Draft

Lower Middle Snake Subbasin Summary

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Prepared for the
Northwest Power Planning Council

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Table of Contents

List of Figures

List of Tables

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Introduction

The Lower Middle Snake 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 a compilation of the existing information about the Lower Middle Snake subbasin, including: the historic and present status of fish and wildlife species, past and ongoing fish and wildlife activities, and current management plans, objectives and strategies. The summary will provide context for project proposals during the provincial reviews while a more extensive subbasin plan is developed.

The process of developing a subbasin summary was initiated as part of the provincial review process 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 Idaho and Oregon provided information and reports and participated in the review process.

The Lower Middle Snake subbasin covers the area that drains into the mainstem Snake River from C.J. Strike Dam to Hells Canyon Dam, excluding major tributaries (Owyhee, Powder, Payette, Weiser, Boise, and Malheur Rivers) which are discussed in separate documents (Figure 1). The subbasin contains small pieces of numerous larger management units, at local, state and federal levels.

This document forms a foundation for future assessment and planning efforts in the subbasin. It is our hope that this summary will enable those working to protect and restore fish and wildlife in the subbasin to move forward to fill data gaps and more effectively implement projects without intensive research to integrate past data.

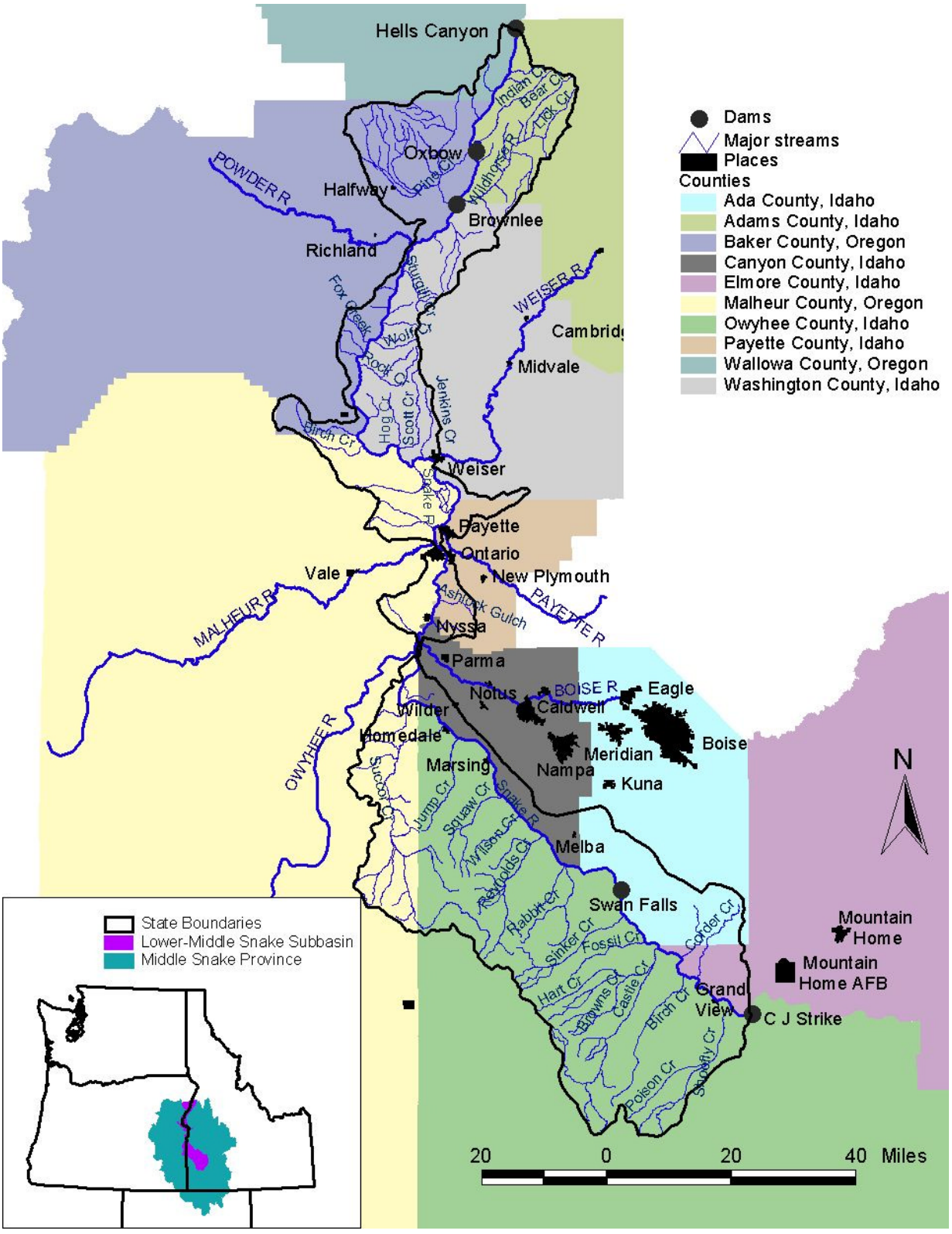

Figure 1. Major features and location of the Lower Middle Snake subbasin.

Subbasin Description

Subbasin Location

The Lower Middle Snake subbasin encompasses the Snake River and the lands that drain into it, from C.J. Strike Dam to Hells Canyon Dam, excluding the major tributaries. It is approximately 2.5 million acres in size. It includes 247 miles of the mainstem Snake River (RM 494 to RM 247), and numerous small tributaries. The major tributaries (Owyhee, Boise, Payette, Weiser) enter near the middle of the subbasin, while the Powder and Burnt Rivers enter on the west side in the lower portion of the subbasin. The downstream half of the Snake River forms the border of Oregon and Idaho. The Snake River drains the western portion of the Snake River Plain and then enters Hells Canyon in the Wallowa and Seven Devils Mountains.

Climate

The Lower Middle Snake subbasin has a semi-arid climate, with limited areas of moderate to high precipitation in the northernmost portions of the subbasin. Summers in the canyons tend to be hot (mean temperatures of 80 to 90° F, with maximums often > l00° F) and winters milder (mean temperatures > 30° F). At mid-elevations and on the upper plateau temperatures are cooler, with moderately severe winters and warm summers (Figure 2).

Annual precipitation follows the same pattern across the subbasin, although amounts of precipitation increase downstream (Figure 4). Precipitation comes in the form of short, intense summer storms and longer, milder winter storms (IDEQ and ODEQ 2001). Precipitation is strongly seasonal, with the majority of the precipitation falling in the winter. The area surrounding the Snake River from C.J. Strike Reservoir downstream to Nyssa, receives 7 to 10 inches of precipitation annually. The Hells Canyon area receives an average of 13 inches per year (Figure 4; Daly et al. 1997), while the Owyhee Mountains receives approximately 49 inches a year. The highest precipitation area in the subbasin is in the headwaters of Pine Creek (average of 69 inches annually) in the Wallowa Mountains.

Topography

The Lower Middle Snake subbasin lies in the lower portion of the Snake River Plain and is surrounded by high mountains: The Jarbidge and Owyhee Mountains are to the south, the Blue Mountains to the west, Seven Devils and Wallowa Mountains to the north, and the Sawtooth and Boise Mountains to the northeast. The highest elevation in the subbasin is 9,101 feet, which occurs at the summit of Granite Mountain in the headwaters of Pine Creek. The lowest elevation in the subbasin is 1,496 feet at Hells Canyon Reservoir. The mean elevation of the Lower Middle Snake subbasin is 3,644 feet (Figure 5).

