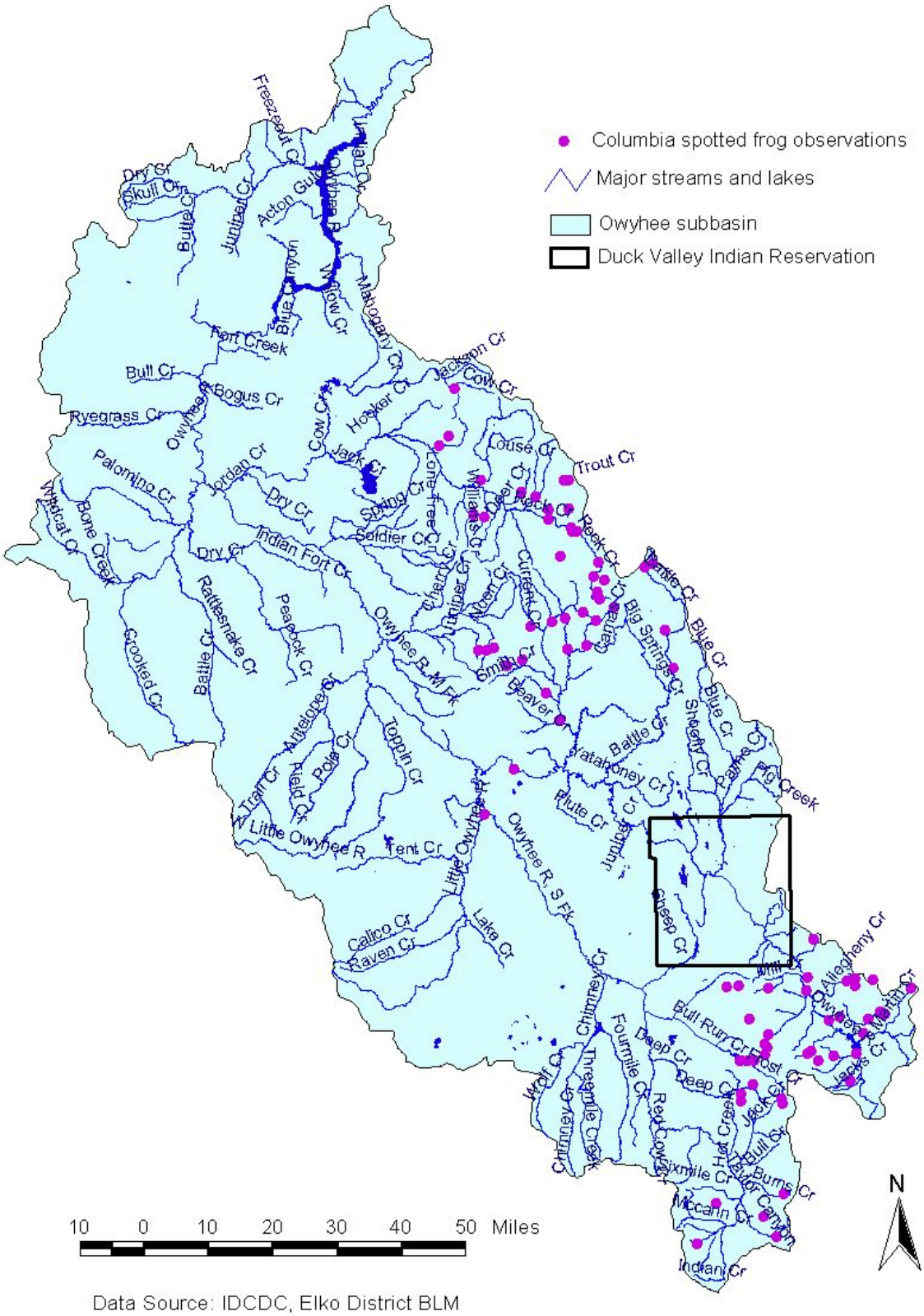

Figure 16. Columbia spotted frog observations, Owyhee subbasin (Oregon data not available)

Mammals

A number of sensitive mammals occur in the subbasin (Table 12).

Table 12. Sensitive mammals in the Owyhee subbasin (ONHP 2001; ICDC 2001; NNHP 2001a; NNHP 2001b)

Sensitive Mammals	Scientific Name	Source	Comments
White-tailed antelope squirrel	*Ammospermophilus leucurus*	OR	
Pallid bat	*Antrozous pallidus*	ID, OR	
Pygmy rabbit	*Brachylagus idahoensis*	ID, OR	Likely in South Owyhee HUC
Gray wolf	*Canis lupus*	OR	
Townsend's big-eared bat	*Corynorhinus townsendii*	ID, NVH, NVE	Likely in South Owyhee HUC
Pale western big-eared bat	*Corynorhinus townsendii pallescens*	OR	
Spotted bat	*Euderma maculatum*	ID, NVE	Likely in South Owyhee HUC
Silver-haired bat	*Lasionycteris noctivagans*	OR	
Hoary bat	*Lasiurus cinereus*	OR	
White-tailed jackrabbit	*Lepus townsendii*	OR	
Dark kangaroo mouse	*Microdipodops megacephalus*	ID	
California myotis	*Myotis californicus*	NVH	
Western small-footed myotis	*Myotis ciliolabrum*	ALL	Likely in South Owyhee HUC
Long-eared myotis	*Myotis evotis*	ID, OR	Likely in South Owyhee HUC
Occult myotis	*Myotis lucifugus occultus*	NVE	
Fringed myotis	*Myotis thysanodes*	ID, NVH, NVE	Likely in South Owyhee HUC
Long-Legged myotis	*Myotis volans*	ID, OR	Likely in South Owyhee HUC
Yuma myotis	*Myotis yumanensis*	ID, OR	Likely in South Owyhee HUC
California bighorn sheep	*Ovis canadensis californiana*	ID, OR	
Little pocket mouse	*Perognathus longimembris*	ID	
Pinon mouse	*Peromyscus truei*	ID	
Western pipistrelle	*Pipistrellus hesperus*	ID	
Preble's shrew	*Sorex preblei*	NVH, NVE, OR	Likely in South Owyhee HUC
Wyoming ground squirrel	*Spermophilus elegans nevadensis*	OR	
Humboldt yellow-pine chipmunk	*Tamias amoenus celeris*	NVH	
Kit fox	*Vulpes macrotis*	ID, OR	

ID = Idaho Conservation Data Center
NVH = Nevada Natural Heritage Program Humboldt County
NVE = Nevada Natural Heritage Program Elko County
OR = Oregon Natural Heritage Program

Bats

Thirteen species of sensitive bats are thought to occur within the subbasin, including the spotted bat (*Euderma maculatum*). The species is considered one of the rarest mammals in North America (Schnitzspahn et al. 2000; Csuti et al. 1997). Spotted bats have been observed along the North Fork Owyhee River and in juniper woodlands in the eastern portion of the subbasin (Schnitzspahn et al. 2000). Due to the rarity of the species, Doering and Keller (1998) consider any areas that support spotted bat populations to be critical.

The cliffs of the Owyhee River and its major tributaries provide roosting and foraging habitat for several bat species and are suspected to support populations of Townsend's big-eared bats . This species uses the lava tubes in the Jordan Craters area as maternal sites (BLM 1998), and inhabit the caves at the Saddle Butte ACEC (BLM 1998).

Researchers recorded bat calls (using ANABAT2 equipment) in the juniper uplands of Idaho. The silver-haired bat (*Lasionycteris noctivagans*), California myotis (*Myotis californicus*), western small-footed myotis (*Myotis ciliolabrum*), long-eared myotis (*Myotis evotis*), fringed myotis (*Myotis thysanodes*), long-legged myotis (*Myotis volans*), and yuma myotis (*Myotis yumanensis*) were among the species detected near Battle and Deep Creeks (Perkins and Peterson 1996). Bat species density and diversity were considered low when compared to old growth forests habitat types. The authors attributed this to a lack of roosting habitat and potentially due to a loss of old growth cottonwoods and junipers along streams (Perkins and Peterson 1996). Further study of bat populations is warranted given the occurrence of so many rare species.

Northern kit fox

The northern kit fox (*Vulpes macrotis*) is present in some of the salt desert habitat in the subbasin. Populations have declined as a result of a number of factors, including habitat loss and poisoning. Kit fox populations in the Oregon portion of the subbasin are low, but higher than when the species was added to Oregon's threatened species list (BLM 1998).

Elk

The Owyhee subbasin supports a small but increasing elk population (*Cervus elaphus).* There were a few hundred elk in Owyhee County during the 1970s and the elk population was estimated at approximately 600 in the mid 1990s. Most of these elk winter in the Oregon portion of the subbasin (Walt VanDyke, Personal Communication, October 2001). The management direction for both ODFW and IDFG is to maintain elk numbers at their current levels (Walt VanDyke, Personal Communication, October 2001, IDFG 2000a). The state of Nevada translocated elk into the subbasin in the early 1990s and are presently working on drafting an elk management plan for the Elko County portion of the subbasin.

California Bighorn Sheep

California bighorn sheep (*Ovis canadensis californiana*) were extirpated from the subbasin in the early 1900s due to the combined effects of habitat degradation, disease and unregulated hunting (Schnitzpahn et al. 2000; USDI 1998). ODFW and IDFG began a series of successful reintroductions in 1963 (Table 13). Today, the subbasin has the largest herd of California bighorn sheep in the country (Schnitzspahn et al. 2000).Population estimates for the Lower and Upper Owyhee River areas (below and above Rome, OR) are 210 and 200,

respectively (Walt VanDyke ODFW Personal Communication, 2001). An aerial census conducted in June, 2000 detected 309 bighorns in the East Fork Owyhee River in Idaho(IDFG 2000b). Bighorn sheep historically inhabited the Nevada portion of the subbasin but are currently not present (Elko BLM District GIS). Bighorn populations in both the Oregon and Idaho portions of the subbasin have declined by approximately 50% since 1992, primarily as a result of poor lamb survival (Walt VanDyke, Personal Communication, October 2001, IDFG 2000b). The number of bighorn hunt permits was reduced in response to the decline and the population is being carefully monitored (IDFG 2000b).

Competition does not appear to exist between bighorn sheep and cattle due to the steepness of the terrain that characterizes bighorn habitat. Bighorn populations are kept separate from domestic sheep to reduce the risk of bacterial pneumonia transmission (BLM 1998).

Table 13. Transplant history of California bighorn sheep in the Owyhee subbasin (Walt VanDyke, Personal Communication, October 2001, IDFG 2000)

Year	Location	Number	Agency
1963	East Fork Owyhee River	19 head	IDFG
1965	Leslie Gulch	17 head	ODFW
1965	East Fork Owyhee River	19 head	IDFG
1966	East Fork Owyhee River	10 head	IDFG
1983	Deary Pasture	14 head	ODFW
1983	Iron Point	21 head	ODFW
1985	South Fork Owyhee River	9 head	IDFG
1987	Painted Canyon	15 head	ODFW
1987	Red Butte	16 head	ODFW
1992	Rattlesnake Creek	19 head	ODFW
1993	Sharon Creek	36 head	ODFW
1994	North Table Mountain	20 head	ODFW
1994	Middle Fork Owyhee River	20 head	ODFW
1995	North Fork Owyhee River	17 head	ODFW

Mule Deer

Mule deer herds in the subbasin utilize habitat in Oregon, Nevada and Idaho. As much as 80% of the summer deer herds in western Owyhee County migrate to Oregon to winter. This interstate movement of deer makes quantifying the population difficult (IDFG 2000c). In the 1930s and 1940s deer populations were low. They increased during the 1950s and 1960s and were at an all time high in the late 1960s and 1970s. In response, state fish and wildlife agencies liberalized hunting regulations and extended seasons (sometimes into December) (IDFG 2000c). Since then, numbers have declined considerably due to drought, severe winters and loss of critical winter range to wildfire (Walt VanDyke, Personal Communication, October 2001, BLM 1999). Fawn survival rates have been relatively low since 1993 (Walt VanDyke, Personal Communication, October 2001). No population data was available from IDFG and the agency identifies this as a primary data need for the region (IDFG 2000c).

Pronghorn

Pronghorn (*Antilocapra americana*) populations in the subbasin peaked in the early 1990s. They experienced a population decline during the winter of 1992-93 and have been

relatively stable since (Walt Van Dyke, Personal Communication, October 2001, IDFG 2001d). NDOW biologists indicate that pronghorn populations in the southern portion of the subbasin have shown a static to slightly downward trend over the past few years.

Wild Horses

The Wild Free-Roaming Horse and Burro Act passed in 1971 states that "It is the policy of Congress that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death; and to accomplish this they are to be considered in the area where presently found as an integral part of the Public Lands." After the passage of this Act the Owyhee subbasin was inventoried for wild horses and Herd Management Areas (HMAs) were delineated to assist in their management. Appropriate Management Levels (AMLs) were established for each HMA to ensure that public land resources, including wild horse habitat, were maintained in a satisfactory and healthy condition. To maintain wild horse populations within the AML range, horses are periodically gathered and placed up for adoption (BLM 1999, BLM 1998).

All or a portion of 10 HMAs occur within the Owyhee subbasin. Oregon HMAs include Jackies Butte, Hog Creek, Cold Springs, Sheepshead, Sand Springs and Coyote Lake. Sands Basin, Hardtrigger, and Black Mountain are located in Idaho and the Owyhee HMA is in Nevada. The Oregon and Idaho HMAs support an average of 1,000 wild horses (BLM 1999, BLM 1998). The Owyhee HMA supported an average of 257 horses per year from 1982 to 1997 (USDI 2000). From 1997 to present, 500-1000 head were observed in the HMA. In June 2000, 612 wild horses were removed. The cause of the increase of horses in the Owyhee HMA is unknown (USDI 2000).

Habitat Areas and Quality

Aquatic Habitat

Due to the jurisdictional boundaries and data inconsistencies, information about habitat in the Owyhee subbasin could not be presented in a single organizational pattern. Information about broad areas is presented first, followed by information organized into fourth field HUCs (see Figure 2).

For its vast size, (7,070,976 acres) the Owyhee subbasin contains a relatively small amount of quality habitat. Only 16% of stream miles in the subbasin flow year around (ICBEMP data), and aquatic habitat is generally characterized as poor. Many factors have contributed to this rating: diversions, dams, overgrazing, loss of riparian habitat, and mining. These activities, combined with the natural conditions present in arid ecosystems, have produced small areas of quality habitat and large areas of poor habitat. Much of the western portion of the subbasin—East Little Owyhee (HUC 17050106), the southwest portion of Middle Owyhee (HUC 17050107), Crooked-Rattlesnake (HUC 17050109) and Lower Owyhee (HUC 17050110)—either is unable to support redband trout due to poor habitat conditions, or represent data gaps (Figure 12). Areas supporting redband populations are in the Owyhee, Independence and Bull Run Mountains or in headwater areas of the South Fork Owyhee River. Although Figure 12 shows depressed populations and a stronghold area for redband trout in the upper North Fork Owyhee (HUC 17050104) no information on habitat or populations was found specific to the area. A limited amount of survey work is currently underway in the Duck Valley Indian Reservation portion of the North Fork Owyhee HUC, but this area represents a data gap at this time.

In the BLM Owyhee Resource Area (ORA) in Idaho (which includes the Idaho portions of the Middle Owyhee, East Little Owyhee, Jordan (HUC 17050108), South Fork Owyhee, and the Deep Creek and Red Canyon portions of the North Owyhee (HUC 17050104) HUCs, an estimated 61% of 500 miles of riverine habitat, most of it perennial, have been surveyed. Eighty-seven percent was found to be in unsatisfactory condition (BLM 1999). Livestock grazing and irrigation water diversions have had the greatest impact on fish habitat quality in this portion of the subbasin. Warm water temperatures have resulted from a loss of riparian vegetation and is causing a shift in the species composition from coldwater to warmwater species, as indicated by reductions in salmonids and increases in non-game species (BLM 1999).

South Fork Owyhee (HUC 17050105)

Stream and riparian habitat conditions for nearly all surveyed streams in the South Fork Owyhee HUC were rated as poor in 1977 and 1986, although some areas showed improvement during 1995 surveys (USDI 1997b). During the earlier surveys, heavy sedimentation, poor pool-riffle ratio and a lack of streambank cover were documented as important limiting factors (USDI 1997b). Streambank stability ratings were satisfactory in 1977, but declined to poor by 1986, possibly as a result of excessive flooding and channel scouring during runoff events in 1983 and 1984 (USDI 1997b). In 1995 surveys, pool habitat was lacking and sedimentation rates remained high, but bank cover and bank stability had improved (USDI 1997b).

In the YP Allotment—located north of the South Fork Owyhee River, south of the Nevada/Idaho state line, and west of the Duck Valley Indian Reservation—salmonid habitat is limited by poor habitat conditions. Fish found in the allotment in a 1995 stream survey consisted largely of northern pikeminnow (232), Columbia redside shiner (155), chiselmouth (121) and largescale sucker (36); small numbers of bridgelip sucker (3), speckled dace (3) and smallmouth bass (2) were also detected (USDI 1997b).

The entire South Fork has been categorized as an "F" type channel with low potential to recover to a narrower, deeper channel configuration (USDI 1997b). Dominant substrates are sand, gravel and sediments. A 5.5 mile stream section was rated as "nonfunctional" due to channel entrenchment, absence of a functional floodplain, excessive sediment deposition, unstable streambanks, and virtually complete absence of a riparian zone (USDI 2000).In the southern portion of the HUC, the Spanish Ranch Allotment supports some of the most valuable stream and riparian habitat in the Nevada portion of the subbasin (USDI 1997c). Approximately 35 miles of streams in the headwaters, including Chino (Fourmile), Red Cow, Big Cottonwood Canyon and Winters Creeks, support small redband trout populations (USDI 1997c). In most areas, stream temperatures during summer were found to be at or above lethal levels for salmonids. Overall habitat conditions in Big Cottonwood Canyon Creek, Winters Creek and Fourmile Creek were rated as poor with a downward or static trend (UDDI 1997c). One exception, Six Mile Creek, had habitat conditions rated fair with a downward trend. Red Cow Creek is considered a priority watershed because habitat has deteriorated to the point where it is only marginally suitable for trout (USDI 1997c). It is fairly extensive and characterized by deep canyons and steep side slopes. Remnant aspen stands occur at higher elevations. The stream supports a moderate population of redband trout, although the fish are confined to isolated, shallow pools with water temperatures in excess of 23°C. Overall stream and riparian habitat conditions were rated as poor with a downward trend. Sedimentation rates, extensive amounts of clinging vegetation on fine substrates, a lack of stream shading, a high width/depth ratio and exceptionally high stream temperatures all contribute to the poor habitat condition rating (USDI

1997c). Comparable declines in habitat have occurred in Fourmile Creek and Big Cottonwood Canyon. Winters Creek had equally degraded habitat but is in a static trend rather than declining. Sixmile Creek was the only creek surveyed in the headwaters area of the South Fork Owyhee River that was found to be in fair condition, although it is in a downward trend (USDI 1997c).

Upper Owyhee HUC

The headwaters of Battle Creek and Blue Creek originate in the Owyhee Plateau in the northeastern portion of the Upper Owyhee (HUC 1050104) (Figure 2). Out of 12.2 miles of perennial and 2.9 miles of intermittent reaches surveyed , 94% of the perennial reaches were rated to be in Properly Functioning Condition (PFC), while 90% of the intermittent reaches were rated at risk (USDI 2000b). This included 4.5 miles of Battle Creek protected by an exclosure in 1995. The riparian area inside the exclosure showed significant recovery as indicated by a widening of the riparian zone, increases in plant size and diversity and robust communities of sedges, rushes and willows. On the North Fork of Battle Creek, an additional 2.3 miles of perennial reaches were surveyed, as part of a different pasture system. The riparian conditions were much different due to more intense grazing pressure. Thirty five percent of the riparian areas surveyed were rated at risk with a declining trend and 49% was non functional (USDI 2000b). Plant vigor was low and species diversity was moderate and trending downward. The stream was entrenched, erosion was excessive with unvegetated slumping banks. Sinuosity and width/depth ratios were outside acceptable parameters (USDI 2000b). Temperatures in Battle Creek were monitored during 1997-1999. State criteria for cold water biota were regularly exceeded (USDI 2000b). Surveys in Battle Creek in 1995 found no redband trout (Allen et al. 1995).