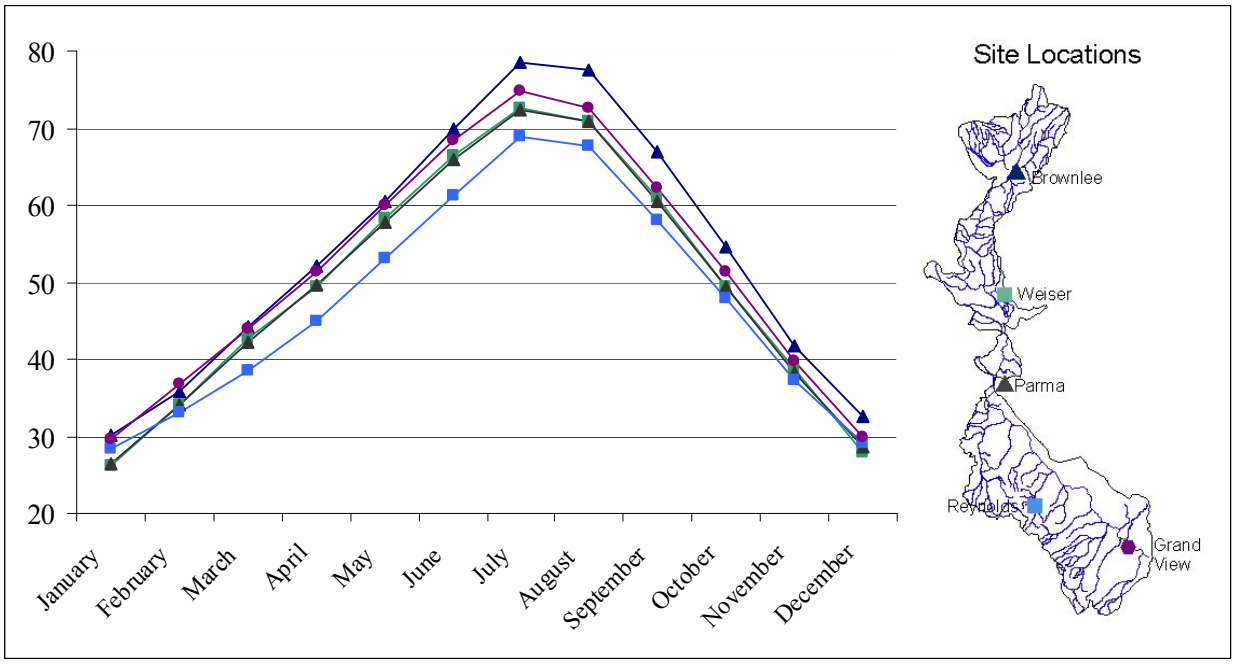

Figure 2. Average monthly temperatures in the Lower Middle Snake subbasin (National Water and Climate Center 2001).

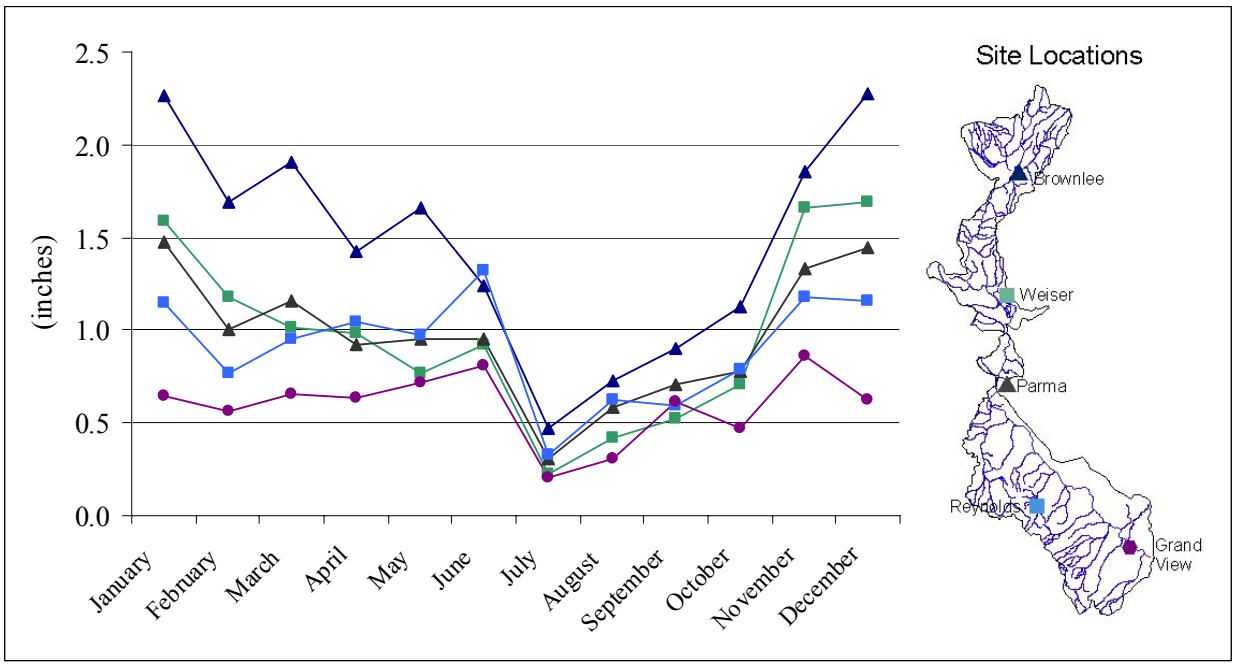

Figure 3. Average monthly precipitation 1962-1900 (National Water and Climate Center 2001)

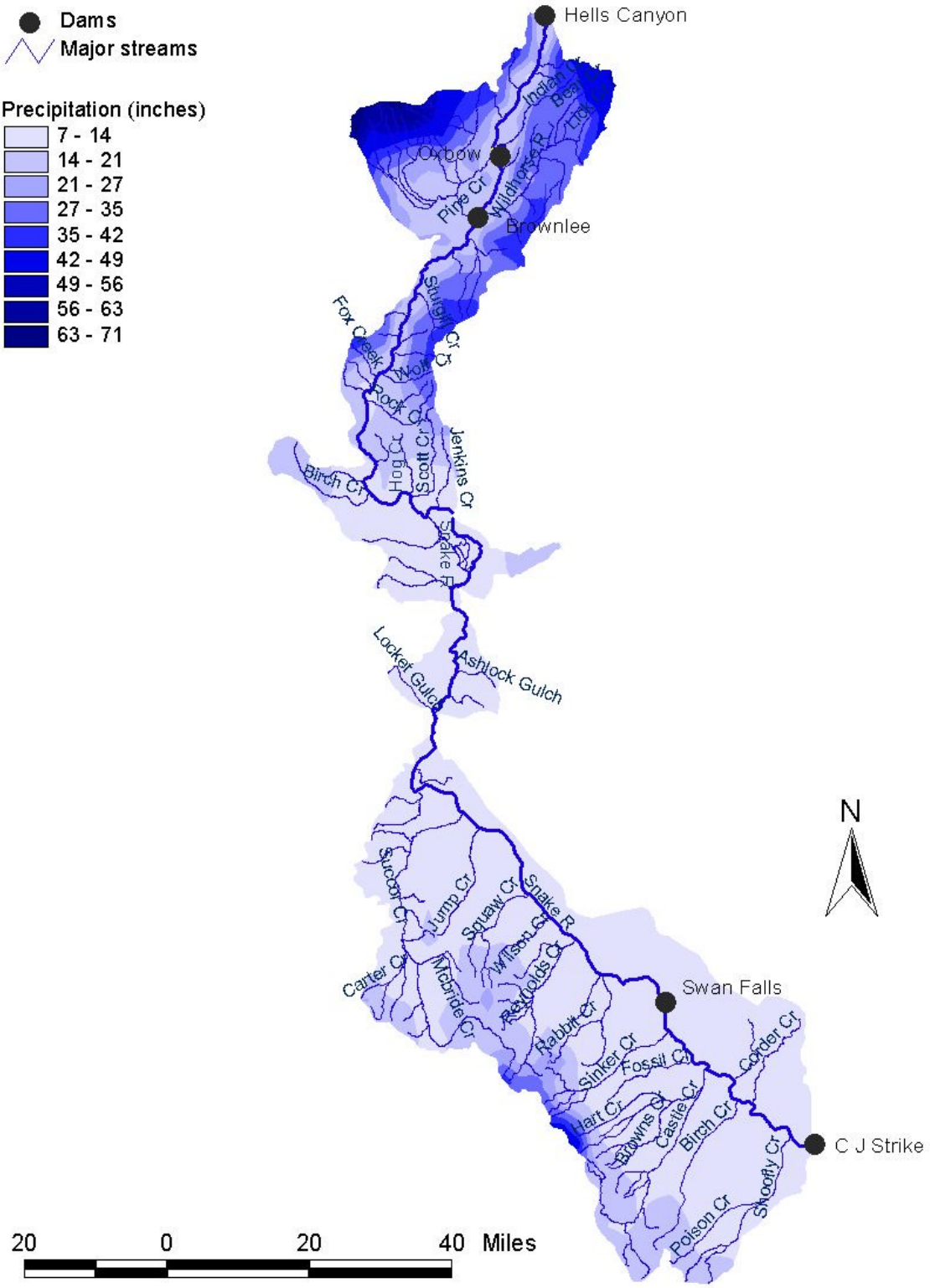

Figure 4. Precipitation patterns in the Lower Middle Snake subbasin.

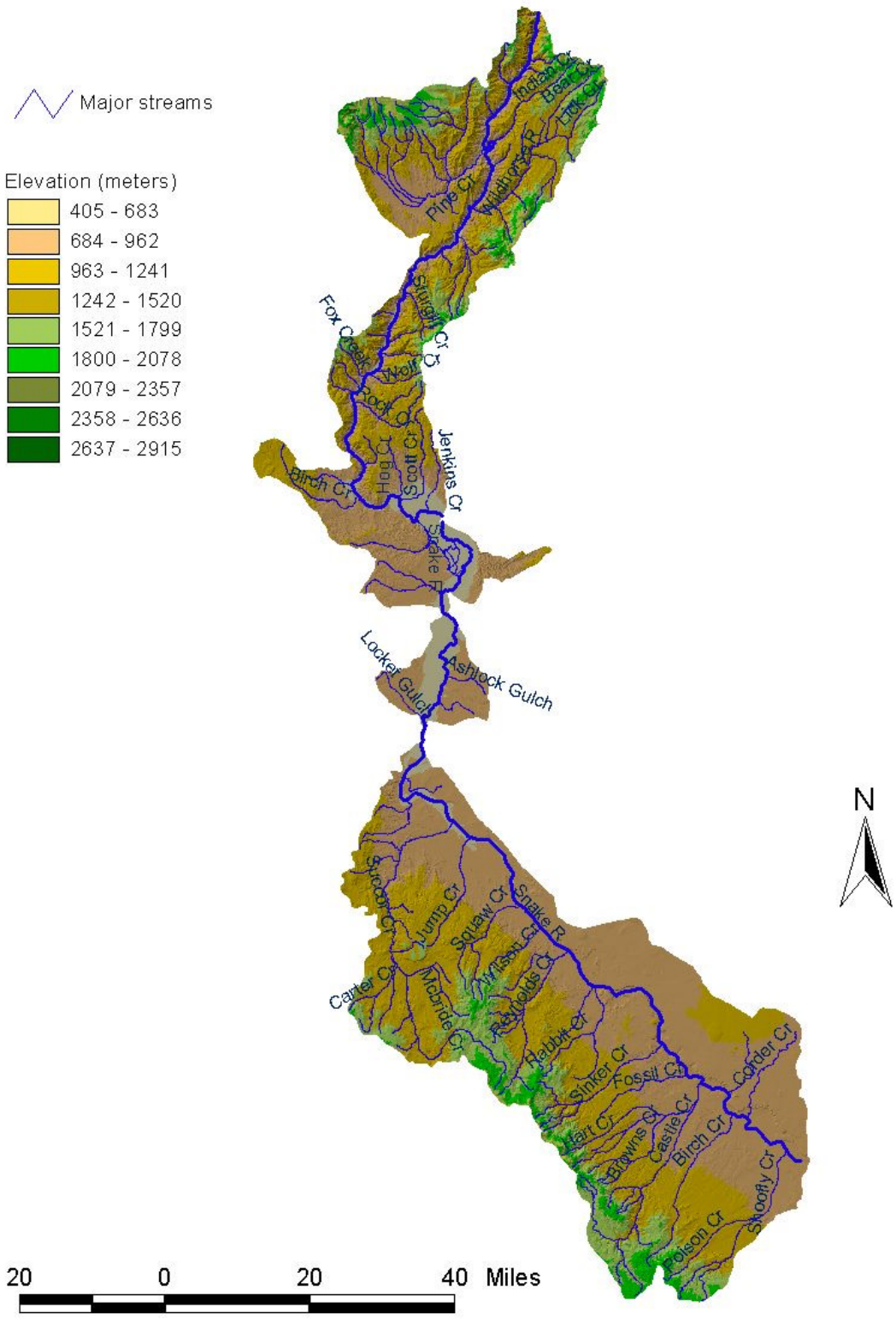

Figure 5. Topography and elevation in the Lower Middle Snake subbasin.

Geology

The upper two thirds of the Lower Middle Snake subbasin is in the Snake River Physiographic Province, which is a deep, wide, fault bound structural basin between the Basin and Range on the southeast and the Idaho Batholith to the north (Orr and Orr 1996). The Owyhee Uplands are geologically considered part of the Snake River Province. The high desert of the Owyhee Uplands averages 5000 feet above sea level and forms the southern edge of the subbasin. After entering Oregon, the Snake River turns more directly northward and enters Hells Canyon, which is a feature in the Wallowa Terrane in the Blue Mountains islands arc (Vallier and Brooks 1986).

The Snake River Province is the result of the opposing forces of water and volcanism (Orr and Orr 1996). Volcanic activity began with catastrophic rhyolite eruptions that covered and smoothed over the landscape, filling and plugging canyons, periodically impounding water in large natural reservoirs. Individual rhyolite flows were typically 300 feet to 800 feet thick in the middle of the subbasin (Orr and Orr 1996). The second phase of volcanism consisted of fluid basalt flows that welled up from cracks to fill low spots in the landscape and create vast volcanic plateaus (Orr and Orr 1996).

In the lower subbasin the Snake River enters the Blue Mountains Province, which joined the continental west coast about 300 million years ago when the Blue Mountain island arc was accreted to the North American continent (Vallier 1998; Orr and Orr 1996; Hubbard 1956). In the Wallowa and Seven Devils mountain ranges, the mountain building of the Northern Rockies uplifted the mountains to their current elevations, causing rivers and streams to rapidly incise the landscape. This led to the formation of canyons and gorges throughout the region (Orr and Orr 1996). About 13 million years ago lava flows dammed the Snake River at the narrows of Hells Canyon (on the Oregon-Idaho border). This backed up the Snake to form Lake Idaho, which grew to be 150 miles long and 50 miles wide (Orr and Orr 1996). Lake Idaho filled an area from the Oregon border to Twin Falls. Sediments deposited within the lake basin (Idaho Group Sediments) persist on the Snake River Plain today (Orr and Orr 1996).

About 1.5 million years ago, Lake Idaho cut through what is now Hells Canyon, connecting the Snake River Plain to the Columbia River Basin. Once this happened, the Snake and its tributaries began to cut their current valleys. About 14,500 years ago, the Bonneville Flood increased the rate of downcutting when the Great Salt Lake drained north through the Snake River Canyon, flushing large amounts of sand and gravel into the subbasin (Orr and Orr 1996). The flood deepened and widened the Snake River Canyon, which in turn, led to further downcutting of the tributary canyons. Most recently, stream alluvium has been deposited in river and stream bottoms and lake sediments have been deposited by wind and water into depressions in the basalt flows (Figure 6; DAF 1998).