Little is known about habitat in the Duck Valley Indian Reservation. Personal observations suggest that much of the habitat is of poor quality. Most of the river is ditched and diked with the natural river channels and floodplain severely altered (Wayne Bowers, Personal Communication, 2001).

Riparian habitat in tributaries to Deep Creek were generally unsatisfactory. Exceptions were portions of Current Creek and Little Smith Creek[2] , which were rated as satisfactory (USDI 1999). Fish habitat condition closely matched riparian condition with few exceptions.

Middle Owyhee (HUC 17050107)

The Middle and North Fork Owyhee watersheds in Idaho historically had much wider floodplains and much less entrenchment than is currently the case (IDEQ DU). The reduction of beaver populations throughout the area has contributed to this condition. Numerous old beaver dams, now represented by grassed over elevated rows, indicate that beaver were once common in the Middle and North Fork Owyhee systems (IDEQ DU). Stream attributes associated with loss of floodplains include reductions in streamside vegetation, changes in stream channel morphology and shape, and a decrease in water quality (IDEQ DU). Many of the streams in the North and Middle Fork Owyhee watersheds continue to downcut until encountering a stable substrate. After incisement, stream channels may slowly widen and recreate floodplains at a lower elevation (IDEQ DU).

[2] Digital copies of habitat condition maps were unavailable within the timeframe of this project, so actual percentages and stream lengths in satisfactory or unsatisfactory condition were unavailable. Qualitative estimates were made based on hard copies of GIS layers)

BURP data indicate that cold water biota standards are being met in the North and Middle Forks of the Owyhee River in Idaho. This rating included Juniper, Cabin, Corral, and Noon Creeks. Other tributaries in the Idaho portion of the Middle Owyhee HUC did not have BURP data available (IDEQ DU). Temperatures exceeded state standards for coldwater biota in all monitored rivers and streams in the Idaho portion of the HUC (IDEQ DU). Additional problems with low flows, loss of habitat features due to changes in channel morphology and sinuosity, and loss of pools and refugia associated with beavers were noted (IDEQ DU). Despite the BURP data, overall habitat quality in the Idaho portion of the Middle Owyhee HUC remains poor with patches in satisfactory condition, and redband populations are depressed or status is unknown throughout the area (USDI 1999; Figure 12).

Jordan Creek HUC

Although most of the HUC is in poor condition due to grazing-related impacts, a number of high quality habitat areas occur in the Idaho portion of the Jordan Creek watershed. .Isolated reaches of Boulder, Combination, Trout, Rose, Josephine, Rock, and Louisa Creeks (USDI 1999) have some of the highest quality fish habitat in the subbasin.

In addition to grazing impacts, the Boulder/Jordan Creek drainage has suffered from acid mine drainage (pH as low as 3.5) and recreational impacts (USDI 1999).

Lower Owyhee (HUC 17050110)

Aquatic conditions in the Owyhee River below Owyhee Dam are suitable to maintaining aquatic species, but winter conditions and lack of spawning habitat are considered limiting factors in the river below the dam. Winter releases from the dam range from 15 to 20 cfs in good water years to 2 to 4 cfs from leakage through the dam during dry years. Occasionally, flood control releases over 1,000 cfs are made in late winter. While low winter releases appear to sustain rainbow and brown trout, non-game fish, and waterfowl, low winter flows are considered the greatest limiting factor for other fish species in the Owyhee River (Larsen, 1993). Fish and waterfowl concentrate in a few deeper pools with open water, which may make them vulnerable to predation until these pools ice over. ODFW stocks the river with rainbow trout fingerlings, which possibly helps offset the loss of any fish due to the lack of suitable overwintering habitat. The lower end of the river supports warmwater fish, which are also limited by low flows between irrigation seasons. ODFW annually stocks rainbow trout to maintain population levels (Walt VanDyke, Personal Communication, October 2001).

Wildlife

Much of the Owyhee subbasin has been identified as a “Center of Biodiversity” and a “Center of Endemism” by the ICBEMP. The subbasin is at the center of the largest contiguous center of shrub-steppe habitat in the Interior Columbia Basin, and only one of several areas identified as having high ecological integrity (Quigely and Arbelbide 1997, Schnitzspahn et al. 2000).

At the center of the subbasin, the Owyhee Canyonlands covers approximately 1 million acres in Idaho, Oregon, and Nevada. The Canyonlands are bounded on the north by the North Fork of the Owyhee watershed, on the west by the West Little Owyhee, on the south by the Little Owyhee and South Fork of the Owyhee and on the east by Battle Creek. The canyonlands contains strongholds for redband trout, sage grouse, and the largest population of California bighorn sheep in the United States (Schnitzspahn et al. 2000) It provides raptor habitat equal in quality to that found in the nationally recognized Snake River Birds of Prey Conservation Area . The area contains more than a dozen endemic or rare plant species.

Information about conditions in much of the subbasin was difficult to obtain. In particular, terrestrial habitat information for the Oregon portion of the subbasin and for the North Fork Owyhee River above and including the Duck Valley Indian Reservation was not available within the timeframe of the project.

In general, upland habitat in the subbasin is in good condition with localized problems, except for agricultural areas.

Agricultural areas support relatively limited wildlife populations but some species thrive there. Magpies, California quail, raccoons, and European starlings are well adapted to these sites and their numbers have increased with increasing development in the subbasin. Agricultural areas support many small birds and mammals and the species that prey on them, including coyotes, red-tailed hawks (Csuti et al. 1997) and red fox (Walt VanDyke, Personal Communication, October 2001). The Conservation Reserve Program (CRP) has helped to increase the quantity and quality of wildlife habitat in the agricultural portions of the subbasin. Agricultural areas are concentrated in the Duck Valley Indian Reservation, Jordan Valley and the lower subbasin adjacent to the Snake River.

Riparian areas throughout the subbasin are generally in poor to severely degraded condition. The arid environment and scarcity of water tends to concentrate cattle and wildlife in riparian areas and around seeps and springs. Species such as sage grouse, mule deer, Columbia spotted frog and other species dependant on riparian areas have been impacted by this problem. Due to the time limitations on this project and a lack of information about significant areas of the subbasin, it was difficult to map out the relationships between highly mobile species, such as pronghorn, and habitat that is described in units of 50,000 acres or less. Site specific information, organized by 4th field hydrologic unit code (HUC) (Figure 2), follows. No information was obtained about the Crooked Rattlesnake HUC.

South Fork Owyhee (HUC 17050105)

In general, upland habitat is in good to excellent condition while riparian habitat is poor. Because of the scarcity of water in the area, grazing pressure is concentrated on riparian areas. Sage grouse and mule deer are among species noted in BLM allotment evaluations as being impacted by poor quality riparian areas (USDI 1997b, 1997c, 2000). The deep canyons of the South Fork Owyhee in the northern part of the HUC are part of a contiguous canyonland habitat including the North Fork, Little Owyhee and mainstem Owyhee River canyons and lower Deep and Battle Creeks, which provide excellent bighorn and raptor habitat and support other deep canyon dependent species.

In the YP Allotment—located north of the South Fork Owyhee River, south of the Nevada/Idaho state line, west of the Duck Valley Indian Reservation—43,344 acres (45.5% of the allotment) of yearlong mule deer habitat was rated in good condition by surveys conducted in 1988 and 1994 (USDI 1997b). Riparian habitat was rated poor (USDI 1997b). The lack of riparian cover has negatively impacted mule deer fawning habitat (USDI 1997b).

Pronghorn habitat in the allotment is considered to be in fair condition with above optimum shrub composition and poor forage diversity. The canyonlands in the YP Allotment provide excellent habitat for chukar, partridge, Canada goose, several species of ducks, mountain lion, bobcat, and river otter. The quality of the canyon habitat for raptors is comparable to the Snake River Birds of Prey Area in Idaho (USDI 1997b). This includes winter habitat for bald eagles. Bald eagles have been seen adjacent to the allotment at the Petan Ranch (also in the South Fork Owyhee HUC) (USDI 1997b). Although no surveys have been conducted, Bradley (1992) feels the habitat conditions are excellent for bats (cited in USDI 1997b). The allotment

also contains California bighorn sheep habitat. The Elko Resource Area has proposed the reintroduction of 10 animals in the allotment (USDI 1997b).

The Owyhee Allotment in Nevada—which includes the northwestern quarter of the South Fork Owyhee HUC and the eastern edge of the East Little Owyhee HUC (Figure 2)--is part of a horse management area (HMA) . In dry years, large portions of the habitat become unsuitable as water sources dry up.

Areas within two miles of the South Fork Owyhee River experience the highest mule deer winter use, and this portion of the allotment is considered critical winter mule deer range (BLM Elko GIS). Mule deer habitat in the eastern portion (Lower and Upper Fourmile Pastures) of the allotment was considered good to excellent in 1996 and habitat in the northern portion of the allotment was rated fair (USDI 2000).

The Owyhee allotment contains critical year-long pronghorn habitat on the Monument Hills and Dry Lakes area. The Winters Fire in the early 1980s resulted in a mosaic of successional stages, which has increase the suitability of the habitat for pronghorn summer habitat.

Aerial surveys conducted in April 2000 detected several hundred sage grouses utilizing a number of areas across the allotment. Seven leks were also identified during the BLM surveys (USDI 2000) /The allotment provides only limited upland habitat areas interspersed with meadow and riparian areas that would be utilized for nesting and brood -rearing habitat. These areas include meadows and riparian areas associated with the South Fork Owyhee River, Fourmile, Winters and Chimney Creeks, a private spring along Fourmile Creek and Bookkeeper and Devils Corral Springs (USDI 2000). The Dry Lakes-Monument Hills area is also an important breeding, nesting, brood-rearing and wintering area. These areas consist of upland big sagebrush-perennial grass sites interspersed with dozens of vegetated playas (dry lakebeds). Riparian conditions in all pastures was rated as poor and should be considered a limiting factor in brood-rearing-summer habitat (USDI 2000).

In the Spanish Ranch Allotment, which includes the southern portion of the South Fork Owyhee HUC, vegetation includes crested wheatgrass seedings, shadscale/bud sage communities, sagebrush-steppe, and aspen (USDI 1997c). The higher elevations are characterized by scattered to dense stands of aspen intermixed with mountain meadows, seeps and springs (USDI 1997).

The allotment contains critical summer, transitional and winter mule deer habitat. Critical summer range occurs in Six Mile Canyon and on Cornucopia Ridge (USDI 1997c). Habitat along Sixmile Creek was rated as excellent in 1994 (USDI 1997c Poor riparian habitat exists in the upland watershed areas of the South Fork of the Owyhee River drainage. This is considered a negative impact on mule deer fawning cover, hiding and thermal cover, and associated forage areas. Both critical and non-critical summer deer habitat has been impacted by the loss of aspen and willows in the low to mid elevation sites (USDI 1997c).

Pronghorn utilize allotment during spring, summer and fall Water availability was considered satisfactory, although spring sources are in poor condition and competition with cattle and wild horses is a problem.

High quality sage grouse habitat exists on the allotment (USDI 1997c). Based on the distribution of leks, , Six Mile Canyon, Soldier Cap, Cornucopia-Hot Sulfer Spring, represent high density nesting and brood rearing areas, while Six Mile Canyon represents an important winter use area (USDI 1997c). With the exception of Six Mile Canyon, riparian habitat

condition in the allotment was rated poor. Many riparian areas, including seeps, springs, and stringer meadows are characterized by lowered water tables, severe erosion and loss of plant species associated with moist soils.

Upper Owyhee (HUC 17050104)

The Battle Creek and Blue Creek watersheds lie in the northeastern portion of the Upper Owyhee HUC in Idaho (Figure 2). This area is part of a larger area of moderate to high quality wildlife habitat that includes the South Fork of Castle, upper Birch and upper Shoofly Creeks in the Lower Middle Snake subbasin and Little Jacks and Big Jacks Creeks and their tributaries in the Bruneau subbasin. Major vegetative communities representative of sagebrush-steppe ecosystem are present. Approximately 56% or the area is comprised of mountain big sagebrush communities and 32% in low sagebrush communities (USDI 2000b). The long-term trend in ecological condition in the upper Battle Creek and Blue Creek watersheds is upward, with some downward trends in perennial grasses since 1996 (USDI 2000b). Losses of perennial grasses were attributed to the effects of drought between 1987 and 1994 (USDI 2000b). Low sagebrush communities were generally at or near site potential, and static long-term trends in this area were deemed acceptable (USDI 2000b). Current communities reflected impacts of historic degradation (USDI 2000b). Cheatgrass was absent to sparse throughout the area and no noxious weeds were documented (USDI 2000b). Livestock use of the area is described as ranging from no use to light (USDI 2000b). Biological crusts, one indicator of range condition, were maintained between surveys in 1983 and 1998 and trends in perennial grass cover were static as well. (USDI 2000b).

In 1980, 50% of mule deer habitat in the area in the Battle Creek and Blue Creek watersheds was rate in good condition, 40% was fair and 10% was in poor condition. Habitat trend from 1980 to 1990 was static to downward (USDI 2000b). Approximately 57,660 acres of pronghorn summer range in the allotment were rated as follows: 51% good, 39% fair and 10% in poor condition (USDI 2000b).

In 1980, 43% of sage grouse nesting habitat in the upper Battle Creek and Blue Creek watersheds was considered in good condition, 43% in fair condition and 14% in poor condition (USDI 2000b). Big sagebrush cover was adequate for overhead screening and vertical screening. Forb composition and diversity was good for early brood rearing. Eight leks occurred historically in this area, although none were found to be active during aerial surveys conducted in 1999 (USDI 2000b). Wet meadow habitats were considered suitable, with favorable species composition and little danger of desiccation (USDI 2000b).

Columbia spotted frogs occur at one site in upper Battle Creek. Most suitable frog habitat occurred within an exclosure, although the frogs were located adjacent to the exclosure in a grazed area with stubble heights of less than 2 inches(USDI 2000b).

East Little Owyhee HUC

Bighorn habitat extends down the upper portion of the Little Owyhee River from the larger habitat areas on the mainstem South Fork Owyhee River and the mainstem Owyhee River (USDI 1999).

Middle Owyhee HUC

The eastern portion of the Middle Owyhee HUC in Idaho includes the Middle and North Fork Owyhee River, which drain the area just west of Deep Creek. This area has experienced a rapid increase in juniper communities and a proportional decline in big and low sagebrush

communities (USDI 1999). This is considered detrimental to a number of wildlife species, including bats.

Riparian conditions in the Idaho portion of the Middle Owyhee HUC are generally unsatisfactory, with the exception of the North Fork Owyhee and several of its tributaries (Noon, Big Spring, Cabin and Juniper Creek) (USDI 1999).

Mule deer habitat has drastically declined in the watershed over the past 30 years (Kuck and Rachael 2001). Juniper encroachment and conversion of shrub-steppe to annual grasslands have reduced the extent and quality of critical winter mule deer habitat. Elk population numbers are low in this area and are not thought to present interspecific competition concerns for mule deer populations (Kuck and Rachael 2001).

In the Oregon portion of the Middle Owyhee HUC, the West Little Owyhee Canyon and the mainstem Owyhee River Canyon provide nesting habitat for a wide variety of raptors including several raptor species (USDI 1993). The upland plateau supports a large concentration of sage grouse (USDI 1993).

Jordan (HUC 17050108)

Riparian condition in the Idaho portion of the Jordan HUC is generally unsatisfactory (USDI 1999). The entire Jordan HUC in Idaho is elk and pronghorn spring, summer, and fall habitat (USDI 1999).

Lower Owyhee (HUC 17050110)

Lake Owyhee and the Owyhee River downstream from the Owyhee Dam supports wintering bald eagles. At present, there appears to be adequate numbers large perching trees as well as cliffs for eagle use (USBR 1998a).

Watershed Assessment

Streamflow Restoration Prioritization – ODFW and OWRD have established priorities for restoration of streamflow from consumptive users, as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). ODFW has identified the need for streamflow restoration by ranking biological and physical factors, water use patterns and the extent to which water is a primary limiting factor. OWRD ranked the opportunities and likelihood for achieving meaningful streamflow restoration. Rankings were performed for subwatersheds at approximately the fifth field hydrologic units (HUCs). OWRD watermasters will incorporate the priorities into fieldwork activities as a means to implement flow restoration measures. The needs priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects.

USDI Bureau of Land Management Allotment Management Plans (AMPs) are developed to address resource concerns on each allotment. AMPs address issues such as: erosion, upland ecological condition, juniper encroachment, noxious weeds, water quality, riparian and wetland conditions, big game habitat, special status plant and animal species, and wild horse management. The following AMPs were used in drafting this summary: Castle Creek Allotment Analysis, Interpretation, and Evaluation (USDI 1997); YP Allotment Evaluation (USDI 1997b); Rock Creek (Spanish Ranch and Squaw Valley) and Andrae Allotment Evaluations (USDI 1997c); Draft Southeast Oregon Resource Management Plan/Environmental Impact Statement (USDI 1998); Draft Southeast Oregon Resource Management Plan/Environmental Impact

Statement (USDI 1999); Owyhee Allotment Evaluation (USDI 2000); and Northwest Allotment Assessment for Standards of Rangeland Health (S&G) (USDI 2000b).

Limiting Factors

Fish

Most coldwater species occur in low densities throughout their current range and are absent from much or most of the subbasin. Abundance, distribution, and limiting factors for most species represents a near complete data gap. For this reason, the limiting factors discussion will be focused on redband trout. Redband are the most abundant and researched of the coldwater species in the Owyhee subbasin. Limiting factors to redband are probably similar to those for mountain whitefish and other species, although comparisons are difficult to make because of the lack of data. Factors commonly listed as limiting the abundance and distribution of native salmonids include hybridization and competition with non-native salmonids, and anthropogenic disturbances to stream habitat due to grazing, dam construction, irrigation diversions, and road building (Rieman and McIntyre 1993; Gresswell 1995).

Structure caused passage problems and the isolation of populations

The impact of irrigation diversions and dams is concentrated in the lower subbasin. Although stock watering ponds and reservoirs are documented in the subbasin, no particular structures have been identified in the literature as posing passage problems, except for Owyhee Dam. Although problems undoubtedly exist, their scale and intensity represents a data gap.

Owyhee Dam causes two major limiting factors to salmonids in the subbasin: the elimination of all potential fluvial connection to other redband (and other species) populations in the Snake River Basin, and the elimination of anadromy from the Owyhee subbasin. It also poses reach specific impacts resulting from its management.

Redband populations in the Owyhee subbasin, like the other desert populations in Lower Middle and Upper Middle Snake River Provinces, were highly mobile. Although a paucity of abundance and distribution data exists, over the last ten years, abandonment and recolonization of habitat have been documented in numerous streams and rivers (e.g. Perkins and Bowers 2000; Allen et al. 1995, 1996, 1997, 1998; Grunder 1999; USDI 1999). Historical interaction of populations within and outside of the subbasin represents a data gap, although it undoubtedly occurred. Current fish populations in many parts of the Owyhee subbasin are at risk of localized extinction. Owyhee Dam removes the possibility of genetic interchange and recolonization between subbasins.

Owyhee Dam was the original dam to eliminate anadromy from the Owyhee subbasin. Steelhead and chinook represented a significant influx of ocean derived nutrients into the system and the magnitude of the impacts due to this loss has yet to be determined

Perkins and Bowers (2000) and USBR (1993) identified low flows from Owyhee Dam as limiting fish populations below the dam. Minimum flows for fish and wildlife have been established and, as of 2000, were not being met. Winter is the most critical time of year because the combination of low flows and river freezing eliminates habitat and wildlife access to open water.