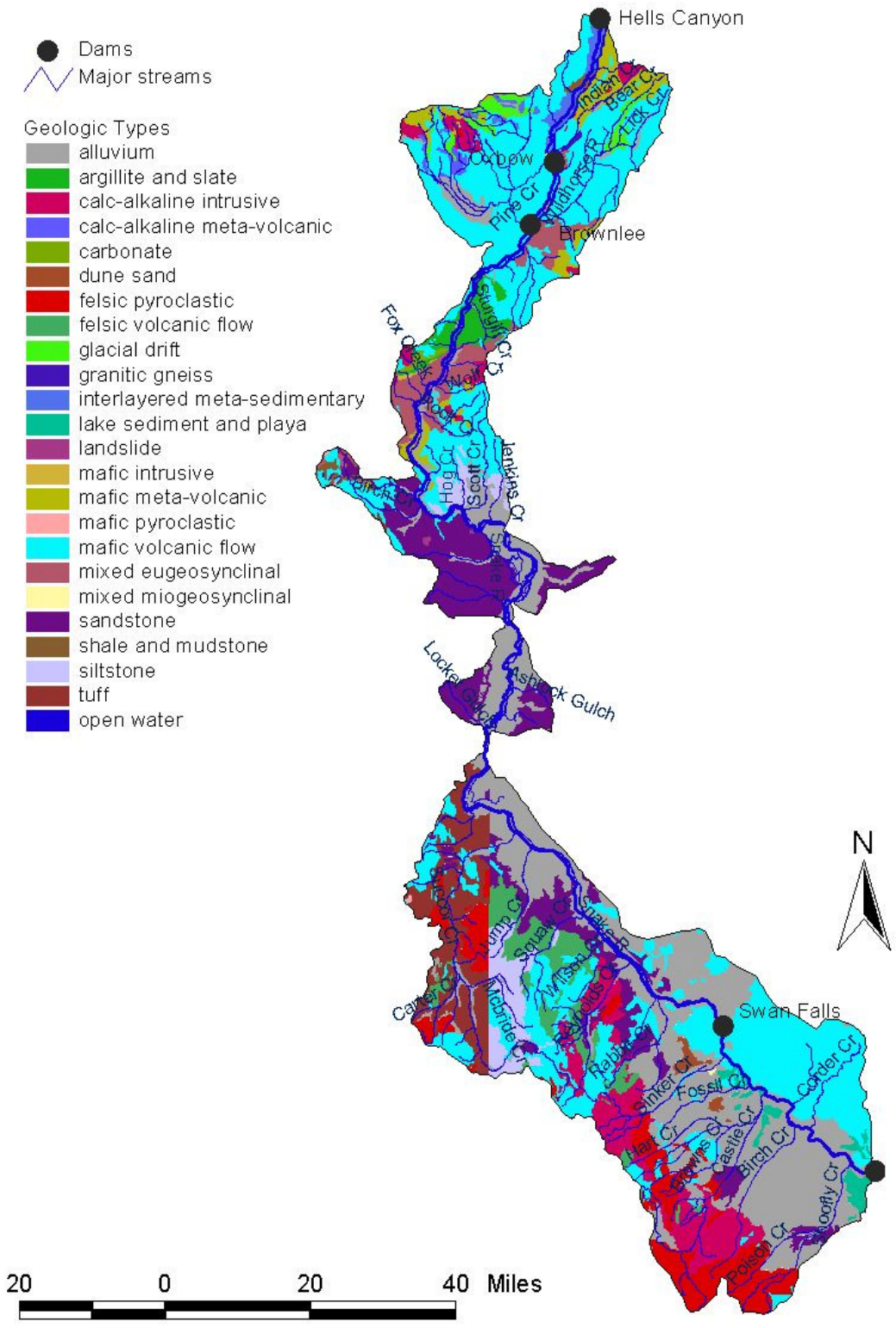

Figure 6. Geologic types of the Lower Middle Snake subbasin.

In Hells Canyon, the basalt is prone to rockslides and forms many colluvium and alluvium deposits throughout the canyon. Many of the canyon walls are steep; the rocks are noncohesive and severely weathered. Relatively large earthquakes (as strong as Richter magnitude 5) appear to have occurred in the past. Landslides and mass wasting contribute significant amounts of gravel and cobbles into the Snake River (Vallier 1998). Overall the subbasin is dominated by mafic volcanic flow, alluvium and sandstone, cumulatively covering approximately 65% of the subbasin (Figure 7).

The over-steepened side slopes of Hells Canyon caused landslides to occur, forming many colluvial and alluvial fans near the base of the canyon. Wind-blown loess and volcanic ash have been deposited in the area and now mantle the ridges and summits on both sides of the canyon (USDA Forest Service 1981a). During the late Pleistocene, the Bonneville Flood swept down through the Snake River, further steepening canyon slopes, creating terraces and depositing gravels (Vallier 1998).

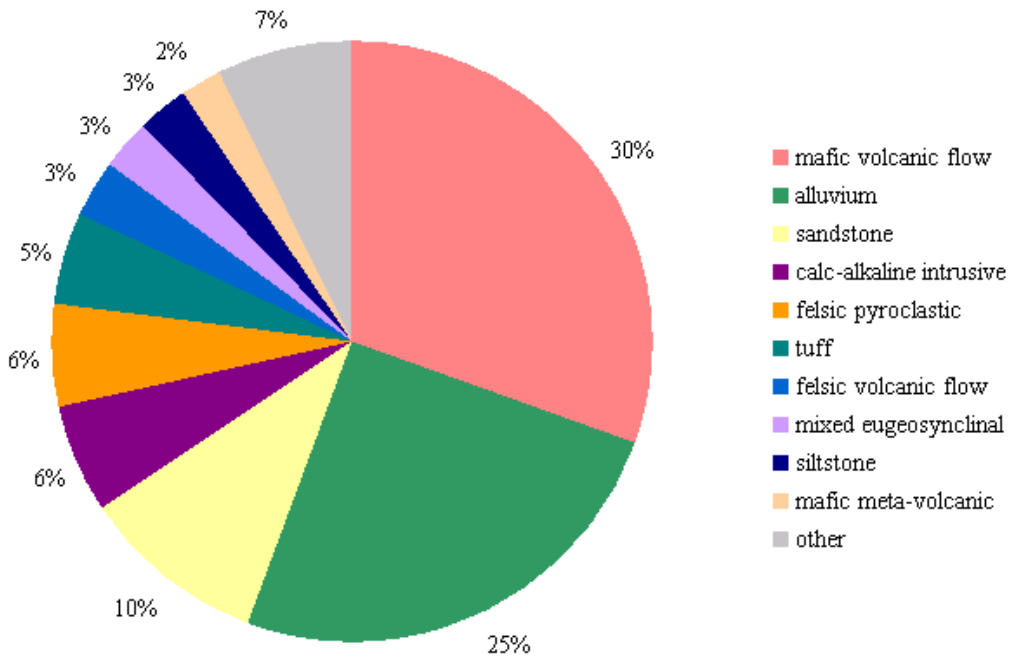

Figure 7. Relative abundance of various lithologies within the Lower Middle Snake subbasin.

Soils

Most erosion problems in the Owyhee Mountains and high plateaus of the upper subbasin occur on soils derived from sedimentary and/or granitic parent materials. Rill and gully erosion are low over most of the Owyhee Uplands area except on the Snake River sediments and granitic soils. Many of these soils are on steep, poorly vegetated slopes (USDI 1999).

Many of the soils on the Snake River sediments and the lower reaches of the high plateau region are associated with disturbance or early seral vegetation. Vegetative cover has been depleted as species composition changed to invasive shrubs, annual grasses and forbs, which have proven less effective at protecting soils (USDI 1999). Livestock trampling has also led to soil compaction problems that reduce infiltration, stunt plant growth and increase erosion (USDI 1999) Widespread disturbance of microbiotic soil crusts, which protect the soils from erosion, has further exacerbated the problem (USDI 1999).

Soils within Hells Canyon influence erosion and sedimentation into the Snake River and its tributaries, influencing water quality and habitat. The primary factor governing soil development is the deep canyon itself, with steep continuous slopes that often continue well over a mile from the river to the crest of the mountain ridges on either side, ascending through several soil climatic regimes. Vegetation and soil development within the canyon are heavily influenced by the east/west facing canyon sides and the north/south slope aspects caused by many ephemeral streams receiving sunlight differently.

Soils in the canyon commonly contain varying amounts of coarse angular gravels, cobbles, silt and ash (USDA Forest Service 1981a). Many rock outcrops interrupt the soil landscape on the mid-slopes of the west-facing Idaho side and along the upper slopes of the east-facing Oregon side of the canyon. The intermittent outcrops and coarse material can inhibit erosion from surface runoff and reduce sediment transport.

The most common sub-type forms in a semi-arid environment and contains a clay-rich subsurface horizon. Alluvium-dominated areas have been developed into agriculture. Few studies of soils and soil erosion have taken place in Hells Canyon and information on the erosion characteristics and processes of soils is therefore limited. Soils identified in the canyon are highly erodible (high K-factors) because of high silt/fine sand texture and high concentrations of volcanic ash. However, surface erosion processes, such as rill and sheet erosion, are not as common in the canyon as in other nearby watersheds due to the undisturbed grassland and shrub-steppe vegetation and forest canopies on many north facing side slopes (Art Kreger, Soil Scientist, USDA Forest Service, personal communication 5/2/01). Within the side slopes of the many draws on the Oregon side of the canyon, some soil creep has taken place because deep current soils overlie horizons of dark organic rich topsoil from past grassland soils (Art Kreger, Soil Scientist, USDA Forest Service, personal communication 5/2/01).

Unlike soil erosion, the hazards associated with geology in the Hells Canyon National Recreation Area have long been studied (Vallier 1994; 1998). Erosion processes taking place in the canyon consist mainly of various forms of mass wasting, with rock and debris flows being the most prevalent. Sustained rainfalls and shaking from the many earthquakes that take place in and around Hells Canyon increase the likelihood of landslides occurring (Vallier 1994).

Because of the continuous steep slopes on either side of the canyon, landslides and debris flows can travel down slope great distances and often reach the bottom. The colluvium at the bottom of many steep slopes is often unstable and subject to movement at any time, and is a source of sedimentation into streams. Undercutting by stream erosion or road construction has increased instability and movement of these deposits (Vallier 1994).

Rockslides are an imminent danger to travelers in the Hells Canyon National Recreation Area. Rock falls occur without warning at anytime almost on a daily basis. Rocks falling onto power line roads have been known to leave indentations in the roads (Vallier 1994).

Although the many gravel bars, alluvial fans, river terraces and landslides have occupied the Hells Canyon area for thousands of years, sedimentation from fine material from more recent influences are still a concern.

Hydrology

Surface Hydrology

Flows originate from C.J. Strike Dam and end with the regulated flows of Hells Canyon Dam. Most major tributaries are regulated as well, with dams and/or major irrigation works on the Owyhee, Boise, Malheur, and Payette Rivers. The reservoirs upstream from Brownlee Dam have the cumulative capacity to store 75% of the average annual runoff (Columbia River Basin System Operation Review 1991).

Major tributaries in this reach of the Snake include the Owyhee River (RM 396.7), the Boise River (RM 396.4), the Malheur River (RM 368.5), the Payette River (RM 365.6), the Weiser River (RM 351.6), the Burnt River (RM 327.5) and the Powder River (RM 296). Tributary flows can be ranked according to relative average annual inflow as follows: the upstream Snake River (58.5%), the Payette River (16.0%), the Boise River (8.5%), the Owyhee River (6.4%), the Weiser River (5.9%), the Powder River (2.9%), the Malheur River (1.1%), and the Burnt River (0.7%; IDEQ and ODEQ 2001).

Hydrology within the agricultural lands of the Owyhee, Boise, Malheur, and Payette tributaries is complex, with water diverted into fields, discharged back into the tributaries through irrigation drains and subsurface flows, and rediverted onto additional lands downstream (IDEQ and ODEQ 2001)**.**

Streamflow in the Snake is seasonally variable. The majority of in-river flow is from snowmelt and runoff from areas where precipitation falls mostly as snow. The snowmelt-driven flow regimes result in low flows in fall and winter and high flows during spring and early summer (IDEQ and ODEQ 2001). In some areas and seasons, groundwater discharge is a substantial source of flow to the Snake.

Mainstem flow in the Snake is heavily influenced by dams and other water-control structures on both the mainstem and tributaries. Less than 20% of the total inflow into the Snake River reaches the river without passing through a reservoir or other control structure (USBR 1998). This management of flows affects both the magnitude and timing of flow variations within the mainstem Snake River. Generally, high flows are lower and low flows are higher than those recorded prior to the placement of impoundments in the early 1900s. The overall volume may not have changed substantially, but the flows are more evenly distributed over the year (USBR 1998; USGS 1996 cited in IDEQ and ODEQ 2001).

Annual streamflow is also highly variable. Between 1928 and 1996 the annual streamflow of the Snake River at Weiser varied between a high flow of 24.5 million acre-feet and a low flow of 6.4 million acre feet (USBR 1998). Mean high flows generally range from 60,000-80,000 cfs, and mean low flows from 7,000-10,000 cfs. Currently, Hells Canyon Dam discharge is maintained at 10,000 cfs minimum discharge during fall chinook salmon (*Oncorhynchus tschawytscha*) spawning/incubation periods. Flow into Brownlee Reservoir is the product of Upper Snake River outflow (96.4%) and the Burnt and Powder Rivers (combined at 3.6%; IDEQ and ODEQ 2001). Water levels fluctuate as much as 9 m from March to July. Annual fluctuation in flows to Brownlee Reservoir from the Snake River is high. Flow at Hells

Canyon dam is 97% from Brownlee (Nurnberg and Brown and Caldwell 2001). Flow into Oxbow Reservoir is mostly from Brownlee outflow, with only 1% from Wildhorse Creek. Flow into Hells Canyon Reservoir is mostly from Oxbow Reservoir outflow, with less than 1% from Pine Creek.

Surface diversions greatly impact the flow through the Lower Middle Snake subbasin. The Hells Canyon complex provides irrigation storage for more than 3.5 million acres of land, with a total estimated annual consumptive use of 6-8 million acre-feet (IDEQ and ODEQ 2001). Of the 3 million acres of irrigated land in the Snake River basin above Hells Canyon Dam, about 2 million acres are supplied by surface water, mostly by gravity diversions (USBR 1998). About 16.5 million acre-feet of surface water are diverted annually and conveyed by more than 3,000 miles of canals and laterals to irrigate agricultural fields (USBR 1998). Out of the 20 million acre-feet of total combined surface water and groundwater used for irrigation, most returns to a stream or aquifer, with about 6 million acre-feet lost to consumptive use (USBR 1998). In low-water years, pumping and diversions can remove more water from the Snake River than is contributed by its inflowing tributaries. Irrigation recharge during periods of low tributary input represents a significant source of in-river flow (as much as 52%; IDEQ and ODEQ 2001).

Minimum flows in the reach from C.J. Strike Dam to Brownlee Dam have been identified for protecting aquatic resources, wildlife and vegetation (Table 1 and Table 2). These flows are often not met during the irrigation season (USBR 1998). In addition to concerns about low flows, episodic high flows are necessary to maintain riparian and wetland vegetation dependant on periodic flooding. Maintaining islands in the Snake River also require periodic sediment deposition from large episodic events (USBR 1998). Episodic events are needed every 10-15 years to maintain viable cottonwood communities.

Table 1. Minimum flows for aquatic resources from C.J. Strike Reservoir to Brownlee Dam in cfs (from USBR 1998)

Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
16000					15,000	12,000	9,000	-	12,500		-

Table 2. Minimum flows for wildlife and vegetation resources from C.J. Strike Reservoir to Brownlee Dam (from USBR 1998)

Reach	Gauge	Parameter Level	Parameter (cfs)				
			Spring[1]	Summer[2]	Fall[3]	Winter[4]	Episodic[5]
C.J. Strike Reservoir to Swan Falls Dam	River below dam near Grand view	Optimum	11,200		9,700		41,300
		Beneficial	10,300		9,600		34,400,
		Neutral	9,300		9,400		27,500
		Adverse	<9,300 and >11,200		<8,300		2,670
Swan Falls Dam to Brownlee reservoir	Near Murphy	Optimum	13,400		11,800		No Data
		Beneficial	13,000		11,500		No Data
		Neutral	11,100		10,800		No Data
		Adverse	<11,100 and >13,400		<8,500		No Data
	At Nyssa	Optimum	21,000		14,900		No Data
		Beneficial	19,700		14,100		No Data
		Neutral	15,200		13,000		No Data
		Adverse	<15,200 and >21,000		<10,500		No Data
	At Weiser	Optimum	28,300		18,600		No Data
		Beneficial	27,600		16,300		No Data
		Neutral	21,000		15,200		No Data
		Adverse	<21,000 and >28,300		<11,500		No Data
Brownlee reservoir		Optimum	Maintain at or near 2078.5 feet spring through fall, fluctuate in winter				
		Beneficial	Maintain at or near 2077.5 feet spring through fall, fluctuate in winter				
		Neutral	Maintain at or near 2077 feet spring through fall, fluctuate in winter				
		Adverse	Maintain at or near 1975 feet spring through fall, fluctuate in winter				

[1]April, May and March
[2]July and August
[3]September, October and November
[4]December, January, February, March
[5]every 10-15 years

Tributaries

Most small tributaries in the low elevation, arid portions of the subbasin are ephemeral or intermittent, with flow present only seasonally or during high precipitation events. Flow is highly variable in the perennial streams. Many creeks remain perennial in the headwaters, but flow subsurface in lower reaches during drought years (USDI 1997, USDI 1999). Annual flow patterns in the tributaries are highly variable, and typically match the wide fluctuations in snow pack that occur throughout the subbasin. The limited data available regarding tributary runoff patterns and volume do not indicate any long-term trends (USDI 1999).

Groundwater

The Snake River Plain Aquifer (SRPA) system is one of the largest groundwater systems in the United States and provides significant amounts of flow to the Snake River. The SRPA contains about 250 million acre-feet of water in its top 500 feet (USBR 1998). The SRPA is divided into an eastern and western aquifer. The Snake River Plain portion of the Lower Middle Snake subbasin lies in the western SRPA. Groundwater quality in the SRPA is generally good (IDEQ and ODEQ 2001), and exceeds national drinking water standards (USBR 1998). While this is generally the case, a study in the Bruneau-Grand View area indicated that water quality in that area is marginal for domestic, industrial and agricultural uses because of moderate to high

concentrations of sodium and excessive amounts of fluoride (USDA 1999). In some areas, the Snake River channel is above the regional water table and recharges the underlying aquifer (IDEQ and ODEQ 2001).

Water Quality

The highly impacted flow regimes that result from the control structures in the Snake River watershed influence pollutant transport within the subbasin. Pollutants such as sediment, mercury and pesticides tend to accumulate behind structures such as dams and diversions (IDEQ and ODEQ 2001). This reduces the overall concentration downstream while localizing the pollutant mass. As a result, downstream habitat may experience better water quality conditions while reservoir water quality suffers.