Passage barriers

No documentation of passage barriers posed by culverts, bridges or other structures were identified in the literature on the subbasin. This represents a data gap, but does not appear to be a major limiting factor in the subbasin.

Habitat degradation

A number of writers have pointed toward the combination of natural conditions and habitat alteration as resulting in limiting factors in the subbasin (e.g. Perkins and Bowers 2000, Allen 1998; Grunder 1999; USDI 1999). The Owyhee subbasin is an arid subbasin with low precipitation and high ambient air temperatures. Naturally, most streams in the subbasin are intermittent or ephemeral and many perennial streams experience periods of intermittent flow during drought. Redband trout are adapted to this environment and display a unique capacity for surviving in seasonal high water temperatures and periodically constricted habitat. So little is known about the history of these desert populations that it is impossible to determine presettlement abundance and distribution within these systems. The variability of abundance and distribution over long time periods is also a data gap.

Natural conditions have been exacerbated in the subbasin by a widespread loss of riparian vegetation and associated impacts due to grazing. Areas not impacted by grazing are almost always in steep canyons with limited access by cattle. All areas accessible to cattle were heavily grazed historically. Practices have improved over the last few decades, but legacy and current impacts are still severe in some parts of the subbasin. No area of the subbasin, for which data is available, contained high percentages of riparian habitat rated as being in satisfactory or good condition (DAF 1998; USDI 1997; 1997b; 1997c; 1998; 1999, 2000; 2000b; Perkins and Bowers 2000; IDEQ DU). Problems associated with degraded riparian habitat include: loss of bank stability, loss of hydrologic function;; deep incision of streams; lowering of the water table and associated narrowing or loss of the riparian zone and vegetation; loss of shading, woody debris and cover; loss of filtration of sediment; and loss of bank storage. These problems are severe in most of the subbasin and cumulatively represent significant limiting factors. In the Idaho portion of the subbasin, base flow conditions limit aquatic habitat, affecting redband populations (Allen et al. 1993; Allen et al. 1995; Allen et al. 1997). Grunder (1999) concluded that surface water conditions were the most critical environmental factor for redband trout in the North and Middle Fork Owyhee River. During drought conditions, the overall range of redband trout is reduced to available refuge areas as connectivity within the habitat is lost. During normal years, redband trout gradually recolonize areas previously abandoned (Grunder 1999). Grunder (1999) concludes that degraded riparian areas have led to a loss of bank storage and lowered the water table, exacerbating low flow impacts. Sediment in the Idaho portion of the Middle Owyhee HUC was considered a factor that should be investigated, but was portrayed as not being a critical limiting factor (Grunder 1999).

The loss of beaver has also been noted as impacting base flow conditions in the Idaho portion of the subbasin (IDEQ DU). The historical presence of beaver ponds in the Owyhee Mountains has been documented and their loss eliminates pool habitat, wetland and riparian zone width and the ability of the riparian zone to store water, all of which impact the quality and quantity of flow during the most critical time of the year, late summer.

High water temperatures associated with loss of riparian vegetation were documented throughout the subbasin, including in Nevada (USDI 1997b; 1997c; 2000). The relationship between flow, temperature and riparian vegetation has been much less studied in Nevada, although

the connections have been well studied in other arid systems (e.g. Chaney et al. 1993; Kauffman and Krueger 1984; Platts 1985; 1991; Reid 1993; IDEQ DU; Allen et al. 1997).

Habitat changes in the headwaters of the South Fork Owyhee River are the most alarming in terms of population level impacts. No strongholds exist in this area and populations are isolated by long distances. Existing populations in Chino(Fourmile), Red Cow, Big Cottonwood Canyon and Winters Creeks, are critically low (USDI 1997c), and no fish at all were found in Six Mile Creek, the only stream in the area with a fair habitat rating. (USDI 1997c). Stream and riparian habitat conditions for nearly all streams in the southern portion of the South Fork Owyhee HUC are rated as being in poor condition and in a downward trend. Major limiting factors include lack of pool habitat, heavy sedimentation, cut and eroding banks, and absence of a healthy riparian zone (USDI 1997c). In most areas, stream temperatures during summer were found to be at or above lethal levels for salmonids. In Red Cow Creek, which supports a moderate population of redband trout, fish are confined to isolated, shallow pools with water temperatures in excess of 23°C during the summer. Overall stream and riparian habitat conditions were rated as poor with a downward trend. Sedimentation rates, extensive amounts of clinging vegetation on fine substrates, a lack of stream shading, and high width/depth ratio all contribute to the poor habitat condition rating (USDI 1997c). Creeks in the South Fork Owyhee River have been designated as critical by NDOW because habitat has deteriorated to the point where it is only marginally suitable for trout (USDI 1997c).

It is critical that habitat in the South Fork Owyhee headwaters be improved rapidly. Although considerable data gaps exist in this area, the identified habitat areas that support redband trout are with little exception in poor shape and declining. In no other area are redband populations so clearly at high risk of local extinction in a short-time frame as in this area of the subbasin. Improving riparian habitats in the headwaters of the South Fork Owyhee River needs to be a short-term priority.

Severe problems exist in Oregon as well. Perkins and Bowers (2000) identified a number of issues that limit or pose long-term threats to native redband populations in Oregon:

1. A combination of habitat alteration and natural conditions restrict abundance and distribution of both tributary and mainstem populations and keep the populations in the mainstem very low
2. Loss of riparian vegetation has increased water temperature, destabilized stream banks and allowed more sediment to flush into streams during high water events
3. Unscreened diversions trap and kill fish
4. Isolation of small numbers of individuals in short perennial reaches increase these populations' vulnerability to catastrophic events and genetic bottlenecks
5. Interactions between hatchery and wild fish may hybridize populations
6. Lack of passage at dams
7. No minimum flows below storage reservoirs

Less detailed information about this area of the subbasin was found and documentation of specific problems remains a data gap.

Limiting factors in the headwater areas of the North Fork Owyhee River are a data gap. Figure 12 (ICBEMP data) shows a redband stronghold in this area, but no information was obtained from the BLM or USFS documenting habitat conditions or population status. Very little is

known about population status and habitat condition in the Duck Valley Indian Reservation (DVIR) (V. Pero, DVIR, personal communication, October 16, 2001). This area may be a critical area to focus restoration efforts on due to its role in connecting two higher quality habitat areas: the headwaters of the North Fork Owyhee River and the strongholds in the Owyhee Mountains.

In the Idaho portion of the subbasin, Allen (et al. 1997) proposes that population isolation represents one of the greatest threats to the long-term persistence of Owyhee native redband trout. The primary problem is that fish no longer inhabit the larger portions of streams and rivers, resulting in a loss of connectivity between local populations (Allen et al. 1997). Disjunct populations occupying fragmented habitat is also a serious problem in the Oregon portion of the subbasin (Wayne Bowers, Personal Communication, 2001). High temperatures and low flows isolate small populations of redband into habitat patches in mountain ranges at the extremes of a very large subbasin. For the South Fork Owyhee populations, this isolation consists of approximately 80 miles of unsuitable habitat. Whether populations in the upper North Fork Owyhee River are isolated from populations in the Owyhee Mountains is unknown. Understanding the habitat dynamics and population movements through the DVIR and other areas of the North Fork Owyhee River will be necessary to determine degrees of connectivity and isolation.

The natural cycles of drought in the Owyhee subbasin coupled with widespread and severe degradation of riparian vegetation has led to an unnatural degree of constriction of habitat during late summer and particularly during periods of drought. This dynamic periodically reduces or eliminates populations at a local scale, and has depressed redband trout populations subbasin-wide. The degree of risk of extinction that populations in Oregon, the Owyhee Mountains, the upper North Fork and South Fork Owyhee River tributaries face is uncertain due to a general lack of data, although it is clear that in most areas these populations are vulnerable to disturbance, most likely to occur in the form of a severe, multi-year drought.

Wildlife

Reductions in quantity and quality of sagebrush and perennial grassland habitat

Big sagebrush habitats and native perennial grasslands of the subbasin are threatened by invasion on both sides of the structural spectrum.

Juniper expansion

Prior to settlement, juniper was primarily confined to rocky ridges or surfaces with sparse vegetation. Extensive livestock grazing pressure between 1880 and 1930 and fire suppression activities reduced the availability of fine fuels and allowed juniper to encroach into big sagebrush, open meadow, grassland and riparian habitat types (USDI 1999).

Juniper expansion can increase habitat suitability for some wildlife populations while reducing it for others. Juniper expansion can result in reduced understory forage production, which reduces mule deer winter range and browse availability for other grazing species.. Alterations of low and big sagebrush structure attributable to the expansion of western juniper have the potential to be deleterious to sage grouse and other sagebrush dependent wildlife species (Quigley and Arbelbide 1997).

Juniper expansion into riparian zones has contributed to the reduction or elimination of quaking aspen, a species of exceptional importance to many wildlife species (USDI 1999). In some areas western juniper has been implicated in reduced infiltration, increased runoff, and soil

erosion (Quigley and Arbelbide 1997). However, juniper trees can provide cavities for nesting birds and bats and thermal and escape cover for a variety of wildlife species. During severe winters, juniper cover may play a critical role in deer survival (USDI 1998).

Western juniper is very susceptible to mortality from fire and prescribed burns are being used on the Owyhee Plateau in an attempt to halt or slow juniper expansion (USDI 1999). This technique needs to be employed with caution, as fire also negatively impacts sagebrush populations and can increase susceptibility to invasion by cheatgrass. Cutting of juniper is also employed as a control technique in the subbasin (USDI 1999). More research on the impacts of juniper encroachment on wildlife populations and control measure is needed (Quigley and Arbelbide 1997).

Cheatgrass invasion and the shortening of fire return intervals

Fire is a natural part of the sagebrush ecosystem in the west, but before the invasion of annual grasses, big sagebrush communities burned slowly and infrequently (DAF 1998). Past disturbances have allowed cheatgrass and other annuals to replace the perennial bunchgrass component of the sagebrush/bunchgrass community, shortening fire return intervals (USDI 1998). Cheatgrass cures earlier in the season than native bunchgrasses, allowing it to form a continuous, fine fuel source that ignites easily and carries fire across the landscape rapidly (DAF 1998). In years of above average spring precipitation, more and larger fires may develop due to increased grass production (USDI 1998). Big sagebrush is highly susceptible to fire injury and is slow growing; in areas where fires are now much more common than they were historically, sagebrush has been reduced or eliminated. Despite fire suppression efforts, large portions of the subbasin have burned in recent years, including in the Lower Owyhee and Crooked Creek drainage (USDI 1998).

Destruction of Biological Crusts

Biological crusts form a dense, low-growing community of various combinations of algae, mosses, liverworts, cyanobacteria, microfungi, bacteria and lichens (USFS 1999). Biological crusts are an important component of the shrub-steppe and grassland ecosystems in the subbasin. These crusts moderate surface temperature extremes, enhance seedling establishment, improve soil stability, productivity, and moisture retention (Wisdom et al. 2000) Crusts in the Owyhee Plateau have been damaged, and in some areas destroyed, by grazing. The reduction and/or destruction of these layers have facilitated the invasion of exotic weeds and have reduced the resistance of soils to erosion. Their restoration is a priority for the BLM in the area (Schnitzspahn et al. 2000).

Noxious weeds

Noxious weeds pose significant long-term threats to ecosystem health. These species reduce plant biodiversity, habitat quality and quantity and generally lowers the ecological quality of the habitat. Cheatgrass and other weeds can increase fire frequency in shrub-steppe habitats which eventually results in the conversion of shrub-steppe to annual grasslands. Much of the subbasin is at high risk of cheatgrass invasion.

Loss of riparian and wet meadow habitats

As discussed in the aquatic habitat section and the aquatic limiting factors section of this report, riparian areas in all areas accessible to cattle have been severely impacted. Loss of riparian quality has been tied to reductions in sage grouse populations, loss of mule deer birthing and

fawn rearing areas, and reductions in amphibians throughout the subbasin (DAF 1998; USDI 1997; 1997b; 1997c; 1998; 1999, 2000; 2000b).

Spring and seep development has been shown to adversely affect mountain quail, sage grouse, western toad, spotted frog, leopard frog, redband trout, and a diversity of neotropical migrants and bats (DAF 1998; USDI 1997; 1997b; 1997c; 1998; 1999, 2000; 2000b). In the lower subbasin, extreme water fluctuations around Owyhee Reservoir limit the composition and extent of vegetation associated with some wetland areas. This reduces the value of the reservoir environment to wildlife species.

Increases in human activity

Off Highway Motor Vehicles OHMV

OHMVs are becoming increasing popular and their use in the subbasin is expected to increase by 70% over the next twenty years (UDSI 1999). Off-road vehicle use sometimes occurs in critical or important wildlife habitats and/or near cultural sites.

Species most likely to be negatively impacted by increases in OHMV use include: western toad, western ground snake, longnose snake, long-billed curlew, burrowing owl, longnose snake, long-billed curlew, ferruginous hawk, and kit fox. These impacts include direct mortality, loss of habitat, burrow collapse, depletion of prey species and disturbance of breeding or migration patterns.

Landscaping rock collecting

Rapid population growth within southwest Idaho has resulted in an increased demand for decorative rock for landscaping and building construction. This has resulted in an increase in both the legal and illegal removal of rock from the subbasin. These activities may result in reduced habitat suitability for the many rock dwelling species, including the Mojave black-collared lizard, western ground snake, Longnose snake, ringneck snake, and bats.

Fire and vegetative responses

Sagebrush/native bunchgrass communities evolved with fire. Mountain big sagebrush communities burned every 20-30 years while Wyoming big sagebrush communities burned every 50-100 years (USDI 1998). The introduction of exotic species and fire suppression activities have altered natural fire regimes which has greatly influenced the distribution, composition, and structure of rangeland vegetation. Impacts to vegetative communities include:

- Increased tree density in former savanna-like stands of juniper and ponderosa pine
- Encroachment of conifers into nonforested vegetation
- Increased density or coverage of big sagebrush and other shrubs, and loss of understory vegetation
- Increased homogeneity of many landscapes (USDI 1998).

In many cases, fire suppression has led to unnaturally high densities of big sagebrush which reduces or eliminates perennial grasses and forbs that wildlife depend on. This leads to increased fuel loads and increased risk of stand-replacing fires. Large wildfires fragment habitat for sage grouse and other shrub obligate species.

Artificial Production

Artificial production has been attempted in many areas of the subbasin. Success in tributaries and rivers has been minimally successful with warmwater species, and unsuccessful with coldwater species. This general failure in developing naturally reproducing hatchery salmonids is reflected both by the lack of fish documented in recent surveys (see fish section) and by the lack of hybridization in most populations that have been tested.

Artificial production is an important and relatively successful component of maintaining viable reservoir fisheries and in maintaining salmonids in the river below Owyhee Dam. A number of warmwater species have been successfully introduced in the subbasin as well.

The IDFG manages redband trout as a wild population and no longer stocks hatchery fish in redband trout waters (BLM 1999).At one time, Lake Lenore Lahontan cutthroat and a Succor Creek stock of redband trout were used in IDFG hatchery programs in the Owyhee subbasin. Only one planting of rainbow trout has occurred in the North and Middle Fork Owyhee watersheds in Idaho (Juniper Creek, 1952))(IDEQ DU, Table 14).

Table 14. Known fish introductions by Idaho Department of Fish and Game (USDI 1999)

Stream	Year, Location
Boulder Creek, tributary to Jordan Creek	1956, catchable rainbow, location unknown
Cow Creek, tributary to Jordan Creek	1965, catchable rainbow, location unknown
Flint Creek, tributary to Jordan Creek	1953, catchable rainbow, location unknown
Jordan Creek	Ongoing, catchable rainbow, locations unknown
Juniper Creek, tributary to N.F. Owyhee R	1952, catchable rainbow, location unknown
Louse Creek, tributary to Jordan Creek	1953, catchable rainbow, location unknown
Rock Creek, tributary to Boulder Creek	1953, catchable rainbow, location unknown
Trout Creek, tributary to Jordan Creek	1953, catchable rainbow, location unknown
Williams Creek, tributary to Jordan Creek	1953, catchable rainbow, location unknown

In Oregon, only #53 fingerling rainbow trout are stocked in the subbasin. Most of these (51,000) are stocked in the river below Owyhee Dam. The rest (approximately 15,000 fingerlings), are stocked in BLM stock ponds. (Wayne Bowers, ODFW, personal communication, October 9, 2001).

Historically, the river below the Owyhee Dam was stocked with kokanee, brook trout, and rainbow trout (Perkins and Bowers 2000). In 1990, brown trout were introduced into the Owyhee River downstream of Owyhee Dam. Of these species, only brown trout has established a naturally reproducing population. Planting of brown trout ended in 1990 (Wayne Bowers, ODFW, personal communication, October 9, 2001).

Historically, Owyhee Reservoir was stocked with westslope cutthroat from Montana, kokanee , coho salmon), brook trout, and kamloops rainbow trout (Perkins and Bowers).

Hatchery rainbow trout in the Owyhee Reservoir are a result of upstream stocking efforts by IDFG and NDOW (Perkins and Bowers 2000).

Historically in Oregon, Lahontan cutthroat trout from Willow Creek in the Trout Creek Mountains and from Summit Lake in Nevada were planted in Crooked Creek, a tributary south of Burns Junction on Hwy. 95 (Perkins and Bowers 2000). Cow Lakes received cutthroat trout of unknown origin in 1964. Parsnip Peak Reservoir was used as a brood site for redband trout from 1979 to 1982. The reservoir was stocked with 497 redband trout from Home and Threemile creeks in Catlow Valley, 5,000 redside shiners from Hooker Creek, and 10 Umatilla dace from Cow Creek (Perkins and Bowers 2000). The trout were spawned at the reservoir in 1979, 1980, and 1981. In 1979, 26,488 fertilized eggs were taken to Klamath Hatchery where 18,500 died of fungus infection. In 1980, 966,168 fertilized eggs were taken to Klamath Hatchery where mortality was 855,268 because the fry would not take to pelletized food. In 1981, 103,161 fertilized eggs were collected and taken to the hatchery. No mention of the outcome was found. In 1982, only one ripe adult and no eggs were collected and the program was discontinued (Perkins and Bowers 2000). Antelope Reservoir was stocked with hatchery rainbows until 1990, when very high mercury levels were found in the fish. Stocking at Cow Lakes was stopped in the mid 1970s because of mortality related to poor habitat and introduced fish species (Perkins and Bowers 2000).

In Nevada, a triploid stock of rainbow, the Tahoe stock of redband, and a strain of Lahontan cutthroat have been used. The Duck Valley Indian Reservation has used a stock of rainbow from the hatchery programs at College of Southern Idaho and Black Canyon (Perkins and Bowers 2000). Large numbers of brook trout, brown trout, cutthroat trout and rainbow trout were stocked in the Owyhee River in Nevada between 1918 and 1960, while channel catfish and smallmouth black bass were stocked in 1968 and 1972, respectively (USDI 1997b). Electroshocking studies in 1957 showed that with the exception of brown trout, most introduced trout were gone or present in only limited numbers by that time (USDI 1997b).

Existing and Past Efforts

BPA funding has rarely been spent in the subbasin (Table 15, Table 16) and very little information was found on projects. BLM staff did not respond to requests for information about ongoing and past projects.