Control structures impact the transport and processing of nutrients and algae. Reduced flow velocities can lead to conditions where excessive incoming nutrient and organic loads, delivered to an impoundment, result in nuisance algae growth and dissolved oxygen (DO) depletion. Reduced DO, in turn, can degrade aquatic habitat, kill fish and increase nutrient and toxins released at the interface between sediments and water (IDEQ and ODEQ 2001).

§303(d) Listed 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. Water bodies that do not meet water quality standards with implementation of existing management measures are listed as impaired under §303(d) of the CWA. It is the state's responsibility to develop their respective §303(d) list and establish a Total Maximum Daily Load (TMDL) for the parameter(s) causing water body impairment.

Mainstem river segments listed under section §303(d) of the CWA are summarized in Table 3. It should be noted that, in addition to the parameters described in Table 3, USBR (1998) identifies sediment as a problem pollutant for all mainstem Snake River reaches between C.J. Strike Dam and Weiser.

Water quality in the Lower Middle Snake subbasin is subject to the criteria of two states. Idaho and Oregon use different methodologies to determine what constitutes a water quality violation. In the reach between Oregon and Idaho, the river must meet the criteria of both states (IDEQ and ODEQ 2001).

Agriculture is the primary nonpoint source pollutant in the subbasin, but other sources are recreation, urban, and forestry. Pollution control efforts include: canal/ditch delivery upgrades, field/ditch erosion control, forest practice measures, irrigation management upgrades, irrigation pumpback systems, river channel/streambank/shoreline erosion controls and restoration, sediment pond settling, removal of sediments, stormwater management and treatment, surface erosion controls, water conservation measures, and wetland construction and enhancement (IDEQ and ODEQ 2001).

Table 3. Stream segments in the Lower Middle Snake subbasin listed under §303d of the CWA (IDEQ and ODEQ 2001)

Listing State	Segment	§303d listed parameters	Designated beneficial uses
Idaho	Snake River: RM 409 to 396.4 (OR/ID border to Boise River Inflow)	Bacteria, dissolved oxygen, nutrients, pH, sediment	cold water biota, primary contact recreation, domestic water supply
Idaho	Snake River: RM 396 to 351.6 (Boise River to Weiser River)	Bacteria, nutrients, pH, sediment	cold water biota, primary contact recreation, domestic water supply
Idaho	Snake River: RM 351.6 to 347 (Weiser River to Scott Creek)	Bacteria, nutrients, pH, sediment	cold water biota, primary contact recreation, domestic water supply
Idaho	Snake River: RM 347 to 285 (Scott Creek to Brownlee Dam	Dissolved oxygen, mercury, nutrients, pH, sediment	cold water biota, salmonid spawning, primary contact recreation, domestic water supply, special resource water
Idaho	Snake River: RM 285 to 272.5 (Oxbow Reservoir)	Nutrients, sediment, pesticides	cold water biota, salmonid spawning, primary contact recreation, domestic water supply, special resource water
Idaho	Snake River: 272.5 to 247 (Hells Canyon Reservoir)	Not listed	cold water biota, salmonid spawning, primary contact recreation, domestic water supply, special resource water
Oregon	Snake River: RM 409 to 395 (OR/ID border to Boise River Inflow)	Mercury and temperature	Private/public private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics
Oregon	Snake River: RM 395 to 335 (Upstream Snake River to Farewell Bend)	Mercury and temperature	Private/public private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics, hydropower
Oregon	Snake River: RM 335 to 260 (Brownlee Reservoir, Oxbow Reservoir and upper half of Hells Canyon Reservoir	Mercury and temperature	Private/public private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics, hydropower
Oregon	Snake River: RM 260 to 188 (Lower half of Hells Canyon Reservoir and Downstream Snake River)	Mercury and temperature	Private/public private domestic water supply, industrial water supply, irrigation water, livestock watering, salmonid rearing and spawning, resident fish and aquatic life, water contact recreation, wildlife and hunting, fishing, boating, aesthetics, anadromous fish passage, commercial navigation and transport

Mercury

The presence of mercury in surface waters is a water quality concern, especially when present in readily mobile and easily accumulated forms such as methylated mercury. Various reaches of the Snake River are listed as having water quality concerns related to mercury (Table 3), and elevated mercury levels in fish tissues have been observed in portions of the river (Rinella et al. 1994 and Clark and Maret 1998, both cited in IDEQ and ODEQ 2001). Mercury concentrations from sampled fish tissues are summarized in Table 4.

Common sources of mercury in the subbasin are legacy mining activities and natural geologic materials. Mercury itself was mined from portions of the subbasin, but more frequently was used to amalgamate mined gold and silver. Mercury is still present in tailing piles associated with those operations (IDEQ and ODEQ 2001).

Tributaries

The primary water quality problems in small tributaries to the Snake include high water temperatures, fine sediment deposition, stream-riparian habitat alteration, and fecal coliform bacteria (USDI 1999). Available water temperature data are summarized in Table 5.

Table 4. Average concentrations of mercury in sampled fish tissues from various locations throughout the Lower Middle Snake subbasin (IDEQ and ODEQ 2001).

Reach	River Miles	# Samples	Year	Avg. Mercury (mg/Kg wet weight)
Upper Snake River	409-335	16	1970	0.79
		9	1990	0.20
		2	1997	0.28
Brownlee Reservoir	335-285	33	1970	0.45
		130	1994	0.39
		5	1997	0.26
Downstream Snake R.	247-188	2	1997	0.15[1]

1 Value reported as mg/Kg *dry* weight of fish tissue

Table 5. Stream temperatures in streams in upper south side of Lower Middle Snake subbasin (USDI 1997)

Stream	Max. Temp ˚C	Avg. Max. Temp ˚C[1]	Year
Castle	27.0	25.0	1994
S. Fork Castle	27.8	24.4	1994
Magpie	23.0	-	1993
Shoofly	26.7	23.5	1994
Birch	25.1	24.7	1994
Poison	32.0	31.4	1994

[1]Average maximum temperatures were for approximate sampling periods of August for Castle Creek and July and August for the rest of the creeks.

Vegetation

. Shrub and grassland communities comprise approximately 78% of the subbasin (Figure 8). Other substantial components of the vegetative community include big sagebrush communities (30.7%), xeric grasslands (22.6%), agricultural fields (14.4%), forest communities (13.1%), and salt-desert shrub communities (9.5%). Various other shrub and grassland types individually cover between 0.5% and 2.4% of the subbasin.

Forested areas in the subbasin are predominately mixed conifer forest (6%) and Ponderosa pine(*Pinus ponderosae*) (2.2%), both of which are concentrated in the Hells Canyon portion of the subbasin. Western juniper (*Juniperus* spp.) and mountain mahogany represent small percentages of land cover for the subbasin, 2.6 percent and 0.44 percent respectively, and are concentrated in the high elevation areas of the upper subbasin.

In Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) communities, big sagebrush is the dominant shrub species and a variety of grass species may dominate the understory. These species include Thurber needlegrass (*Stipa thurberiana*), bluebunch wheatgrass (*Agropyron spicatum*), bottlebrush squirreltail (*Sitanion hystrix*), basin wildrye (*Elymus cinereus*), Indian ricegrass (*Oryzopsis hymenoides*), Sandberg bluegrass (*Poa secunda*), and needle and thread grass (*Stipa comata)* USDI 1995).

The major shrub species associated with salt desert communities include winterfat (*Ceratoides lanata*), shadscale (*Atriplex confertifolia*), fourwing saltbush (*Atriplex canescens*), Nuttall saltbrush (*Atriplex nuttallii*), budsage (*Artemisia spinescens*), spiny hopsage (*Grayia spinosa*), and black greasewood (*Sarcobatus vermiculatus*; USDI 1995). Major grass species associated with salt desert communities include Indian ricegrass, bottlebrush squirreltail, and Sandberg bluegrass (USDI 1995). Salt desert communities generally occur below 3,500 ft. elevation.

Riparian communities along the Snake River and perennial and intermittent creeks are dominated by coyote willow (*Salix exigua*). This species grows in a very narrow band just above the mean water line of the river. Russian olive (*Elaeagnus angustifolia*), an exotic species, often grows along with willow (USDI 1995). The confluences of intermittent and perennial streams with the Snake River often have alluvial areas that support more extensive stands of coyote willow, peachleaf willow (*Salix amygdaloides*) and occasionally black cottonwood (*Populus trichocarpa*). Cottonwoods are found at the mouth of Sinker Creek (USDI 1995). In higher elevation riparian areas, aspen (*Populus tremuloides*), birch (*Betula* spp.), shrubs and other trees occur in groves. Riparian areas in tributaries are often limited in size because of limited canyon wall constriction. Pockets of diversity lie scattered around the desert in the form of wetlands and creeks, hot springs and wet meadows (Figure 8). Several islands in the Snake River are almost entirely covered with coyote willow, Wood's rose (*Rosa woodsii*) and golden currant (*Ribes aureum*).