Table 15. BPA-funded Columbia River Basin Fish and Wildlife Program activities within the Owyhee subbasin

Activity	Watershed Location	Agency	BPA #	Dates
Master Plan/Sho-Ban and Sho-Paiute trout hatchery Plan and develop a facility to provide trout as part of the resident fish substitution program.	Duck Valley Reservation, Fort Hall Reservation	Shoshone-Paiute Shoshone-Bannock Tribes	9500600	1995-2001
Lake Billy ShawDesign/Construction/O&M, Duck Valley	Billy Shaw Dam and Reservoir	Shoshone-Paiute Tribes	9501503	1997-2001
Duck Valley Reservation Habitat Enhancement Restore fish habitat by repairing dikes, improving fish screens, and doing instream and bank construction, fencing, and planting.	Owyhee River, Mountain View Reservoir/Dam, Sheep Creek Reservoir/Dam, Duck Valley Reservation	Shoshone-Paiute Tribes	9701100	1997-Present

Table 16. Non-BPA funded projects

Project	Funding/Lead Agency	Status
Big game guzzler installed on Saddle Butte in Malheur County.	Foundation For North American Wild Sheep/ODFW	Completed 1999
Chukar life history research project on Succor Creek.	ODFW/University of Idaho	Completed 1998
Big horn sheep telemetry project in Owyhee Reservoir area.	Foundation For North American Wild Sheep/ODFW	On going
Purchase and Management of Rogers Wildlife Area, Malheur County.	NRCS/ ODFW	Purchased 2000
Beulah/South Sumpter Elk Telemetry Study	Rocky Mountain Elk Foundation/ODFW	Completed 1998
Aerial monitoring of sage grouse leks in Malheur County	ODFW	Completed 2000
Streamflow Restoration Prioritization:	Oregon Watershed Enhancement Board/ODFW	Unknown

Present Subbasin Management

Federal Government

As a result of the federal government's significant role in the Columbia Basin, through the development of the federal hydropower system, as a land manager, and due to its responsibilities under Section 7(a) of the Endangered Species Act (ESA), several important documents have been published in the last year that will guide federal involvement in the Owyhee subbasin and Middle Snake Province. These documents are relevant to and provide opportunities for states, tribes, local governments, and private parties to strengthen existing projects, pursue new or additional restoration actions, and develop the institutional infrastructure for comprehensive fish and wildlife protection. The key documents include the FCRPS Biological Opinion, the federal All-H paper entitled, *Conservation of Columbia Basin Salmon: A Coordinated Federal Strategy for the Recovery of the Columbia-Snake River Basin Salmon*, and the Interior Columbia Basin Ecosystem Management Project (ICBEMP). All are briefly outlined below.

Bonneville Power Administration (BPA)

BPA is a federal agency established to market power produced by the federal dams in the Columbia River Basin. As a result of the Northwest Power Act of 1980, BPA is required to allocate a portion of power revenues to mitigate damages caused to fish and wildlife populations and habitat from federal hydropower development and operation. These funds are provided and administered through the Lower Snake River Compensation Plan (LSRCP).

Columbia Basin Fish and Wildlife Authority (CBFWA)

CBFWA is made up of Columbia Basin fish and wildlife agencies (state, federal and tribal). CBFWA's purpose is to coordinate management among the various agencies and agree on goals, objectives and strategies for restoring fish and wildlife in the Columbia Basin.

Farm Services Agency (FSA)

FSA is a department within the US Department of Agriculture that ensures the well-being of American agriculture, the environment, and the American public through efficient and equitable administration of farm commodity programs, farm ownership, operating and emergency loans, conservation and environmental programs, emergency and disaster assistance, domestic and international food assistance and international export credit programs. Conservation program payments that FSA administers include Conservation Reserve Program (CRP) and the Environmental Quality Incentives Program (EQIP). Technical assistance for these programs is provided by Natural Resource Conservation Service (NRCS). County offices coordinate delivery of programs.

Interior Columbia Basin Ecosystem Management Project (ICBEMP)

The ICBEMP is a regional-scale land-use plan that covers 63 million acres of federal lands in the Interior Columbia River Basin. It was produced by the primary federal land management agencies, including the Forest Service (USFS) and the Bureau of Land Management (BLM). This document (if approved) will affect how these federal agencies prioritize actions and undertake and fund restoration activities. The BLM and USFS released a Supplemental Draft Environmental Impact Statement for the ICBEMP in March 2000. The EIS focuses on the

critical broadscale issues related to landscape health, aquatic and terrestrial habitats, human needs, and products and services.

National Marine Fisheries Service (NMFS)

NMFS is part of the National Oceanic and Atmospheric Administration (NOAA) which is under the U.S. Department of Commerce. NMFS has ESA administration and enforcement authority for anadromous fish. NMFS reviews ESA petitions, provides regulations and guidelines for activities that affect listed species, and develops and implements recovery plans. NMFS is also involved in primary research on anadromous and marine species.

NMFS developed the FCRPS Biological Opinion and the Basinwide Salmon Recovery Strategy that contain actions and strategies for habitat restoration and protection throughout the Columbia River Basin. Agencies are identified to lead fast-start efforts in specific aspects of restoration on non-federal lands. Federal land management will be implemented consistent with current programs that protect aquatic habitats (PACFISH, ICBEMP). Actions within the FCRPS Biological Opinion are intended to be consistent with or compliment the Northwest Power Planning Council's amended Fish and Wildlife Program and state and local watershed planning efforts.

Natural Resource Conservation Service (NRCS)

NRCS provides technical assistance to private land users, tribes, communities, government agencies, and conservation districts. NRCS assists in developing conservation plans, provides, field-based assistance including project design, and encourages the implementation of conservation practices to improve water quality and fisheries habitat. Programs include Conservation Reserve Program, Public Law 566 (Small Watershed Program), River Basin Studies, Forestry Incentive Program (FIP), Wildlife Habitat Improvement Program (WHIP), EQIP, and Wetlands Reserve Program (WRP).

Northwest Power Planning Council (NWPPC)

The NWPPC was created by Congress under the Northwest Power Act of 1980. The governors of Idaho, Oregon, Washington, and Montana each appoint two members to serve on the eight member council. The NWPPC has three principal mandates:

1. 20 year electric power plan to use all available resources to ensure adequate and reliable energy and lowest possible economic and environmental costs,
2. Development of a program to protect and rebuild fish and wildlife populations affected by the hydropower system,
3. Educate and involve the public in the Councils decision-making process.

US Army Corps of Engineers (USACE)

The USACE is responsible for river and harbor development and flood protection by such means as building and maintaining levies, channelization of streams and rivers , and regulating flows and reservoir levels. The ACE operates some federal dams, including fish passage on dams in the Columbia and Snake Rivers.

US Bureau of Land Management (BLM)

The BLM administers federal lands in the West not claimed by the end of the homesteading era of the 19th century, and not set aside as National Forests, National Parks, or other special federal land use designations. The BLM took over the functions of the Grazing Service (established in

1934 by the Taylor Grazing Act) and the General Land Office in 1946 when these agencies were merged to form the BLM. Lands administered by the BLM consist primarily of dry grasslands and desert in the intermountain West. These lands are currently managed for multiple use under authority of the Federal Land Policy and Management Act (FLPMA) of 1976. Primary commodity uses are grazing and mining. The BLM also manages wildlife, wilderness, archaeological and historic sites, and recreation. US Bureau of Reclamation (USBR)

The primary activity of the USBR is to provide irrigation water for the arid West. This has been accomplished through an aggressive dam building and reservoir creation program. Although no longer constructing dams, the USBR continues to operate dams and irrigation projects in the western U.S. The USBR is involved in multiple use resource management on its lands and facilities, including recreation and wildlife conservation.

US Environmental Protection Agency (EPA)

Formed in 1970, the EPA administers the Federal Air, Water, and Pesticide Acts. EPA sets national air and water quality standards. The EPA provides funding through Section 319 of the CWA for TMDL implementation projects. Each state's Department of Environmental Quality administers section 319 funds.

US Fish and Wildlife Service (USFWS)

The USFWS administers the ESA for resident fish and wildlife species and enforces the Lacey and North American Migratory Bird Treaty Acts. The USFWS distributes monies to state fish and wildlife departments through the federal tax on the sale of hunting and fishing equipment under the authority of the Pitman-Robertson Federal Aid in the Fish and Wildlife Restoration Act (1937) and the Dingle-Johnson Act. The USFWS manages a national system of wildlife refuges and provides funding for restoration of riparian areas, wetlands, and native plant communities through the Partners in Wildlife Program.

The USFWS administers the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP) that was authorized by the Water Resources Development Act of 1976, Public Law (P.L.) 94-587, to mitigate and compensate for fish and wildlife resource losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects. The fishery resource compensation plan identified the need to replace adult salmon and steelhead and resident trout fishing opportunities, and the size of the anadromous program was based on estimates of salmon and steelhead adult returns to the Snake River Basin prior to the construction of the four lower Snake River dams. A summary document describing the LSRCP and its role in individual subbasins has been compiled and submitted under separate cover to the ISRP and CBFWA (US Fish and Wildlife Service 2001a).

US Forest Service (USFS)

The USFS is responsible for the management of all National Forests and National Grasslands in the United States. The multiple use mandate of the USFS was emphasized in the Multiple Use Sustained Yield Act of 1960, and the forest planning process used for over the last 20 years was established under the Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974, and the National Forest Management Act (NFMA) of 1976. The Humboldt-Toiyabe National Forest is located in the Nevada portion of the subbasin and is managed out of Elko, Nevada.

US Geological Survey (USGS)

The USGS monitors hydrology and maps soil, geological and geomorphological features. The USGS conducts some fish and wildlife research that was formerly carried out by the USFWS.

Tribal Government

Duck Valley Shoshone Paiute Tribes

The Shoshone-Paiute Tribes are responsible for managing, protecting, and enhancing fish and wildlife resources and habitats on the Duck Valley Indian Reservation (which encompasses portions of the Owyhee and Bruneau subbasins) as well as surrounding areas in the Middle Snake Province where the tribes held aboriginal title. They are a self-governance tribe as prescribed under Public Law 103-414. A seven member Tribal Business Council is charged with making decisions on behalf of 1,818 tribal members.

The Wildlife and Parks Department, with direction from the Tribal Council, is responsible for: fish and wildlife species monitoring and management, recovery efforts, mitigation, research, management of the tribal fisheries, and enforcement of fishing and hunting regulations. The department implements fish and wildlife restoration and mitigation activities towards the goal of restoring properly functioning ecosystems and species assemblages for present and future generations to enjoy.

State Government

Idaho

Idaho Conservation Data Center (ICDC)

The ICDC, located within the IDFG, was established in 1984 (as Idaho Natural Heritage Program) through a cooperative effort involving IDFG, Idaho Department of Parks and Recreation, and The Nature Conservancy. In 1987 the program merged with the IDFG. The ICDC is part of an expanding international network of Natural Heritage Programs that collect and maintain information on the status of rare, threatened, and endangered plant and animal species; ecological reference and natural areas; and terrestrial and aquatic habitats and plant communities using an integrated, relational data management system (The Nature Conservancy 1982; The Nature Conservancy et al. 1996).

Idaho Department of Agriculture (ISDA)

The ISDA serves the state's agricultural community by providing technical and financial assistance, laboratory testing, national and international marketing, inspection, and licensing programs (ISDA Web Page 2000).

ISDA is composed of several divisions. Through these divisions, ISDA monitors pesticide use and application, groundwater, wildlife, and noxious weeds (ISDA Web Page 2000).

Idaho Department of Environmental Quality (IDEQ)

The IDEQ is charged with protecting human health and preserving the quality of Idaho's environment. IDEQ regulates facilities that generate air, water and hazardous waste pollution; conducts air and water quality monitoring; cleans up contaminated sites; and provides educational and technical assistance to businesses, local and state government agencies, and Idaho citizens. IDEQ implements regulations adopted by the Idaho Board of Environmental Quality (IDEQ Strategic Plan 2002 – 2006).

Idaho Department of Fish and Game (IDFG)

Under Title 36 of the Idaho Code, the IDFG is responsible for preserving, protecting, perpetuating, and managing fish and wildlife in the state of Idaho, as well as providing continued supplies of fish and wildlife for hunting, fishing, and trapping.

Idaho Department of Lands (IDL)

The IDL is charged with managing state-owned lands as well as providing other services to residents and businesses in Idaho. IDL is composed of five Bureaus: Administration, Fire Management, Forest Management, Forest Assistance, and Lands (IDL Web Page 2000).

The Fire Management Bureau is responsible for protecting six million acres of private, state, and federal forest lands in Idaho. It also provides technical assistance to local fire departments throughout the state (IDL Web Page 2000).

The Forest Management Bureau coordinates and administers forest products sales, forest improvement, forest inventory, and measurement of all designated forest products from endowment lands (IDL Web Page 2000). Revenue from the sale of forest products from endowment lands are used for the support of Idaho public schools.

The Lands, Range, and Minerals Division has responsibility for range management and surface leasing of state lands as well as administering weed control and water rights filings. It manages Public Trust Lands, which are those below high water mark of navigable water bodies. Other responsibilities of this division include land sales and exchanges, mineral leasing, lake protection, and the regulation of oil and gas exploration (IDL Web Page 2000).

Idaho Department of Parks and Recreation (IDPR)

The IDPR formulates and executes a long range, comprehensive plan and program to acquire, plan, protect, operate, maintain, and wisely develop areas of scenic beauty, recreational utility, or historic, archaeological, or scientific interest.

Idaho Forest Products Commission (IFPC)

The Idaho Forest Products Commission (IFPC) was created in 1992to "promote the economic and environmental welfare of the state by providing a means for the collection and dissemination of information regarding the management of the state's public and private forest lands and the forest products industry." IFPC provides a variety of statewide communications activities, educational programs and informational materials to educate specific audiences such as decision makers, educators and students as well as the general public about the need for proper forest management (IFPC Web Page 2000). IFPC goals include:

1. Increase public understanding that Idaho's forests are a renewable source of important consumer products and environmental values.
2. Provide and disseminate information about economic and environmental aspects of timber management practices.
3. Promote public support for Idaho's forest products industry.
4. Help achieve and maintain a healthy forest products industry through responsible forest stewardship.
5. Advocate balanced use of forest resources (IFPC Web Page 2000).

Idaho Geological Survey (IGS)

IGS is public service and research agency at the University of Idaho. IGS collects and disseminates geologic and mineral data for the state. The Survey studies and reports on general geology, environmental geology and geological hazards, metallic and nonmetallic deposits, surface and groundwater, and energy resources. The information is made available through oral and written communication and in publications (IGS Web Page 2000).

Idaho Rangeland Resource Commission (IRRC)

IRRC provides programs that result in an informed public that understands and supports balanced, responsible management of Idaho's economically vital private and public rangelands. Goals of the IRRC include (IRRC Web Page 2000):

1. To increase public understanding that Idaho's rangelands are a renewable resource of important consumer products and environmental values.
2. To provide and disseminate information about the economic and environmental aspects of grazing management practices.
3. To promote support for Idaho's livestock industry.
4. To help achieve and maintain an healthy livestock industry through responsible rangeland stewardship.
5. To advocate balanced use of rangeland resources.

Idaho Soil Conservation Commission (ISCC)

The ISCC consists of five members appointed to five-year terms by the Governor. A 25 member staff is responsible for delivery of natural resource improvement and administrative programs. The ISCC has the following authorizations:

- Soil Conservation District Law
  Provide assistance and guidance to the supervisors of soil conservation districts in order to enhance their capabilities in carrying out effective local conservation programs
- Idaho Water Quality Law
  Designated agency for grazing activities and agricultural activities
- Idaho Agricultural Pollution Abatement Plan (Ag Plan)
  State-level agency to implement the Ag Plan for private and state agricultural lands

The ISCC administers the following natural resource programs in the subbasin through a partnership consisting of local soil and water conservation districts and the NRCS:

- Water Quality Program for Idaho
  Provides cost sharing to owners and operators of agricultural lands for agricultural and grazing improvements to protect water quality. Priority areas include TMDL watersheds, watersheds with threatened aquatic species under the Endangered Species Act, and ground water quality protection areas.
- RCRDP – Loans
  Low interest loans to agricultural operators to install practices for the enhancement of soil and water resources, improvement of riparian areas and fish and wildlife habitat, and to increase agricultural productivity.
- RCRDP – Grants
  Provides 50 percent cost sharing for installation of agricultural conservation practices to protect water quality and enhance critical fish and wildlife habitat.
- Grazing Land Conservation Initiative
  Allocate funding to develop grazing and riparian conservation plans.
- Natural Resources Conservation Income Tax Credit

Tax credit to owners and operators of private lands for installation of riparian protection practices.

Soil and Water Conservation Districts

Soil and Water Conservation Districts (SWCDs) are subdivisions of state government consisting of five to seven-member boards of locally elected supervisors. SWCDs coordinate technical and financial assistance to protect and conserve natural resources, primarily on privately owned lands. In implementing resource conservation measures, SWCDs work with the ISCC, NRCS, tribal, and other local, state, and federal technical specialists.

SWCDs develop Five Year Resource Conservation Plans to manage conservation efforts throughout their district. In this planning effort, goals, objectives, and tasks are prioritized and specified for resource concerns including soil erosion, water quality, and fish and wildlife habitat. Five year plans are available from each SWCD.

Agricultural TMDL Implementation Plans

As the designated agency for grazing and agricultural activities under Idaho water quality law, ISCC coordinates development of the agricultural component of comprehensive TMDL implementation plans. The following agricultural implementation plans for the Owyhee subbasin are complete or in progress.

TMDL	Plan Status
Upper Owyhee River	Complete
Owyhee River	Initiated
Jordan Creek	2006

Nevada

Nevada Department of Agriculture (NDA)

NDA promotes the advancement and protection of the livestock and agricultural industries of Nevada. Programs include continuing education, pesticide and fertilizer product registration, entomology, and invasive weed strategies.

Nevada Department of Conservation and Natural Resources (NDCNR)

NDCNR is responsible for establishing and administering goals, objectives, and priorities that preserve the state's natural resources. The Director's office provides administrative, technical, budgetary, and supervisory support for nine divisions and 10 boards and commissions.

Nevada Department of Transportation (NDT)

NDT ensures a safe and effective transportation system for Nevada's economic, environmental, and social needs.

Nevada Division of Conservation Districts (NDCD)

NCDC provides administrative support to the State Conservation Commission. Conservation districts provide services to individual landowners and coordinate with other public and private agencies to protect and develop the state’s renewable resources. NCDC is the official state agency cooperating with the NRCS.

Nevada Division of Environmental Protection (NDEP)

NDEP is made up of nine bureaus that protect and enhance the environment of the state consistent with public health and enjoyment, propagation, and protection of terrestrial and aquatic life, operation of existing industries, and economic development.

Nevada Division of Forestry (NDF)

NDF coordinates and manages all forestry, nursery, threatened and endangered plant species and watershed resource activities on certain public and private lands. NDF's Natural Resource Management Program includes financial incentives, technical assistance, and education to landowners for scientifically-based forestry, conservation, and restoration practices.

Nevada Division of State Parks (NDSP)

NDSP plans, develops, and maintains a system of parks and recreation areas for residents and visitors. NDSO also preserves areas of scenic, historic, and scientific significance in Nevada.

Nevada Division of Water Planning (NDWP)

The roles and responsibilities of NDWP are to develop a plan for water use within the state that includes alternate sources, storage, protection of existing water rights, current demand, and future needs.

Nevada Division of Water Resources (NDWR)

NDWR conserves, protects, and manages the state's water resources for Nevada's citizens through the appropriation and reallocation of public waters. In addition, NDWR is responsible for quantifying existing water rights, monitoring water use, distributing water in accordance with court decrees, and reviewing water availability.

Nevada Division of State Lands (NDSL)

NDSL acquires, holds, and disposes all state lands and interests in lands; provides technical land use planning assistance, training, and information to local units of government or other agencies. The NDSL develops policies and plans for the use of lands under federal management, and represents the state in its dealings with federal land management agencies.

Nevada Division of Wildlife (NDOW)

NDOW protects, restores, and manages wildlife and wildlife habitat for the aesthetic, scientific, educational, recreational, and economic benefit of Nevada and other US citizens. The NDOW includes separate bureaus dealing with conservation education, fisheries management, game regulations, habitat enhancement, law enforcement, and licensing.