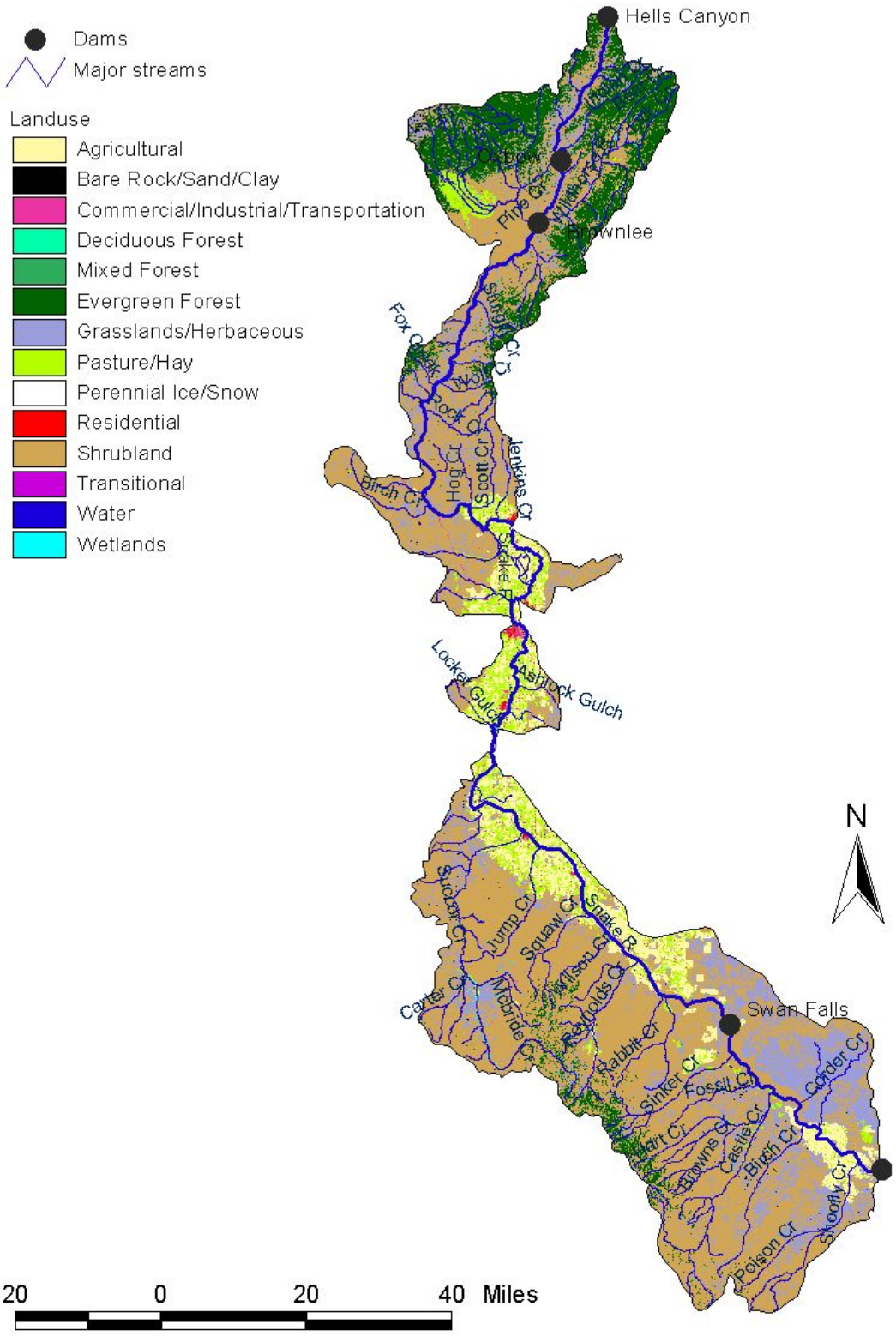

Figure 8. Current land cover patterns in the Lower Middle Snake subbasin.

Vegetation in the subbasin has changed rapidly since presettlement times due in part to heavy grazing pressure by domestic stock, changes in the fire regime, and dramatic changes in hydrology. Heavy grazing in conjunction with 14 years of below normal precipitation, which culminated in the drought of 1934, resulted in a drastic reduction of native understory grasses and the creation of dense, monotypic stands of big sagebrush (USDI 1995). The reduction in native understory paved the way for the invasion of exotic annuals and noxious weeds (USDI 1995). Noxious weeds have become established in many areas of the subbasin and have caused reductions in plant diversity, habitat quality, habitat quantity, and forage for wildlife species (Table 6). By changing basic regimes, such as the fire regime, exotic plants, especially the grasses, have changed basic ecological patterns that now limit the reintroduction of native vegetation communities and encourage further weed invasion. In many areas, succession towards more complex communities has been stunted or stopped and fish and wildlife populations have been negatively impacted.

Table 6. Noxious weeds documented to occur in the Lower Middle Snake subbasin (USDA 1999; USDI 1999; 2001a; 2001b; 2001c)

Common Name	Species
Canada thistle	*Cirsium arvense*
Dalmatian toadflax	*Linaria dalmatica*
Diffuse knapweed	*Centaurea diffusia*
Field bindweed	*Convolvulus arvensis*
Leafy spurge	*Euphorbia esula*
Perennial pepperweed	*Lepidium latifolium*
Poison hemlock	*Conium maculatum*
Puncture vine	*Tribulus terrestris*
Purple loosestrife	*Lythrum salicaria*
Rush skeletonweed	*Chondrilla juncea*
Russian knapweed	*Centaurea repens*
Scotch thistle	*Onopordon acanthium*
White-top	*Cardaria draba*
Yellow starthistle	*Centaurea solstitialis*

Table 7. Sensitive plants and habitat requirements (USDI 1997; 1999; 2001a; 2001b; 2001c; ICDC 2001)

Common Name	Scientific Name	Habitat	Documented Locations
Annual salt buckwheat	*Polygonaceae*	Ashy, clay soils in shadescale-bud sagebrush and Wyoming big sagebrush habitat	Shoofly to Castle Creek
Bailey's ivesia	*Ivesia baileyi*	Found in Jump Creek on the North side of the Owyhee Mountains	Grows in cracks on cliffs
Bank monkey flower	*Mimulus clivicola*		Lick Creek
Bruneau River prickly phlox	*Leptodactylon glabrum*		
Cusick's camas	*Camassia cusickii*		Wildhorse River
Davis' peppergrass	*Lepidium davisii*	Hard bottom playa, sparsely vegetated playas	
Dimeresia	*Dimeresia howellii*	Sagebrush steppe, juniper; volcanic cinder	
Greeley's wavewing	*Cymopterus acaulis* var. *greenleyorum*	Sagebrush steppe; volcanic ash; coarse sand	
Inch-high lupine	*Lupinus uncialis*	Sagebrush steppe; volcanic cinder, loamy soils	
Janish's penstemon	*Penstemon janishiae*	Lakebed soils in sagebrush and salt desert shrub habitat	Shoofly to Castle Creek
Matted cowpie buckwheat	*Eriogonum shockleyi* v. *packardae*	Salt desert shrub; oolitic limestone, lakebed sediments	
Mud Flat milkvetch	*Astragalus Yoder wiliamsii*	Cindery, silt loam soils in lower elevation mountain big sagebrush sites	Shoofly to Castle Creek
Mulford's milvetch	*Astragalus mulfordiae*	Deep sandy soils with needle-and-thread grass; oolitic limestone	Shoofly to Castle Creek
Packard's cowpie buckwheat	*Eriogonum shockleyi* Var. *packardiae*	Lakebed sediments and oolitic limestone outcrops in salt desert shrub habitat	Shoofly to Castle Creek
Rigid threadbush	*Nemacladus rigidus*	Sandy, cindery, or ashy outcrops in shadescale-sagebrush habitats; Salt desert shrub; sand, volcanic cinder	Shoofly to Castle Creek
Simpson's hedgehog cactus	*Pediocactus simpsonii* var. *robustior*	On benches and canyon rims in rocky or sandy soil in low sagebrush habitat; Low sagebrush, juniper zone; thin soil over rhyolite	Shoofly to Castle Creek
Slick spot peppergrass	*Lepidium papilliferum*		
Snake River milkvetch	*Astragalus purshii* var *ophiogenes*	Sandy bluffs and dunes in salt desert shrub habitat; oolitic and limestone	Shoofly to Castle Creek
Snake River goldenweed	*Haplopappus radiatus*	Bunchgrass dominated sagebrush-steppe	Sturgil Creek Rock Creek
Spine-noded milkvetch	*Peteria thompsoniae*		
Spreading gilia	*Ipomopsis polycladon*	Soils of lakebed origin in sagebrush or salt desert shrub habitat	Shoofly to Castle Creek
Squaw apple			Jenkins Creek
Tolmie's Onion	*Allium tiliei v. persimile*		Wildhorse River
Trout Creek milkvetch	*Astragalus salmonis*	Stony flats and hillsides among low sagebrush, in deep soils overlying basalt or rhyolite	Shoofly to Castle Creek
Washington monkeyflower	*Mimulus patulus*		Lick Creek
White eatonella	*Eatonella nivea*	Sagebrush steppe; volcanic cinder, sand	Shoofly to Castle Creek
White-margined wax plant	*Glyptopleura marginata*	Salt desert shrub; sand, oolitic limestone	Shoofly to Castle Creek