Nevada Natural Heritage Program (NNHP)

NNHP helps coordinate the resource needs of Nevada's biological heritage with human activities by maintaining an inventory and current databases on the locations, biology, and conservation status of all threatened, endangered, and sensitive species and biological communities in the state. NNHP continually evaluates conservation priorities for over 600 kinds of native animals, plants, vegetation types, and their habitats and supplies information and technical services to meet diverse conservation, planning, development, and research needs.

Nevada State Conservation Commission (NSCC)

NSCC guides and regulates two conservation districts within the Owyhee subbasin. The NSCC is involved in planning, enforcement, information distribution, collaboration, and cooperation between districts, the state, and the federal government.

Nevada State Environmental Commission (NSEC)

NSEC is an 11 member quasi-judicial and quasi-legislative agency that achieves and maintains state-regulated air and water quality and solid and hazardous waste management systems. NSEC hears and decides contested cases through appeals. This includes final decisions made by the Division of Environmental Protection in regard to enforcement actions and permits. NSEC also responds to changes in federal laws and regulations that affect Nevada's environmental programs.

Nevada Wild Horse Preservation Commission (NWHPC)

NWHPC serves to sustain viable herds of wild horses on public lands throughout Nevada. They work with federal agencies to ensure that sufficient habitat is available for wild horse populations. NWHPC participates in programs designed to encourage and promote the protection of wild horses by providing information to the general public and news media.

Oregon

Oregon Department of Environmental Quality (ODEQ)

ODEQ is responsible for implementing the Clean Water Act and enforcing state water quality standards for protection of aquatic life and other beneficial uses. The mission of the ODEQ is to lead in the restoration and maintenance of Oregon's quality of air, water, and other environmental media. With regard to watershed restoration, the ODEQ is guided by Section 303(d) of the Federal Clean Water Act and Oregon statute to establish total maximum daily loads (TMDLs) of pollutants and implement water quality standards as outlined in Oregon Administrative Rules 340-041. The ODEQ focuses on stream conditions and inputs and advocates for other measures in support of fish populations (Don Butcher, ODEQ, personal communication February 2, 2001).

Oregon Department of Fish and Wildlife (ODFW)

ODFW is responsible for protecting and enhancing Oregon's fish and wildlife and their habitats. Management policies are guided by Oregon Administrative Rules (OAR), collaborative efforts with affected tribes, and federal and state legislation. ODFW divisions focus on natural fish production, wild fish, hunting seasons, wildlife diversity, instream water rights, and mitigation. Species-specific plans are implemented for mule deer, elk, bighorn sheep, cougar, black bear, and migratory game birds. The Oregon Trout Plan, Warmwater Fish Plan and Wild Fish Management Plan guide fisheries management.

Oregon Department of Forestry (ODF)

ODF enforces the Oregon Forest Practices Act (OFPA) regulating commercial timber production and harvest on state and private lands. The OFPA contains guidelines to protect fish bearing streams during logging and other forest management activities. These guidelines address stream buffers, riparian management, road maintenance, and construction standards.

Oregon Department of Transportation (ODT)

ODT maintains highways in the subbasin. Under the Oregon Plan for Salmon and Watersheds, efforts to improve protection and remediation of fish habitat impacted by state highways are ongoing.

Oregon Division of State Lands (ODSL)

ODSL regulates the removal and filling of material in waterways. Permits are required for projects involving 50 cubic yards or more of material. Permit applications are reviewed by the ODFW and may be modified or denied based on project impacts on fish populations.

Oregon House Bill 3609

This legislation directs the development of plans for fully seeded, sustainable production of natural anadromous fish runs in Oregon river subbasins above Bonneville Dam through consultation among state and tribal entities. Adopted plans will be based on sound science and adaptive management, incorporate M&E and objectives and outcomes benefiting fish and wildlife, and be consistent with State of Oregon efforts to recover salmonid populations under the ESA.

Oregon Land Conservation and Development Department (OLCDD)

OLCDD regulates land use on a statewide level. County land use plans must comply with statewide land use goals. Effective land use plans and policies are essential tools to protect against permanent fish and wildlife habitat losses and degradation, particularly excessive development along streams, wetlands, floodplains, and sensitive wildlife areas.

Oregon Plan for Salmon and Watersheds

Passed into law in 1997, the Oregon Plan for Salmon and Watersheds outlines a statewide approach to ESA concerns based on watershed restoration and ecosystem management to protect and improve salmon and steelhead habitat in Oregon. The Oregon Watershed Enhancement Board facilitates coordination among state agencies, administers a grant program, and provides technical assistance to local watershed councils and others to implement the plan.

Oregon Senate Bill 1010

Under this plan, county-specific agricultural water quality issues are identified and addressed through a committee process. Landowners are encouraged to develop farm plans to meet the intent of the strategy. Efforts are focused on reducing water pollution from agricultural sources and protecting beneficial uses of watersheds. These plans are then incorporated in the Total Maximum Daily Load (TMDL) as a section of the Water Quality Management Plan (WQMP).

Oregon State Police (OSP)

The Fish and Wildlife Division of the OSP is responsible for enforcement of fish and wildlife regulations in the state. The Coordinated Enforcement Program (CEP) ensures effective enforcement by coordinating enforcement priorities and plans by and between OSP officers and ODFW biologists. OSP develops yearly actions plans to guide protection efforts for critical species and their habitats. Action plans are implemented through enforcement patrols, public education, and agency coordination. Voluntary and informed compliance is the cornerstone of the Oregon Plan concept.

Oregon Water Resource Department (OWRD)

OWRD regulates water use in the subbasin in accordance with Oregon Water Law. Guidelines for water appropriation determine the maximum rate and volume of water than can legally be diverted. OWRD acts as trustee for in-stream water rights issued by the state of Oregon and held in trust for the people of the state. The Water Allocation Policy (1992) tailors future appropriations to the capacity of the resource, and considers water to be "over-appropriated" if there is not enough water to meet all demands at least 80% of the time (80% exceedence). The

OWRD is a partner in the Oregon Plan and has developed streamflow restoration priorities for fish.

Oregon Watershed Enhancement Board (OWEB)

OWEB funded ODFW and OWRD, through a grant to OWRD, to determine streamflow restoration priorities in Columbia River Basin tributaries. Priorities for flow restoration have been provided to, and are being used by, OWEB as one of several factors considered in determining funding for restoration projects and activities.

Local Government

Soil and Water Conservation Districts

The eight soil and water conservation districts within the Owyhee subbasin (four in Idaho, two in Oregon, and two in Nevada) are responsible for protecting and promoting the natural resources within their county boundaries. Soil and water conservation districts work with landowners on conservation management with programs such as erosion and non-point source pollution control, groundwater protection, and education.

Other Entities and Organizations

Columbia River Basin Forum

Formerly called The Three Sovereigns, the Columbia River Basin Forum was designed to improve management of fish and wildlife resources in the Columbia River Basin. The process is an effort to create a forum where the federal government, Northwest states, and tribes could better discuss, coordinate, and resolve basinwide fish and wildlife issues under the authority of existing laws. The forum is a vehicle for implementation of the Basinwide Salmon Recovery Strategy.

Idaho Power Company

Idaho Power Company formed in 1919 as a regulated utility to provide electric service to residential and business customers in a 20,000-square-mile service territory throughout southern Idaho, eastern Oregon, and northern Nevada. The company owns and operates 17 hydroelectric plants on the Snake River and its tributaries, including the Owyhee Dam.

The natural resource management policy at Idaho Power includes

- protecting and enhancing the land, water, wildlife, and habitat resources within company ownership
- continuing to provide and expand public recreational use of said resources
- continuing to protect and improve anadromous fish populations
- protecting birds of prey affected by utility facilities

The Nature Conservancy

The mission of The Nature Conservancy (TNC) is to preserve the plants, animals, and natural communities that represent the diversity of life on earth by protecting the lands and waters they need to survive. TNC has a strong tradition of working with landowners, local communities, tribes, and public agencies to achieve conservation goals.. TNC has been instrumental in protecting important habitat areas through purchase of lands and conservation easements.

In order to achieve this mission, TNC has identified priorities for conservation action. To identify these priorities, TNC (1) identified "conservation targets," consisting of the species, natural communities and ecosystems representative of the ecoregion; (2) set conservation goals that define how much of a target species or ecosystem needs to be conserved for long-term survival; (3) assembled and mapped information using a Geographic Information System (GIS);

(4) designed a portfolio of conservation sites that best "capture" the conservation targets and consider factors such as ecosystem processes, land ownership and linkages among the sites; and (5) established priorities among conservation sites on the basis of biological values, threats, the feasibility of taking conservation action and potential leverage for accomplishing conservation at other sites.

TNC has identified four conservation sites within the Owyhee subbasin that provide exceptional opportunities for conservation of biological diversity: Owyhee Canyonlands, Duck Valley, Saddle Butte and Dry Creek.

The Owyhee Canyonlands Conservation Site is slightly over 1 million acres in Idaho, Oregon, and Nevada roughly bounded on the north by the North Fork of the Owyhee watershed, on the west by the West Little Owyhee, on the south by the Little Owyhee and South Fork of the Owyhee and on the east by Battle Creek. This area has been identified as one of the largest blocks of intact shrub steppe habitat within the entire Columbia River Basin (Quigley et al. 1996, TNC 1998). The canyonlands contains strongholds for redband trout, sage grouse, and the largest population of California bighorn sheep in the United States. The site also contains more than a dozen endemic or rare plant species. Key threats include invasive species, altered fire regimes, poorly managed grazing, and agricultural-silvicultural conversion. The Owyhee Canyonlands is one of six sites within Idaho that will receive the highest priority for TNC's conservation efforts through 2005.

The Duck Valley Conservation Site includes roughly 85,000 acres along the upper East Fork of the Owyhee River. The site contains important riparian and wetland communities as well as a wide diversity of wildlife. The site is located on the Duck Valley Indian Reservation. The Shoshone-Paiute Tribes will determine any conservation goals and actions on the site.

Saddle Butte is a 167,000 acre site in Oregon upstream from the Owyhee Reservoir. The site includes portions of the Owyhee Wild and Scenic River and contains important native shrub-steppe habitat. High quality stands of Wyoming big sage and several rare plants are found within the site.

Dry Creek is a 100,000 acre conservation site in Oregon west of Owyhee Reservoir. The area has high quality salt desert scrub habitat and several species of rare plants.

Nevada Wildlife Federation (NWF)

NWF is the state's oldest nonprofit conservation organization, representing Nevada sportsmen and conservationists concerned about issues that affect local wildlife, wetlands, streams, forests, and ranges. It is an affiliate of the National Wildlife Federation, the world's largest conservation organization.

Existing Goals, Objectives, and Strategies

USFS and BLM (INFISH)

Fish and Fish Habitat Goals

- Restore water quality that provides for stable and productive riparian and aquatic ecosystems.
- Restore stream channel integrity, channel processes, and sediment regimes under which riparian and aquatic ecosystems developed.
- Restore instream flows supporting healthy riparian and aquatic habitats, stable and effectively functioning stream channels, and rerouted flood discharges.
- Restore natural timing and variability of the water table elevation in meadows and wetlands.
- Restore diversity and productivity of native and desired non-native plant communities in riparian zones.
- Restore riparian vegetation through a) providing large woody debris characteristic of natural aquatic and riparian ecosystems, b) providing adequate summer and winter thermal regulation within the riparian and aquatic zones, c) achieving rates of surface erosion, bank erosion, and channel migration characteristic of those under which the communities developed.
- Restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region.
- Restore habitat to support populations of well-distributed native and desire non-native plant, vertebrate, and invertebrate populations that contribute to the viability of riparian-dependent communities.

Fish and Fish Habitat Objectives (Riparian Management Objectives - RMO)

Objective 1. Establish Pool Frequencies dependent on width of wetted stream (Table 17)

Table 17. Pool Frequency goals for various stream widths (number of pools per mile)

Width	10	20	25	50	75	100	125	150	200
# Pools	96	56	47	26	23	18	14	12	9

Objective 2. Comply with state water quality standards in all systems (max < 68°F)

Objective 3. Establish large woody debris in all forested systems (> 20 pieces/mi, > 12 in diameter, > 35 ft length).

Objective 4 Ensure > 80% bank stability in non-forested systems

Objective 5. Reduce bank angles (undercuts) in non-forested systems (> 75% of banks with < 90% angle).

Objective 6. Establish appropriate width/depth ratios in all systems (< 10, mean wetted width divided by mean depth).

General Riparian Area Management

Objective 1. Identify and cooperate with federal, tribal, and state and local governments to secure instream flows needed to maintain riparian resources, channel conditions, and aquatic habitat

Objective 2. Fell trees in Riparian Habitat Conservation Areas when they pose a safety risk. Keep felled trees on site when needed to meet woody debris objectives.

Objective 3. Apply herbicides, pesticides, and other toxicants/chemicals in a manner to avoid impacts that are inconsistent with attainment of Riparian Management Objectives (RMOs).

Objective 4. Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows.

Watershed and Habitat Restoration

Objective 1. Design and implement watershed restoration projects in a manner that promotes the long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and contributes to attainment of RMOs.

Objective 2. Cooperate with federal, state, and tribal agencies, and private landowners to develop watershed-based CRMPs or other cooperative agreements to meet RMOs.

Fisheries and Wildlife Restoration

Objective 1. Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of the RMOs.

Objective 2. Design, construct, and operate fish and wildlife interpretive and other use-enhancement facilities in a manner consistent with attainment of RMOs.

Objective 3. Cooperate with federal, state, and tribal wildlife management agencies to identify and eliminate wild ungulate impacts inconsistent with attainment of RMOs.

Objective 4. Cooperate with federal, state, and tribal fish management agencies to identify and eliminate impacts associated with habitat manipulation, fish stocking, fish harvest, and poaching that threaten the continued existence and distribution of native fish stocks inhabiting federal lands

Shoshone-Paiute Tribes of the Duck Valley Indian Reservation: Goals, Objectives and Strategies (Guy Dodson, Personal Communication, October 15, 2001).

Goals:

- Protect, preserve, and perpetuate fish and wildlife species on the Duck Valley Indian Reservation for present and future generations in order to meet tribal members' subsistence, cultural and economic needs.
- Restore anadromous fish to the Owyhee system.
- Work cooperatively with federal, state, county and private entities throughout the subbasin to enhance, protect and/or restore fish and wildlife habitat.

Objectives:

- Coordinate subbasin-wide land acquisitions, conservation easements and riparian habitat improvements.
    - Strategy 1: Fund and facilitate coordinator position and activities in subbasins where the Shoshone-Paiute Tribes have historical natural resource and cultural interests and rights.

    - Strategy 2: Facilitate development of cooperative funding and implementation of habitat protection and restoration across state and jurisdictional boundaries.
- Determine wildlife species composition, distribution and abundance on Duck Valley Indian Reservation.
    - Strategy 1: Work with USFWS to establish survey/monitoring protocols for candidate, threatened, and endangered species. Where appropriate, request USFWS assistance with field crew training.
    - Strategy 2: Work with IDFG, NDOW, ODFW, USFWS, BLM and other interested organizations and individuals to develop data collection methods.
    - Strategy 3: Share wildlife information with appropriate agencies (e.g. Nevada's Natural Heritage Program, Idaho Conservation Data Center, Rocky Mountain Elk Foundation, Ducks Unlimited).
    - Strategy 4: Develop long-term monitoring program for Duck Valley Indian Reservation.

- Develop and implement a sage grouse conservation plan on Duck Valley Indian Reservation.
    - Strategy 1: Participate in local sage grouse working groups (Owyhee, Jarbidge and Northeastern Nevada Stewardship Groups) to gather and share information and to identify collaborative opportunities.
    - Strategy 2: Work with IDFG, NDOW, BLM and other biologists to assess sage grouse habitat on Duck Valley Indian Reservation.
    - Strategy 3: Have conservation plan reviewed by USFWS, IDFG, NDOW and BLM.
    - Strategy 4: Secure funding source for sage grouse monitoring program.
- Protect, enhance, and/or acquire wildlife mitigation properties in Middle Snake Province, with emphasis on the Owyhee and Bruneau subbasins.
    - Strategy 1: Work with local landowners to discuss habitat enhancement/protection/acquisition opportunities.
    - Strategy 2: Develop method to evaluate habitat enhancement/protection/acquisition opportunities in the subbasin.
    - Strategy 3: Work collaboratively with interested entities in the subbasins including, but not limited to Nature Conservancy, IDFG, NDOW, local sage grouse working groups, Owyhee Initiative Workgroup, BLM, USFS, and NRCS.
    - Strategy 4: Explore opportunities to develop "grass banks" in Owyhee and Bruneau subbasins.
- Explore opportunities to protect wetland areas on the Duck Valley Indian Reservation.
    - Strategy 1: Conduct wetland evaluation.
    - Strategy 2: Establish waterfowl monitoring program.
    - Strategy 3: Work with IDFG, NDOW, Ducks Unlimited, Nature Conservancy, NRCS and others to explore collaborative opportunities for management/enhancement of wetland complex.
- Evaluate feasibility of construction/operation of an artificial production facility on Duck Valley Indian Reservation.
    - Strategy 1: Secure funding to conduct feasibility study.
    - Strategy 2: Conserve genetics of high risk populations of redband.

- Strategy 3: Determine feasibility of outplanting juvenile redband and bull trout for possible supplementation in areas with high risk populations
- Strategy 4: Continue outplanting and monitoring on Lake Billy Shaw
- Strategy 5: Expand monitoring program to include research on feasibility of redband supplementation.
- Strategy 6: Expand outplanting and monitoring on existing reservoirs to include stocking of native fish or other suitable species.

- Protect streams, associated wetlands and riparian areas on Duck Valley Indian Reservation.
  - Strategy 1: Continue spring protection project.
  - Strategy 2: Work with Natural Resources Department to revise grazing management plan for Reservation.
  - Strategy 3: Continue to construct fences to exclude domestic stock from sensitive areas on Reservation.
  - Strategy 4: Work with NRCS and other agencies to identify possible cost-share projects.
- Expand redband trout genetics study.
  - Strategy 1: Complete data collection on East Fork Owyhee River tributaries.
  - Strategy 2: Share information with pertinent state, federal and private agencies.
  - Strategy 3: Work collaboratively with IDFG, NDOW, BLM and USFS to identify data gaps and develop a research and monitoring plan to fill those gaps.
  - Strategy 4: Determine potential thermal migration barriers using FLIR or remote sensing technologies.
- Determine long-term viability of redband metapopulations in the Owyhee, Bruneau and Middle Snake Area.
  - Strategy 1: Determine priority risks to isolated redband populations in the South Fork Owyhee River watershed.
  - Strategy 2: Survey and assess condition of redband populations and habitat in Duck Valley Indian Reservation, lower Blue Creek and the North Fork Owyhee River to develop data sets and assessment resources on par with information in other portions of the subbasin.
  - Strategy 3: Determine function of Duck Valley Indian Reservation habitat in maintaining connectivity and overall population viability in the upper Owyhee subbasin.
  - Strategy 4: Develop integrated databases and GIS resources that combine data collected in different states and jurisdictions to develop understanding of population and habitat dynamics across the Owyhee subbasin.
- Restore anadromous fish to the Owyhee and Bruneau subbasins.
  - Strategy 1: Conduct feasibility study on passage for anadromous species through Hells Canyon Complex and Owyhee Dam.
  - Strategy 2: Evaluate various passage options.
  - Strategy 3: Conduct habitat studies of potential spawning areas to determine viability of natural reproduction above Owyhee Dam.

Owyhee County Commissioners – Owyhee Initiative

Goal: To develop and implement a landscape-scale program in Owyhee County that preserves the natural process that create and maintain a functioning, unfragmented landscape supporting and sustaining a flourishing community of human, plant and animal life, that provides for economic stability by preserving livestock grazing as an economically viable use, and that provides for the protection of cultural resources.

Objectives:

- Implement a landscape-based research, management and restorative program that identifies current state of scientific knowledge of the area, identifies information gaps and needed research, identifies and builds on successful management strategies and research and restoration projects, and identifies management strategies designed to achieve the objectives.
- Develop and implement "grass banking" in Owyhee County in order to advance research and restoration.
- Establish a National Sage Grouse Research and Restoration Area.
- Evaluate and consider a series of voluntary land exchanges that benefit the resource, the landowners, management of federal lands and the further interests of the county.
- Create incentives for conservation.
- Authorize and fund implementation of sagebrush-steppe restoration programs at sites identified by science advisory committee as providing opportunity for high probability of success.
- Resolve status of Wilderness Study Areas and management issues associated with WSA-related management restrictions.

Owyhee County Sage Grouse Working Group

Goal: Preserve and increase sage grouse populations in Owyhee County.
Objectives:

- Map locations of all known active and historic sage grouse leks in Owyhee County by the end of 2001.
- Identify and map sage grouse breeding (nesting and early brood) habitat associated with active leks by the end of 2004.
- Identify and map known sage grouse wintering habitat by the end of 2001.
- Perform a qualitative assessment of sage grouse breeding (nesting and early brood) habitat associated with active leks.
- Map undesirable disturbance and habitat.
- Develop maps that identify sage grouse habitat for high priority protection from wildfire.
- Develop allotment specific grazing management plans.
- Reseed sites that have been burned.
- Implement sagebrush restoration projects in historic sage grouse habitat.
- Identify existing and potential loss of sage grouse habitat due to juniper encroachment. Prioritize sites and perform juniper control activities.
- Using radio-telemetry tracking of sage grouse, determine the effect of predation on sage grouse.
- Perform artificial nest studies in selected parts of Owyhee County to compare artificial nest fate in different types of habitats.

- Use interviews with local landowners, hunters, and others to gather data on predators.
- Review data collected during 1999 and 2000 and, if necessary, recommend more restrictive hunting seasons.
- Support legislation to allow IDFG Habitat Improvement Program funds to be used for sage grouse habitat improvement.
- Recommend that the IDFG require a free permit to hunt sage grouse to allow better monitoring of sage grouse hunters and their harvest.
- Offer all sage grouse permit holder's mail-in envelopes for sage grouse wings. Include a letter explaining the need for the information obtained from wings.
- Maintain needed check stations and wing barrels.
- Use a telephone survey of permit holders to estimate sage grouse harvest in each county.
- Band sage grouse in selected areas to help estimate harvest rates in those areas.
- Provide a reliable estimate of the distribution and populations of sage grouse in Owyhee County by 2004.
- Coordinate efforts by IDFG, BLM, USAF and others to systematically survey and/or otherwise identify through landowner surveys all active leks and historic leks in the county by the end of the 2004 breeding season.
- Determine which sage grouse populations are non-migratory and migratory.
- Initiate radio-telemetry studies to determine causes of sage grouse chick mortality by 2002.
- Investigate the impact of different weather on variation in sage grouse numbers
- In Owyhee County.
- Encourage research on the impact of human disturbance of sage grouse.

USDA Natural Resources Conservation Service

The following is from the Natural Resources Conservation Service Strategic Plan 2000 – 2005 (USDA Natural Resources Conservation Service 2000)

Goals and Objectives

Goal 1. Enhance natural resource productivity to enable a strong agricultural and natural resource sector.
- Objective 1.1. Maintain, restore, and enhance cropland productivity.
- Objective 1.2. Maintain, restore, and enhance irrigated land.
- Objective 1.3. Maintain, restore, and enhance grazing land productivity.
- Objective 1.4. Maintain, restore, and enhance forestland productivity.

Goal 2. Reduce unintended adverse effects of natural resource development and use to ensure a high quality environment.
- Objective 2.1. Protect farmland from conversion to non-agricultural uses.
- Objective 2.2. Promote sound urban and rural community development.
- Objective 2.3. Protect water and air resources from agricultural non-point sources of impairment.
- Objective 2.4. Enhance animal feeding operations to protect the environment.
- Objective 2.5. Maintain, restore, or enhance wetland ecosystems and fish and wildlife habitat.

Goal 3. Reduce risks from drought and flooding to protect individual and community health and safety.

Objective 3.1. Protect upstream watersheds from flood risks.
Objective 3.2. Protect watersheds from the effects of chronic water shortages and risks from drought.

Goal 4. Deliver high quality services to the public to enable natural resource stewardship.
Objective 4.1. Deliver services fairly and equitably.
Objective 4.2. Strengthen the conservation delivery system.
Objective 4.3. Ensure timely, science-based information and technologies.

Strategies

NRCS will work with the conservation partnership to achieve stated goals and objectives. Detailed lists of strategies pertaining to individual goals and objectives are presented in the Natural Resources Conservation Service Strategic Plan, 2000 – 2005 (USDA Natural Resources Conservation Service 2000).

Native Salmonid Assessment Research (Kevin Meyers, Personal Communication, August 28, 2001)

The overall goal of this research is to protect and rebuild populations of native salmonids in the middle and upper Snake River provinces to self-sustaining, harvestable levels. Associated with this goal are three specific objectives, which are being implemented in phases:

Objective 1 Assess current stock status and population trends of native salmonids and their habitat.
- Strategy 1. Coordinate with other ongoing projects and entities to avoid data duplication and to prioritize sampling efforts.
- Strategy 2. Use electro-fishing and snorkeling to estimate presence/absence and abundance of salmonids throughout the middle and upper Snake River provinces.
- Strategy 3. Identify, describe, and measure stream habitat and landscape-level characteristics at the fish sampling sites.
- Strategy 4. Collect genetic samples (fin clips) from native salmonids to determine (using microsatellite DNA markers) the purity of populations and the degree of genetic variability among and within populations.
- Strategy 5. Develop models that explain the occurrence and abundance of native salmonids based on measurable characteristics of stream habitat and landscape features. Results will identify populations at risk and in need of recovery strategies, and will guide study design for Objective 2.

Objective 2 Based on results from Objective (or Phase) 1, initiate studies to identify major limiting factors and life history and habitat needs for native salmonid populations throughout the middle and upper Snake River provinces, especially for populations most at risk of extirpation.

Objective 3 Develop and implement recovery and protection plans based on results from Objectives (or Phases) 1 and 2.

The Nature Conservancy (Will Whelan, Personal Communication, October 15, 2001)

Goals

1. Shrub-steppe habitat: Identify and protect the existing high quality shrub-steppe habitat (late seral condition areas), while moving the fair quality shrub-steppe (mid seral areas) into late seral conditions.
2. Redband trout: Protect and maintain population strongholds of redband trout by focusing on the protection and enhancement of riparian habitat within the stronghold population's watershed.
3. Springs, spring creek systems, and wetlands: Maintain or improve the ecological conditions of all springs, spring creek systems, and wetlands so as to be rated in Proper Functioning Condition.
4. Intermittent streams and rivers: Maintain the high quality and diversity of the riparian communities within and along intermittent streams and rivers and prevent the degradation of these systems.
5. River terrace communities: Maintain the existing condition and quality of all A and B ranked big basin sagebrush/basin wildrye river terrace communities along the South Fork of the Owyhee, and identify and protect similar river terrace communities throughout the Owyhee Canyonlands.
6. Vernal pools: Identify and protect all high quality (A and B-ranked) occurrences of vernal pools within the Owyhee Canyonlands site.
7. California bighorn sheep: Double the population of California bighorn sheep within the Owyhee Canyonlands from the 1994 reported levels or increase the population to approximately 750 animals. Protect and maintain California bighorn sheep populations elsewhere in the subbasin.

Strategies

1. Develop community supported plans for conservation of key ecological values that also take into account economic and cultural values.
2. Direct resources to highest priority projects within the subbasin as identified using a science-driven ecoregional planning process.
3. Establish forage reserves on private lands to help ranchers alter their grazing patterns to meet ecological objectives.
4. Emphasize protection of existing high quality habitats for a wide range of species and maintain existing areas of undisturbed shrub-steppe habitat.
5. Establish and provide enhanced funding for locally developed cooperative weed management programs that bring together private landowners, local, state, and federal agencies, and other interested parties. Plans will be developed that utilize best integrated weed management practices to control and prevent weed infestations.
6. Manage fire to achieve ecological objectives using adaptive management principles.
7. Work with willing landowners and land managers to protect priority conservation lands through acquisitions, conservation easements, land exchanges, and management agreements.
8. Support the use of best management practices for grazing to protect sensitive habitats.
9. Work with stakeholders to implement a travel plan that adequately addresses potential impacts from construction or development of new roads and off-road vehicles on key conservation targets.
10. Fund research and monitoring to address key uncertainties regarding management and protection of sage grouse.

11. Conduct monitoring and evaluation to measure success of projects.

Research, Monitoring, and Evaluation Activities

Snake River Native Salmonid Assessment (Project No. 980002) (Kevin Meyer, Personal Communication, August 28, 2001)

This is an ongoing research project initiated in August 1998 to assess the current status of native salmonids in the Middle and Upper Snake Provinces in Idaho (Phase I), identify factors limiting populations (Phase II), and develop and implement recovery strategies and plans (Phase III). The inventory phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. Recovery strategies for individual or groups of subbasins will be developed to address the factors most important in limiting the patterns of distribution and abundance of native salmonids.

In the first 3+ years of the project, fish and habitat surveys have been made at a total of 757 sites on private and public lands across southern Idaho in nearly all major watersheds, including the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneufe, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project is also evaluating the effectiveness of electro-fishing to remove non-native brook trout as a means of reducing threats to native salmonids. After three years of removal, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky 2001, in progress). Other removal techniques (e.g., Young 2001) may be evaluated in subsequent years in an attempt to find a more viable method of removing non-native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

Because the inventory phase is ongoing and not completed for any one species (Yellowstone cutthroat trout will be completed in 2002), analysis to date for the most part has been preliminary and cursory (Meyer 2000; Meyer and Lamansky 2001). However, in a study of Yellowstone cutthroat trout densities across southeast Idaho, densities remained unchanged and fish size structure improved over the last 20 years, suggesting that at least at some locations in the middle and upper Snake River provinces, native salmonid populations may be relatively stable (Meyer et al. in review). Maturity of Yellowstone cutthroat trout has been determined for a number of locations across southeast Idaho to assess effective population size for extinction risk analysis in Idaho.

Table 18. BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities within the Owyhee subbasin

Activity	Watershed Location	Agency	BPA #	Dates
Duck Valley Resident Fish Project Fund fish purchase on the Duck Valley Indian Reservation and contribute to management costs of the sport fishery at the reservoirs.	East Fork Owyhee River, Boyle Creek Pond, Sheep Creek Reservoir, Mountain View Reservoir, Lake Billy Shaw	Shoshone-Paiute Tribes	8815600	1988-Present
Lake Billy Shaw study: Duck Valley reservation Analyze feasibility of the Billy Shaw Reservoir in order to develop an additional lake fishery at this site.	Billy Shaw Slough, Duck Valley Indian Reservation	Shoshone-Paiute Tribes,	9501500	1995-1996
Assess Resident Fish Stocks, Owyhee Basin/DVIR Identify genetic composition of fish species in upper East Fork Owyhee River	Tributaries to East Fork Owyhee River	Shoshone-Paiute Tribes	200007900	2001
Technical Review: Billy Shaw dam, Duck Valley Consult, model/plan, develop, and gather data	Billy Shaw Dam and Reservoir	Us Bureau Of Reclamation - Boise	9501502	1997

Statement of Fish and Wildlife Needs

Fish

1. Continue to inventory native salmonids in the Owyhee subbasin to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation
2. Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within native redband trout populations and to delineate genetic population structure of redband trout throughout their historic range. This fundamental genetic information is needed to identify remaining pure populations, to preserve existing genetic variability, to identify population segments for the development of management plans, and to designate conservation units/management units
3. Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout. A greater understanding of the phenomenon of hybridization and introgression observed within *Oncorynchus* populations throughout the Middle and Upper Snake River Provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of possible future genetic risks

4. Continue coordinated collection of water temperature data throughout the Lower Middle Snake River Province.
5. Maintain connectivity of the populations in Oregon with populations in Idaho and Nevada to reduce vulnerability to catastrophic events and genetic bottlenecks, and to enable recolonization of suitable empty habitat
6. Determine impacts introduced warm water fishes are having on native redband populations
7. Determine minimum flows necessary for aquatic life downstream of irrigation storage reservoirs
8. Provide fish screening and passage at diversions
9. Determine abundance, distribution, and life history characteristics of mountain whitefish
10. Evaluate Boylan Bypass fish bypass system for applicability to Hells Canyon Dam Complex, Owyhee Dam
11. Protect riparian and wetland areas from grazing impacts
12. Survey habitat in DVIR, the upper North Fork Owyhee River, the South Fork Owyhee River and in Oregon to determine status of redband and mountain whitefish populations in areas that are currently data gaps
13. Determine degree of isolation and connectivity between salmonid populations and identify and implement strategies for increasing connectivity
14. Investigate feasibility and implement if possible, genetic preservation actions for South Fork Owyhee River populations of redband trout and other populations identified in high risk of local extirpation
15. Model historic redband population to determine ranges of variability in abundance and distribution within the subbasin

Wildlife

1. Investigate population dynamics of California bighorn sheep populations in the Owyhee and Bruneau subbasins
2. Develop GIS/data repository for fish and wildlife information generated about subbasin
3. Protect, enhance, and/or restore riparian habitats on public/private lands by working cooperatively with private landowners
4. Conduct inventory of sensitive and rare plants in Owyhee Canyonlands, and Duck Valley Indian Reservation
5. Continue to collect life history, distribution, movement and habitat data for Sage Grouse populations in subbasin
6. Conduct comprehensive survey of herptiles in the subbasin
7. Collect life history, habitat use, distribution and movement information on bat species in subbasin (DVIR)
8. Conduct comprehensive survey of avian species across the subbasin (DVIR)
9. Conduct research to determine population dynamics of sage grouse population on Duck Valley Indian Reservation (DVIR)
10. Conduct radio telemetry study of mule deer to determine movement patterns, habitat use, competitive interactions with elk (DVIR)
11. Conduct research on pronghorn populations in subbasin to collect life history information, movement data and herd productivity (DVIR).

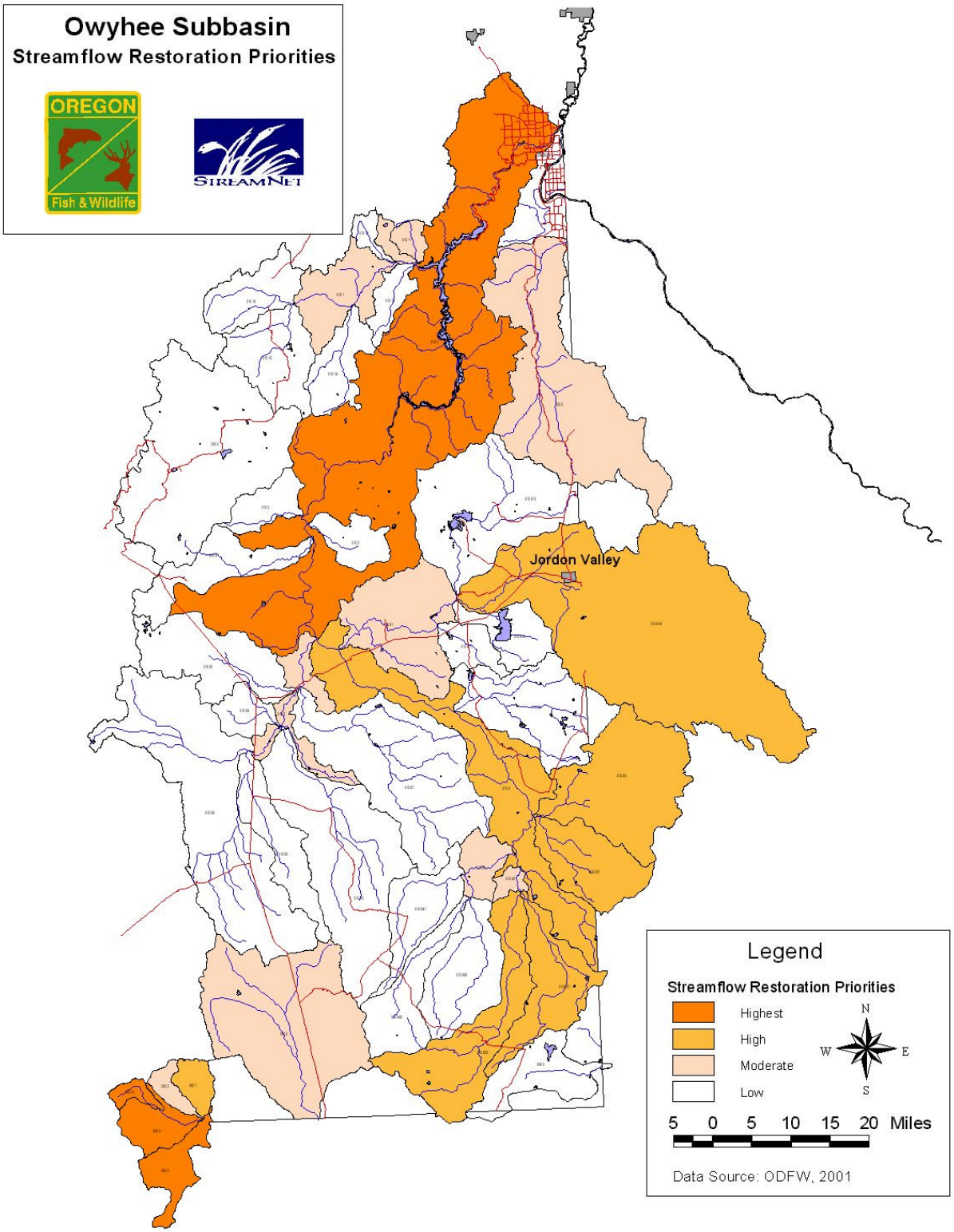

Figure 17. Oregon streamflow restoration priorities

Owyhee Subbasin Recommendations

Projects and Budgets

The following subbasin proposals were reviewed by the Middle Snake Provincial Working Group and Columbia Basin Fish and Wildlife Authority during April 2002 and are recommended for Bonneville Power Administration project funding for the FY2003-FY2005 funding cycle.

Table 1 provides a summary of how each project relates to resource needs, management goals, objectives, strategies and other activities in the subbasin.

Continuation of Ongoing Projects

Project: 198815600 – Implement Fishery Stocking Program Consistent With Native Fish Conservation

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Sponsor: Shoshone-Paiute Tribes of Duck Valley Indian Reservation (SPT)

Short Description:

To enhance fisheries on the DVIR we will stock three reservoirs (closed systems) with rainbow trout. This project will support a sustainable (put-and-take) harvest by Shoshone-Paiute tribal members and non-Indian anglers without impacting native trout.

Abbreviated Abstract

The Shoshone-Paiute Tribes will stock two closed reservoir systems (Mountainview and Sheep creeks) on the Duck Valley Indian Reservation with catchable and sub-catchable size rainbow trout. This project will help restore a subsistence fishery for tribal members that historically depended on wild salmon and steelhead in the Owyhee and Bruneau Rivers. This project is partial substitution for the loss of anadromous fish production due to construction and operation of hydroelectric dams on the Columbia and Snake Rivers and is expected to last indefinitely unless naturally self-sustaining fisheries equal to the lost production can be restored. Certified disease-free rainbow trout will be purchased from private hatcheries. Monitoring (including creel surveys) was implemented in FY2000 (as part of a comprehensive management plan) to evaluate the success of the fishery. Since 1999 CPUE at both reservoirs has increased. Trout in the reservoirs are sampled biannually through gill netting and visual inspection through creel surveys for length-weight-condition data and signs of disease. Adaptive management practices are utilized on this project to minimize impacts on native fish stocks, especially endemic redband trout stocks. When the results of our genetics program (Project 200007900) are analyzed, modifications to this program towards becoming a native fishery will be made. At present we will continue to monitor and evaluate the success of this program.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
199701100	Enhance and Protect Habitat & Riparian Areas on the Duck Valley Indian Resv.	Habitat enhancement is a critical need for comprehensive fish & wildlife management of the Owyhee Basin DVIR
199501500	Lake Billy Shaw Fishery O&M	A new Bonneville Power Administration (BPA)-funded reservoir was completed in 1998 on the DVIR -- the development of its fisheries needs to be integrated into the stocking project to maintain consistency and protect the native trout fishery on the DVIR and downstream.
200007900	Assess Resident Fish, East Fork Owyhee River	Results from this project could aid the Tribes in stocking of native redband trout into closed system reservoir on the DVIR

Relationship to Existing Goals, Objectives and Strategies

Since no specific new amendments have been approved for the blocked areas as of this writing, we are referencing the 1994/5 amendments to the Northwest Power Act.

2.1A.1 Explore methods to assess trends in ecosystem health.
2.2A Support native species in native habitats.
2.2H The need to learn from implementation (M&E)
7.1B Conserve genetic diversity
7.3C Collection of population status, life history and other data on wild and naturally spawning populations
10.1E.1 Implementation of identified resident fish projects by 2006
10.2A.2 Address potential impacts on resident fish, where such impacts exist, in developing basin wide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1.
10.8C.2 Review DVIR surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in the Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

From the NWPPC's Document 2000-19 "Columbia River Basin Fish and Wildlife Program" biological objectives regarding substitution for anadromous fish losses:

- Restore native resident fish species to near historic abundance throughout their historical ranges where original habitat conditions exist and where habitats can be feasibly restored.
- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery reared stocks that are compatible with the continued persistence of native resident fish species and their

restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

This project addresses the following objective outlined in the Owyhee subbasin summary:

- Expand out-planting and monitoring on existing reservoirs to include stocking of native or other suitable species.

Review Comments

CBFWA recommends that the sponsor should consider combining this project with Project 199501500 since they are essentially the same but occur in different lakes. If this project was combined with Project 199501500 administrative, M&E, and O&M costs could be reduced without reducing the quality and deliverables of these projects.

Stocking rates for these waters seem excessive considering that temperature and oxygen profiles indicate they are marginal for trout. CBFWA questions how they are determined and adjusted annually? During the next 2 years the project costs will increase from $110,000 to $420,000. CBFWA questions why are project costs increasing so much over prior years?

If the goal of the project is to produce more and bigger fish for anglers, The suggests the proponent should consider using net-pens or rearing ponds to reduce transportation and fish costs. Equipment maintenance seems excessive for what is needed to do this project, most of the equipment is owned by sub-contractors. See project 199501500 for additional issues that also relate to this project.

Budget

FY2003	FY2004	FY2005
$211,688 Category: High Priority Comments:	$209,000 Category: High Priority	$218,000 Category: High Priority

Project: 199501500 - Lake Billy Shaw Operations and Maintenance and Evaluation (O&M, M&E)

Sponsor: Shoshone-Paiute Tribes of Duck Valley Indian Reservation (SPT)
Short Description:

The purpose of this operation and maintenance (O&M) project is to enhance and develop Lake Billy Shaw as a premier fishery in the Northwest U.S. The lake will be stocked with native fish or other suitable species. Shoreline and water quality enhancement/monitoring will be conducted.

Abbreviated Abstract

The purpose of this Operation and Maintenance (O&M) project is to enhance and develop Lake Billy Shaw into a premier fishery in the Western United States. The O&M will include maintaining the area as a high quality camping and fishing area in the West. Interpretive signs will be updated and maintained to instruct anglers and campers of regulations. Native trees and shrubs will continue to be planted along the riparian areas of the inlet canals and shoreline of the lake to help ensure water quality is sufficient for trout survival and growth. Maintenance of exclosure fencing will be needed on streams and feeder canal to protect them from degradation and maintain high water quality in the lake. Fish screens will be monitored and maintained to

prevent entrance of non-game/native fish into the lake. Water quality of the lake and streams will be measured throughout the year with a suite of metals testing occurring once a year. Existing habitat and newly planted trees/grasses will be monitored and evaluated. Photo points have been established to provide better monitoring of enhancement activities. The fishery will be evaluated twice yearly to determine fish health, overwinter survival, food sources, and growth. The monitoring plan includes provisions for escapement numbers, water quality and quantity, fishery success, catch rates, habitat and wildlife monitoring and evaluation.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
198815600	Implement Fishery Stocking Program Consistent With Native Fish Conservation	Similar tasks and objectives to Lake Billy Shaw
200007900	Assess Resident Fish, East Fork Owyhee River	Will eventually provide information on native trout on the DVIR for possible stocking into Lake Billy Shaw
199701100	Enhance and Protect Habitat & Riparian Areas on the Duck Valley Indian Reservation	Habitat enhancement is a critical need for comprehensive fish & wildlife management of the Owyhee Basin DVIR

Relationship to Existing Goals, Objectives and Strategies

Since no specific new amendments have been approved for the blocked areas as of this writing we are referencing the 1994/95 amendments to the Northwest Power Act.

2.1A1: Explore methods to assess trends in ecosystem health.
2.2A: Support native species in native habitats.
2.2H: The need to learn from implementation (M&E)
7.1B: Conserve genetic diversity
7.1C: Collection of population status, life history and other data on wild and naturally spawning populations
10.1E1: Implementation of identified resident fish projects by 2006
10.2A.2 Address potential impacts on resident fish, where such impacts exist, in developing basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1
10.8C.2 Review DVIR surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in the Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

From the NWPPC's Document 2000-19 "Columbia River Basin Fish and Wildlife Program":

Biological Objectives regarding substitution for Anadromous Fish Losses:

- Restore native resident fish species to near historic abundance throughout their historical ranges where original habitat conditions exist and where habitats can be feasibly restored.

- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

Resident Fish Losses:

- Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystems elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.

This project is identified in the Owyhee subbasin summary:

Objective: Evaluate the feasibility of construction/operation of an artificial production facility in the DVIR.

- Strategy 4:Continue out-planting and monitoring on Lake Billy Shaw
- Strategy 5: Expand monitoring program to include research on feasibility of redband supplementation.
- Strategy 6: Expand out-planting and monitoring on existing reservoirs to include stocking of native fish or other suitable species (i.e. sterile rainbow).

Review Comments

This is a fundable project; however, CBFWA suggests that the following concerns should be addressed. Although many tasks (e.g., planting projects, fencing, signage, and public relations) have been in progress for multiple years, when will they be finished? Much of the work seems repetitive and once baseline data has been established, implementing select tasks (e.g., water quality monitoring) on a yearly basis may have limited value. Monitoring could be conducted on a rotating basis with other lakes from Project 198815600. CBFWA suggests that data for each lake could be updated every three years and this would provide adequate information for assessing changes over time. In addition, monitoring riparian plants should be conducted one year after planting and then every five to ten years. Furthermore, CBFWA believes that hook and line sampling is redundant if creel surveys are conducted. The CBFWA recommends that the sponsors consider combining this project with Project 198815600 resulting in an annual budget of $250,000.

Budget

FY2003	FY2004	FY2005
$293,000 Category: High Priority Comments:	$244,000 Category: High Priority	$261,000 Category: High Priority

Project: 199505703 – Southern Idaho Wildlife Mitigation – Shoshone-Paiute Tribes

Sponsor: Shoshone-Paiute Tribes of the Duck Valley Indian Reservation (SPT)

Short Description:

Acquire, enhance and protect wildlife habitat to mitigate for the construction of Anderson Ranch, Deadwood, and Black Canyon hydroelectric facilities.

Abbreviated Abstract

The Northwest Power Planning Council's (Council) 2000 Fish and Wildlife Program's primary wildlife strategy is to "complete the current mitigation program for construction and inundation losses….(NWPPC 2000)." To achieve this goal, the Shoshone-Paiute Tribes propose to protect, enhance/restore and maintain native riparian, wetland, forest and shrub-steppe habitats (2500 habitat units (HUs) of habitat protection, 500 HUs of habitat enhancements in FY2003) at suitable sites in the Middle Snake Province as mitigation for the construction of Anderson Ranch, Deadwood, and Black Canyon hydroelectric projects. The Tribes, in coordination with the Shoshone-Bannock Tribes and the Idaho Department of Fish and Game, plan to fully mitigate construction losses by 2013. Identified losses at Anderson Ranch, Black Canyon, and Deadwood total 19,270 habitat units (HUs), of which only 57 (.3%) have been mitigated for to-date (this is based on a 1:1 crediting ratio pending resolution of crediting issues surrounding the Council's 2000 Fish and Wildlife Program).

Potential acquisition/easement/enhancement sites will be identified using a number of tools, including, but not limited to: geospatial data, GAP Analysis information and regional wildlife data. The Tribes will work extensively with entities interested in protecting fish and wildlife resources in the province, including: the Nature Conservancy, Owyhee Initiative Working Group, Idaho Department of Fish and Game (IDFG), Shoshone-Bannock Tribes (SBT), Bureau of Land Management (BLM) Resource Area biologists, U.S. Fish and Wildlife Service (USFWS), U.S. Forest Service (USFS) and private land owners. Projects will be reviewed by IDFG and the SBT for consistency with the Council's 2000 program.

Progress towards long-term habitat protection goals will be measured using Habitat Evaluation Procedures (HEP) (USFWS 1981), by conducting Proper Functioning Condition (PFC) assessments (Prichard 1998) and by monitoring fish and wildlife populations. Wherever possible, passive restoration techniques will be employed.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
199206100	Albeni Falls Wildlife Mitigation Program	This is the wildlife mitigation program in place in the northern part of the state. The Tribes will consult and coordinate with this interagency team during M&E development and on HEP activities.

Relationship to Existing Goals, Objectives and Strategies

This project proposal is consistent with the Council's 2000 Fish and Wildlife Program and has significance in the context of regional planning activities being undertaken in the Owyhee and

Bruneau subbasins. The following excerpts, taken from the NWPPC 2000 Program, illustrate project consistency with the Program:

- The extent of the wildlife mitigation is of particular importance to agencies and tribes in the so-called "blocked" areas, where anadromous fish runs once existed but were blocked by the development of the hydrosystem. While there are limited opportunities for improving resident fish in those areas, resident fish substitution alone seldom is adequate mitigation.
- Wildlife mitigation should emphasize addressing areas of the basin with the highest proportion of unmitigated losses (losses in Middle Snake Province only .3% mitigated to-date)
- Habitat Strategies -…The Northwest Power Act allows off-site mitigation for fish and wildlife populations affected by the hydrosystem. Because some of the greatest opportunities for improvement lie outside the immediate area of the hydrosystem—in the tributaries and subbasins off the mainstem of the Columbia and Snake Rivers—this program seeks habitat improvements outside the hydrosystem as a means of off-setting some of the impacts of the hydrosystem.
- The program directs significant attention to rebuilding healthy, naturally producing fish and wildlife populations by protecting and restoring habitats and the biological systems within them.
- Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin.
- There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to hydroelectric development.
- (regarding) Eliminated Habitat: In the case of wildlife, where the habitat is inundated, substitute habitat would include setting aside and protecting land elsewhere that is home to a similar ecological community.
- Build from Strength – Efforts to improve the status of fish and wildlife populations in the basin should protect habitat that supports existing populations that are relatively healthy and productive.
- Habitat units identified in Table 11-4 must be acquired in the subbasin in which the lost units were located unless otherwise agreed by the fish and wildlife agencies and tribes in the subbasin.

The Owyhee subbasin supports a diversity of wildlife and plant species. Much of the subbasin has been identified as a "Center of Biodiversity" and rated as having high ecological integrity by ICBEMP (Quigely and Arbelbide 1997). The subbasin supports the largest population of California bighorn sheep in the U.S. as well as being part of the largest contiguous center of shrub-steppe biodiversity in the Interior Columbia River Basin (Quigely and Arbelbide 1997, Schnitzspahn et al. 2000). The Owyhee-Bruneau Canyonlands (3.2 million acres encompassing portions of the Owyhee and Bruneau subbasins) was recently under consideration for a national monument designation.

A number of conservation efforts are in progress in the subbasin. Following are a listing of some of the goals, objectives and strategies that were put forth in the Owyhee subbasin summary (NWPPC 2000a):

Entity – Shoshone-Paiute Tribes
Goal: Work cooperatively with federal, state, county and private entities throughout the subbasin to enhance, protect and/or restore fish and wildlife habitat
Objective: Protect, enhance, and/or acquire wildlife mitigation properties in the Middle Snake Province, with emphasis on the Owyhee and Bruneau subbasins.

- Work with local landowners to discus habitat enhancement/protection/acquisition opportunities.
- Develop method to evaluate habitat enhancement/protection/acquisition opportunities in the subbasin
- Work collaboratively with interested entities in the subbasins, including, but not limited to: the Nature Conservancy, IDFG, NDOW, local sage grouse working groups, Owyhee Initiative Work Group, BLM, USFS, and NRCS.
- Explore opportunities to develop "grass banks" in Owyhee and Bruneau subbasins

Objective: Coordinate subbasin-wide land acquisitions, conservation easements and riparian habitat improvements.

- Fund and facilitate coordinator position and activities in subbasins where the Shoshone-Paiute Tribes have historical natural resource and cultural interests and rights.
- Facilitate development of cooperative funding and implementation of habitat protection and restoration across state and jurisdictional boundaries

Objective: Protect streams, associated wetlands and riparian areas on Duck Valley Indian Reservation

Entity – The Nature Conservancy
Goals:

- Shrub-steppe habitat – Identify and protect the existing high quality shrub-steppe habitat (late seral condition areas), while moving the fair quality shrub-steppe (mid seral areas) into late seral conditions.
- Springs, spring creek systems, and wetlands: Maintain or improve the ecological conditions of all springs, spring creek systems, and wetlands so as to be rated in Proper Functioning Condition.

River terrace communities: Maintain the existing condition and quality of all A and B ranked big basin sagebrush/basin wild rye river terrace communities along the South Fork of the Owyhee, and identify and protect similar river terrace communities throughout the Owyhee Canyonlands.

Strategies:

- Develop community-supported plans for conservation of key ecological values that also take into account economic and cultural values.
- Direct resources to highest priority projects within the subbasin as identified using a science-driven eco-regional planning process.
- Emphasize protection of existing high quality habitats for a wide range of species and maintain existing areas of undisturbed shrub-steppe habitat.

Work with willing landowners and land managers to protect priority conservation lands through acquisitions, conservation easements, land exchanges, and management agreements.

Entity – Owyhee County Commissioners – Owyhee Initiative
Goal: To develop and implement a landscape-scale program in Owyhee County that preserves the natural processes that create and maintain a functioning, unfragmented landscape supporting and sustaining a flourishing community of human, plant, and animal life, which provides for economic stability by preserving livestock grazing as an economically viable use, and provides for the protection of cultural resources.

Objectives:

- Implement a landscape-based research, management and restorative program that identifies current state of scientific knowledge of the area, identifies information gaps and needed research, identifies and builds on successful management strategies and research and restoration projects, and identifies management strategies designed to achieve objectives
- Develop and implement "grass banking" in Owyhee County in order to advance research and restoration.
- Establish a National Sage Grouse Research and Restoration Area.
- Authorize and fund implementation of sagebrush-steppe restoration programs at sites identified by science advisory committee as providing opportunity for high probability of success.

Entity – Owyhee County Sage Grouse Working Group (selected objectives)
Goal: Preserve and increase sage grouse populations in Owyhee County

- Develop maps that identify sage grouse habitat for high priority protection from wildfire.
- Implement sagebrush restoration projects in historic sage grouse habitat.
- Prioritize sites for juniper control activities.

Entity - USDA Natural Resources Conservation Service
Goal: Enhance natural resource productivity to enable a strong agricultural and natural resource sector.

- Maintain, restore, or enhance wetland ecosystems and fish and wildlife habitat.
- Deliver high quality services to the public to enable natural resource stewardship.

Review Comments

No comments.

Budget

FY2003	FY2004	FY2005
$1,813,746 Category: High Priority Comments:	$831,347 Category: High Priority	$2,017,201 Category: High Priority

Project: 199701100 – Enhance and Protect Habitat and Riparian Areas on the DVIR

Sponsor: Shoshone-Paiute Tribes of the Duck Valley Indian Reservation (SPT)

Short Description:

This project enhances critical riparian areas of the Owyhee River and its tributaries and protects the numerous natural springs located on the Duck Valley Indian Reservation. Provides a clean pure source of water for the fish and wildlife.

Abbreviated Abstract

This is an ongoing project sponsored by the Shoshone-Paiute Tribes of the Duck Valley Indian Reservation to implement spring and stream enhancement projects. The projects will help protect wild fish stocks by restoration of impaired native habitats and improving the function of key watershed processes. The past intent of this project has been to collect baseline field data concerning fish habitat conditions, abundance, water quality, and natural spring conditions. This data is instrumental to guide our Tribal watershed and fish protection/ restoration planning efforts.

Various goals include protecting and enhancing selected natural springs and streams, removal of causes of habitat degradation on streams, monitoring water quantity and quality parameters, and to develop a database that can be used by other fisheries professionals which includes information on water quality and fish composition, health, abundance, and genetic makeup (in cooperation with Project 200007900) of native fish. Passive regeneration of degraded habitat will be accomplished utilizing riparian exclosure fencing, off site water developments (in order to distribute stock away from riparian areas), and willow planting in exclosure areas. Road crossings will be repaired or installed on roads where springs traverse roadways, or where roads cross streams directly.

Exclosure fencing will also be utilized on reservoirs and stock ponds whose excess waters flow directly into tributaries of, or into the main Owyhee River. The exclosure fencing will utilize either gravity flow water troughs or solar power to pump water into troughs to provide water for domestic stock and wildlife.

New areas will be evaluated for protection and enhancement as the project continues. All data from this work will be included in the annual reports to BPA, uploaded to StreamNet or other regional databases as needed.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
198815600	Implement Fishery Stocking Program Consistent With Native Fish Conservation	Project 199701100 provides habitat and clean cold water to the reservoirs to help maintain the fishery.
199501500	Lake Billy Shaw Fishery O&M	A new BPA- funded reservoir was completed in 1998 on the DVIR -- the development of its fisheries is an integral part of the habitat project. Same benefits as above.
200007900	Assess Resident Fish, East Fork Owyhee River	The habitat project will focus its efforts on where pure native trout populations are located once preliminary results are received.

Relationship to Existing Goals, Objectives and Strategies

Since no specific new amendments have been approved for the blocked areas as of this writing we are referencing the 1994/95 amendments to the Northwest Power Act.

2.1A1: Explore methods to assess trends in ecosystem health.
2.2A: Support native species in native habitats.
2.2H: The need to learn from implementation (M&E)
7.1B: Conserve genetic diversity
7.1C: Collection of population status, life history and other data on wild and naturally spawning populations
10.1E1: Implementation of identified resident fish projects by 2006
10.2A.2 Address potential impacts on resident fish, where such impacts exist, in developing basinwide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1
10.8C.2 Review DVIR surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in the Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

From the Council's Document 2000-19 "Columbia River Basin Fish and Wildlife Program":

Biological Objectives regarding substitution for Anadromous Fish Losses:

- Restore native resident fish species to near historic abundance throughout their historical ranges where original habitat conditions exist and where habitats can be feasibly restored.
- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

Resident Fish Losses:

- Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystems elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.

This project is identified in the Owyhee subbasin summary:

- Protect riparian and wetland areas from grazing impacts.
- Survey habitat on DVIR, Upper North Fork Owyhee River, South Fork Owyhee River to determine status of redband trout and mountain whitefish populations in areas that are currently data gaps.
- Model historic redband population to determine ranges of variability in abundance and distribution within the subbasins.
- Survey and assess condition of redband populations and habitat in the DVIR, Lower Blue Creek, North Fork Owyhee, and South Fork Owyhee to develop data sets and assessment resources on par with information in other portions of the basin.
- Work collaboratively with IDFG, NDOW, BLM, USFS, USFWS, to identify data gaps and develop a research and monitoring plan to fill those gaps.

Review Comments

An M&E Plan needs to be completed for this project.

Budget

FY2003	FY2004	FY2005
$344,696 Category: High Priority Comments:	$360,000 Category: High Priority	$375,000 Category: High Priority

New Projects

Project: – 32001 - Evaluate the Feasibility Artificial Production Facility DVIR

Sponsor: Shoshone-Paiute Tribes of the Duck Valley Indian Reservation (SPT)

Short Description:

To provide a sustenance fishery for the Tribal members of the Duck Valley Indian Reservation (DVIR). This will be accomplished through the feasibility, construction, and operation of an artificial production facility.

Abbreviated Abstract

The Shoshone-Paiute Tribes of the Duck Valley Indian Reservation (DVIR) currently have three closed system reservoirs stocked annually with rainbow trout for subsistence of Tribal members and as a put-and-take fishery for non-Indians. Historically, 5-7 small reservoirs were stocked with catchable trout for Tribal members' subsistence. The Tribes desire to have a production facility located on the DVIR in order to cut costs involved in transport, lessen the chance of disease introduction, and to try and relieve fishing pressure of native salmonids in the streams of

the DVIR. The construction and operation of hydropower projects in the Columbia River Basin have completely blocked anadromous fish migration and altered resident fish habitat and movement. Both native anadromous fish (complete extirpation) and native resident fish have been severely impacted. A priority of the Councils Program is to mitigate for the irretrievable losses in areas permanently blocked to anadromous fish using resident fish substitution. The goal of this project is to produce 170,000 lbs of catchable and sub-catchable size resident fish annually for stocking in closed reservoir systems on the DVIR. The Tribes will produce sterile rainbow trout for outplanting to three closed system reservoirs until final results from Project # 2000-079 (Assess Resident Fish DVIR) are complete and analyzed. At this time, if native populations of redband trout are found, and the populations are of sufficient quantity for broodstock, we will begin production of native redband trout for outplanting to these reservoirs. This concept was the original plan for Lake Billy Shaw. As was the defunct Joint Culture Facility, which did not make it past step three of the NWPPC three-step review. At this time, there is an unmet need on the DVIR for an artificial production facility to stock either sterile or native redband trout in three reservoirs. The loss of anadromous fish has severely impacted the Shoshone-Paiute people. The Tribes have a sacred cultural relationship with the salmon that can no longer be practiced. Through the resident fish substitution program we will mitigate in part for the loss of our culture.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
198815600	Duck Valley Resident Fish Stocking	Provide fish for these reservoirs
199501500	Lake Billy Shaw Reservoir Operations and Maintenance	Provide fish for this reservoir

Relationship to Existing Goals, Objectives and Strategies

Since no specific new amendments have been approved for the blocked areas as of this writing we are referencing the 1994/95 amendments to the Northwest Power Act.

2.1A1: Explore methods to assess trends in ecosystem health.
2.2A: Support native species in native habitats.
2.2H: The need to learn from implementation (M&E)
7.1B: Conserve genetic diversity
7.1C: Collection of population status, life history and other data on wild and naturally spawning populations
10.1E1: Implementation of identified resident fish projects by 2006
10.2A.2 Address potential impacts on resident fish, where such impacts exist, in developing basin wide guidelines to minimize genetic and ecological impacts of hatchery fish on wild and naturally spawning species as called for in measure 7.2A.1
10.8C.2 Review DVIR surface water and groundwater suitability for resident fish production facilities. Initiate a comprehensive genetic sampling program of the redband trout in the Owyhee Basin. Based on results of these studies, develop and implement strategies to protect wild redband trout populations from potential impacts caused by hatchery programs.

From the NWPPC's Document 2000-19 "Columbia River Basin Fish and Wildlife Program":

Biological Objectives regarding substitution for Anadromous Fish Losses:

- Restore native resident fish species to near historic abundance throughout their historical ranges where original habitat conditions exist and where habitats can be feasibly restored.
- Administer and increase opportunities for consumptive and non-consumptive resident fisheries for native, introduced, wild, and hatchery reared stocks that are compatible with the continued persistence of native resident fish species and their restoration to near historic abundance (includes intensive fisheries within closed or isolated systems).

Resident Fish Losses:

- Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystems elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.

This project is identified in the Owyhee subbasin summary:

Investigate feasibility and implement if possible, genetic preservation for S. Fork Owyhee populations of redband trout and other populations identified in high risk of local extirpation.

- Evaluate the feasibility of construction/operation of an artificial production facility on the DVIR.
- Secure funding to conduct feasibility study
- Conserve genetics of high - risk populations of redband
- Determine the feasibility of out-planting juvenile redband and bull trout (if possible) for supplementation in areas with high risk populations
- Expand out-planting and monitoring on existing reservoirs to include stocking of native fish or other suitable species (sterile rainbow)

Review Comments

CBFWA recommended that Objective 1 (Tasks a-d) be categorized as "High Priority." Although not included in the proposal, a cost benefit analysis will be performed. CBFWA suggests that Objective 1 be extended for a three-year period at a total cost of $450,000. CBFWA questions whether 170,000 lbs. of annual production is appropriate for the DVIR? In addition, CBFWA suggested that other options (e.g., net pen program, using shaker boxes, continued fish purchases, or developing a rearing facility) may be more cost effective. Regardless of how the fish are obtained, CBFWA recommends that monitoring and evaluation continue after stocking.

Budget

FY2003	FY2004	FY2005
$300,000 Category: High Priority Objective 1 (Tasks A-D) Comments:	$260,000 Category: High Priority Objective 1 (Tasks A-D)	$1,855,000 Category: High Priority Objective 1 (Tasks A-D)

Project: 32008 - Wildlife Inventory and Habitat Evaluation of Duck Valley Indian Reservation

Sponsor: Shoshone-Paiute Tribes of the Duck Valley Indian Reservation (SPT)

Short Description:

Conduct wildlife surveys to determine species composition and relative abundance on the Duck Valley Indian Reservation. Habitat evaluations will be conducted to ascertain ecological condition, trend and to identify areas for management actions.

Abbreviated Abstract

The purposes of this project are threefold: (1) to gather information on wildlife species composition (with emphasis on USFWS listed or candidate species and species of concern), distribution and relative abundance (where possible) on the Duck Valley Indian Reservation; (2) to assess the condition of existing habitat; and (3) to disseminate this information for use in Reservation and subbasin planning efforts.

The Tribes propose to conduct two years of survey work after development and approval of a monitoring program for birds, mammals, amphibians and reptiles. More intensive investigations will be directed at species of concern (sage grouse, American white pelican, sensitive bat species, pygmy rabbit) and USFWS listed or candidate species (spotted frog). One of the first tasks to be initiated will be the delineation of habitat types on the Reservation. This will be achieved by having Landsat Thematic Mapper satellite images taken and analyzed by the University of Idaho Landscape Dynamics Lab. The resulting habitat map will assist in the selection of survey sites as well to identify appropriate species for the habitat evaluation procedures (HEP)(USFWS 1981) plan (fieldwork to occur in FY2004). The Tribes will consult and with regional wildlife biologists from USFWS, IDFG, NDOW, USFS and BLM during both phases of this project. At the conclusion of the first field season, data will be analyzed and sent to cooperating agencies for review. Any modifications to the monitoring plan will be submitted to Columbia Basin Fish and Wildlife Authority (CBFWA) Wildlife Committee for their review and approval.

Information resulting from this research effort will be disseminated, through reports, GIS data layers and other appropriate means to the Idaho Conservation Data Center, Nevada Natural Heritage Program and the state and federal agencies responsible for managing wildlife resources in the region.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
199701100	Enhance and Protect Habitat and Riparian Areas on Duck Valley Indian Reservation	Habitat information from this proposed project will aid in identifying habitat areas on the Reservation in need of enhancement and/or protection

Relationship to Existing Goals, Objectives and Strategies

The Council's 2000 program provides a template for subbasin planning. The subbasin summaries, recently completed, serve as the basis for BPA funding decisions during the first

iteration of the rolling provincial review process. Fish and wildlife needs, the identification of data gaps, and an assessment of current fish and wildlife status were presented in these summaries. This project would serve to fill gaps in our knowledge about the distribution, abundance, and habitat relationships of wildlife species on the DVIR in particular, and the subbasin, in general. It will assist state and federal agencies, the Tribes, and others to manage wildlife resources more effectively on the lands they administer. A similar project proposal was submitted by the Tribes as a FY2000 project and was recommended for funding by the ISRP. CBFWA commented that the Council's program, at that time, did not provide a mechanism for funding this type of proposal. The 2000 program does have provisions to allow funding these types of efforts: "The Council expects that the initial assessments in some subbasins will encounter significant data gaps requiring additional information. In such cases, the subbasin plan should identify this need, and include the measures necessary to meet it…. The program will only fund new planning activities where there are clear gaps and omissions (NWPPC 2000)."

This project is consistent with the following wildlife needs identified in the Owyhee and Bruneau subbasin summaries:

- Fund the establishment of techniques, surveys, and programs to assess the health and trend of wildlife, wildlife habitat, and overall biodiversity in the subbasin. Existing surveys and information are inadequate, making it difficult to protect species or to evaluate progress towards goals stated in the summary.
- Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
- Establish and maintain permanent baseline monitoring systems for priority ecosystems and species.
- Conduct comprehensive survey of herptiles in the subbasin.
- Collect life history, habitat use, distribution, and movement information on bat species in the subbasin.
- Conduct comprehensive survey of avian species across the subbasin.
- Conduct research on DVIR population of sage grouse to gain understanding of the viability of the population and to assist in management of the population.
- Continue lek inventories throughout subbasin utilizing ground and aerial surveys.
- Map existing vegetation communities in GIS (referring to sage grouse)

This project also addresses the following goals, objectives and strategies outlined in the Bruneau and Owyhee subbasin summaries:

Entity - Shoshone-Paiute Tribes, Duck Valley Indian Reservation

- Determine wildlife species composition, distribution, and abundance on DVIR
    - Strategy 1: Work with USFWS to establish survey/monitoring protocols for candidate, threatened, and endangered species. Where appropriate, request USFWS assistance with field crew training.
    - Strategy 2: Work with IDFG, NDOW, BLM and other interested organizations and individuals to develop data collection methods
    - Strategy 3: Share wildlife information with appropriate agencies (Nevada's Natural Heritage Program, Idaho Conservation Data Center, Rocky Mountain Elk Foundation, Ducks Unlimited)
    - Strategy 4: Develop long-term monitoring program for DVIR

- Develop and implement a sage grouse conservation plan on DVIR
    - Strategy 1: Participate in local sage grouse working groups (Owyhee, Jarbidge and Northeastern Nevada) to gather and share information and to identify collaborative opportunities
    - Strategy 2: Work with IDFG, NDOW, BLM and other biologists to assess sage grouse habitat on DVIR
    - Strategy 3: Have conservation plan reviewed by USFWS, IDFG, NDOW and BLM
    - Strategy 4: Secure funding source for sage grouse monitoring program

Entity – Owyhee County Sage Grouse Working Group

- Map locations of all known active and historic sage grouse leks in Owyhee County by the end of 2001.
- Identify and map sage grouse breeding (nesting and early brood) habitat associated with active leks by the end of 2004.
- Identify and map known sage grouse wintering habitat by the end of 2001.
- Perform a qualitative assessment of sage grouse breeding (nesting and early brood) habitat associated with active leks.
- Provide a reliable estimate of the distribution and populations of sage grouse in Owyhee County by 2004.

Coordinate efforts by IDFG, BLM, ASAF and others to systematically survey and/or otherwise identify through landowner surveys all active leks and historic leks in the county by the end of the 2004 breeding season.

Entity – Idaho Conservation Data Center

- Maintain high quality, accurate, and timely information on the occurrence of rare, threatened, and endangered plant and animal species
    - Conduct appropriate population inventory monitoring work for priority species
- Maintain high quality, accurate, and timely information on the distribution, abundance, and ecological status of plant and animal habitats, representative ecological reference areas and plant communities
- Assist with species and ecosystem conservation management actions within the subbasin.

Entity – The Nature Conservancy

- Direct resources to highest priority projects within the subbasin as identified using a science-driven eco-regional planning process.
- Fund research and monitoring to address key uncertainties regarding management and protection of sage grouse.

Review Comments

No comments.

Budget

FY2003	FY2004	FY2005
$127,461 Category: High Priority Comments:	$120,000 Category: High Priority	$23,839 Category: High Priority

Research, Monitoring and Evaluation Activities

BPA-funded research, monitoring and evaluation activities:

- Implement Fish Stocking Program Consistent With Native Fish Conservation (199815600) – Shoshone-Paiute Tribes of Duck Valley Indian Reservation. Monitoring is conducted to evaluate the effectiveness of the fish-stocking program on the Reservation. Creek surveys are conducted throughout the fishing season and data has been collected for several years. Monitoring of the limnology and water quality of the reservoirs are conducted on a bi-weekly basis during the spring and summer. These data are evaluated to determine appropriate times and locations for stocking fish.
- Lake Billy Shaw Operations and Maintenance and Evaluation – (199501500) – Shoshone-Paiute Tribes of Duck Valley Indian Reservation. The Lake Billy Shaw Reservoir was constructed in 1998 as partial mitigation for the loss of anadromous fish from the subbasin. Monitoring and evaluation efforts for this project focus on water quality, fish health, and harvest parameters. Water quality monitoring is conducted bi-weekly throughout the spring and summer, with metals/pesticides testing being conducted annually. Fish health is assessed by through twice-yearly gill netting and rod and reel sampling. Fish harvest is assessed through creel surveys.
- Enhance and Protect Habitat and Riparian Areas on the Duck Valley Indian Reservation - (199701100) – Shoshone-Paiute Tribes of Duck Valley Indian Reservation. This project has been ongoing since 1997 and focuses on riparian and spring protection activities.
- Water quality, habitat condition and exclosure fencing are monitored over time. Water quality parameters include dissolved oxygen, temperature, pH, etc. Habitat conditions are monitored using photo points, aerial photography, and assessing species diversity. The Tribes' evaluates the effectiveness of spring exclosures by monitoring species composition inside and outside the exclosures and flows from protected springs. The Tribes are investigating other monitoring methods such as habitat evaluation procedures, Proper Functioning Condition monitoring and others.
- IDFG's Native Salmonid Assessment Project (199900200) is an ongoing research project initiated in August 1998 to assess the current status of native salmonids in the Middle and Upper Snake Provinces in Idaho (Phase I), identify factors limiting populations (Phase II), and develop and implement recovery strategies and plans (Phase III). The inventory phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. Recovery strategies for individual or groups of subbasins will be developed to address the factors most important in limiting the patterns of distribution and abundance of native salmonids.

Non BPA-funded research, monitoring and evaluation activities:

Several non-BPA funded research, monitoring and evaluation activities have recently been initiated or are underway in the subbasin:

- Spotted Frog Long Term Monitoring Program – U.S. Fish and Wildlife Service. This ten-year plan was initiated in 2001 for the following purposes: (1) collect long-term monitoring information on the Owyhee sub-population of spotted frogs; (2) survey sites that are representative of the sub-population; (3) provide federal and state land management agencies with information they can use to modify land management practices to ensure the persistence of the species.
- Sage Grouse Predator Project – IDFG. This is the first year of a six year study that will monitor six sage grouse populations across the state, one of which is in the Cow Creek drainage near Jordan Valley. The objectives of the study are to (1) evaluate the effect of predator control on sage grouse nest success; (2) evaluate the effect of predator control on sage grouse survival; (3) document cause-specific mortality of sage grouse eggs, juveniles and adults; (4) evaluate the effect of predator control on sage grouse breeding populations; (5) document the relative abundance and species composition of predators in different study areas; (6) document the relative change in predator numbers following removal efforts in different sage grouse habitats; and (7) assess the cost/benefit ratio associated with removing predators to increase sage grouse numbers.

Other monitoring activities:

- Periodic stream surveys and wildlife inventories and monitoring are conducted by the Forest Service and Bureau of Land Management on the lands they administer.
- Nevada, Oregon and Idaho State fish and wildlife agencies conduct aerial big game surveys on a periodic basis.

Needed Future Actions

- Fish Passage – Conduct studies to assess the feasibility of reintroducing anadromous fish to the area above the Owyhee Reservoir.
- Investigate effects of the loss/lack of nutrients due to extirpation of anadromous fish populations from the subbasin, and coordinate and evaluate nutrient enhancement alternatives.
- Improve fluvial habitat conditions. Projects that promote increased instream flow and water quality are critical to meeting fish and wildlife objectives in the subbasin. Projects involving riparian management, rehabilitation, and/or restoration should be emphasized.
- Improve ecological condition of riparian areas. In a system that inherently suffers from high water temperatures and low flows, the additive effects of reduction or removal of riparian vegetation on aquatic resources are magnified.
- Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost fish and wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
- Fund the establishment of techniques, surveys, and programs to assess the health and trend of wildlife, wildlife habitat, and overall biodiversity in the subbasin. Existing surveys and information are inadequate, making it difficult to protect species or to evaluate progress toward goals stated in this summary.
- Continue and enhance the cooperative/shared approach in research, monitoring and evaluation between tribal, federal, state, local and private entities to facilitate restoration and enhancement measures. Protection and restoration of fish and wildlife populations and habitat will not be successful without the interest and commitment by all.

Actions by Others

Coordination between tribal, county, state, federal, and private entities is critical to insure that comprehensive land use planning occurs in the subbasin. Issues regarding jurisdictional boundaries, agency mandates, research protocols, data management/ handling, etc. need to be understood and addressed if these entities are to draft and implement subbasin plans.

There is a need to encourage/promote implementation of conservation measures on private property. Federal and state agencies could assist private conservation organizations and landowners in obtaining grants and provide technical assistance in planning, design and project implementation.

There is a critical need to develop the technology, methods, and market for native seed production. Reseeding efforts on disturbed rangelands are using, in many cases, a native/exotic seed mix due to the lack of availability of site adapted native species.

Table 19. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	**198815600**	**199501500**	**199505703**	**199701100**	**32001**	**32008**
Provincial Team Funding Recommendation	**High Priority**	**High Priority**	**High Priority**	**High Priority with completed M&E**	**High Priority (Obj. 1(A-D)**	**High Priority**
Expand out-planting and monitoring on existing reservoirs to include stocking of native or other suitable species	+	+				
Evaluate the feasibility of construction/operation of an artificial production facility in the DVIR					+	
Secure funding to conduct feasibility study					+	
Conserve genetics of high - risk populations of redband					+	
Determine the feasibility of out-planting juvenile redband and bull trout (if possible) for supplementation in areas with high risk populations					+	
Protect riparian and wetland areas from grazing impacts.		+	+	+		
Maintain or improve ecological condition of all springs, spring creek systems and wetlands			+	+		
Identify and protect existing high quality shrub-steppe habitat			+	+		
Maintain, restore, or enhance wetland ecosystems and fish and wildlife habitat			+	+		
Fund the establishment of techniques, surveys, and programs to assess the health and trend of wildlife populations			+			
Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin			+			
Establish and maintain permanent baseline monitoring systems for priority ecosystems and species			+			
Continue lek inventories throughout subbasin			+			
Determine wildlife species composition, distribution and abundance, DVIR			+			
198815600 –Implement Fish Stocking Consistent with Native Fish Conservation						
199501500 – Lake Billy Shaw O&M						
199505703 – Southern Idaho Wildlife						

Project Proposal ID	198815600	199501500	199505703	199701100	32001	32008
Mitigation						
199701100 – Enhance and Protect Habitat and Riparian Areas on the DVIR						
32001 – Evaluate Feasibility of Artificial Production Facility, DVIR						
32008 – Wildlife Inventory and Habitat Evaluation, DVIR						

Note: + = potential or anticipated effect on subbasin objectives

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