Land Ownership

Approximately 68% of the land in the subbasin is publicly owned (Figure 9)The BLM is the largest federal landowner, managing 48% of the landholdings in the subbasin. The Wallowa-Whitman National Forest manages approximately 133,000 acres, including 55,700 acres of the Hells Canyon National Recreation Area that falls within the subbasin. The Payette National Forest manages 170,000 acres of the subbasin (Figure 10). The majority of the privately owned land (810,000 acres) is located at the lower elevations in near the Snake River (Figure 10). Much of this land is used for agricultural purposes (Figure 8).

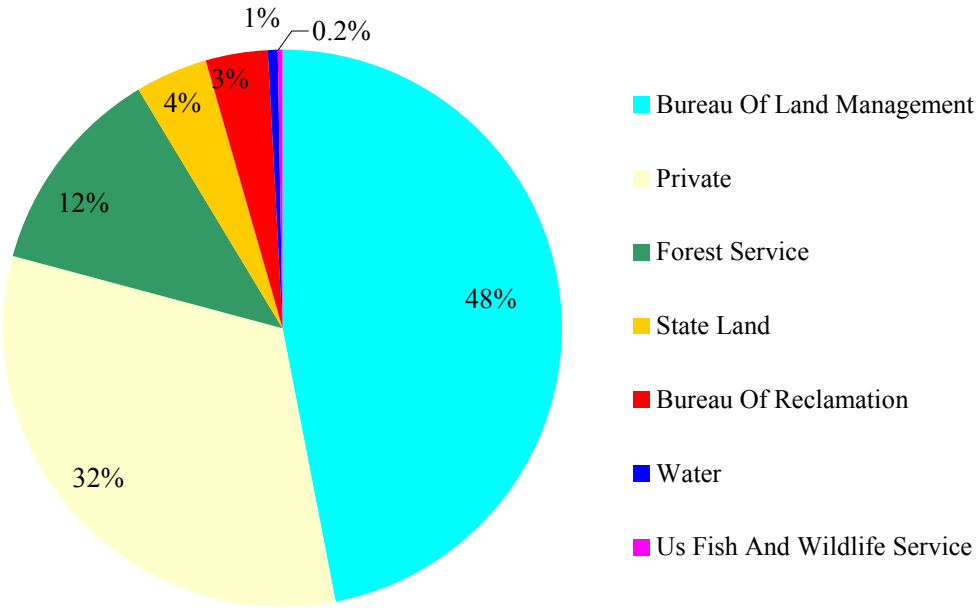

Figure 9. Land ownership in the Lower Middle Snake subbasin.

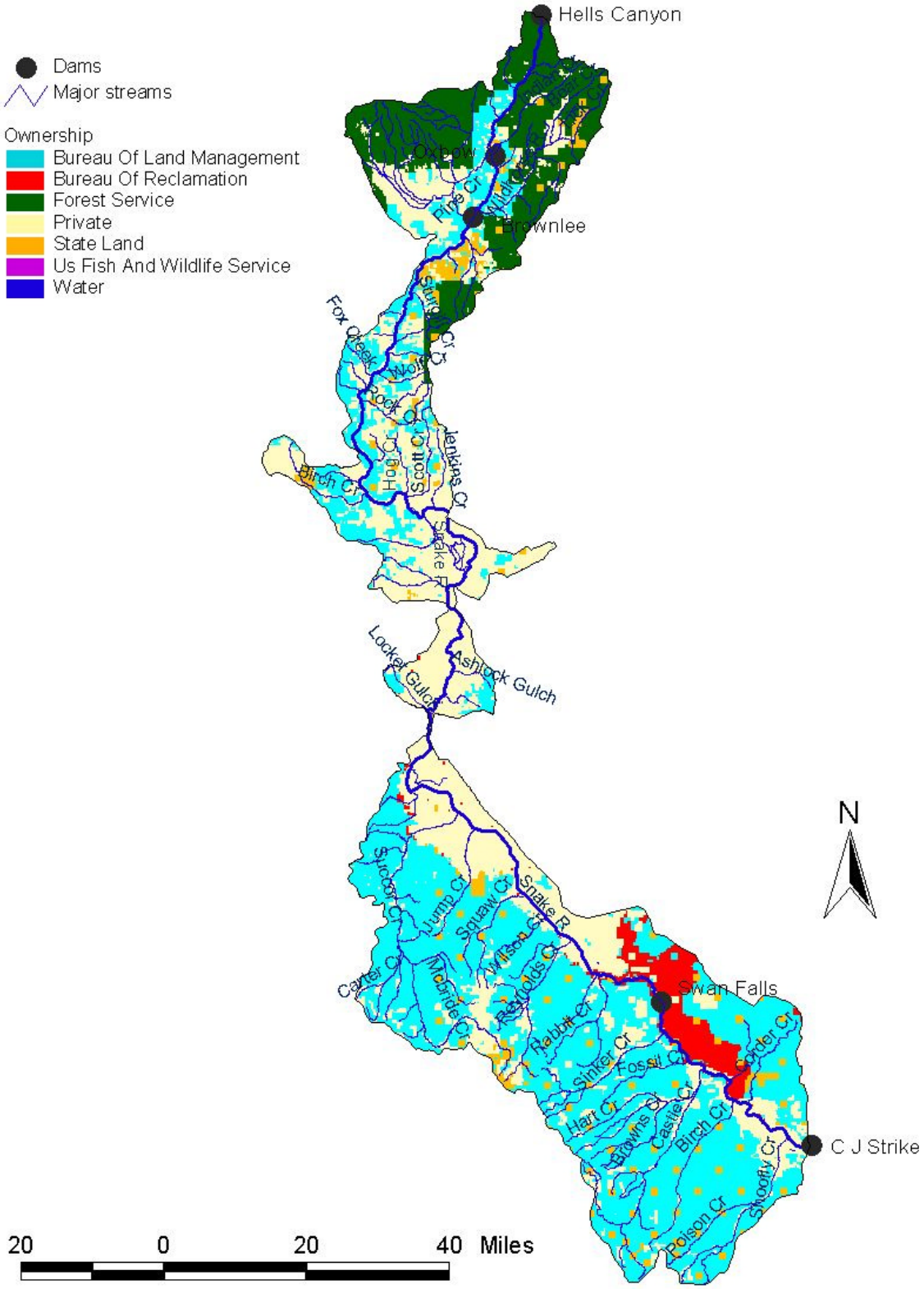

Figure 10. Land ownership in the Lower Middle Snake subbasin

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 today 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, steelhead trout (*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

Land use is closely tied to land ownership, with the private lands further developed than public lands. Road density is often used as a surrogate for intensity of land use, since development of land involves building roads. Figure 11 shows the most intensive development along the Boise side of the upper portion of the subbasin and through the middle of the subbasin. Least developed areas include the Owyhee Mountains and Plateau area, especially upper Shoofly and Birch Creek where they border Little Jacks Creek in the Bruneau subbasin, and in the Hells Canyon area, along the canyon itself and in parts of Pine Creek.

Agriculture, Farming and Ranching

Agricultural land uses occur on 14% of the Lower Middle Snake subbasin (USGS 1999). Agriculture is concentrated in areas of flat terrain adjacent to the Snake River, with irrigation water coming from the Snake or its tributaries. The upstream and central reaches of the Snake River support the highest concentrations of agricultural land uses. All major tributaries of the Upper Snake also contain agricultural lands, which contribute to the water quality of the mainstem (IDEQ and ODEQ 2001).

Almost the entire subbasin is grazed, often impacting riparian vegetation, water temperatures and sedimentation. The environmental costs of both grazing and farming are severe in some areas of the subbasin, but the economic and social benefits of the two land uses are important locally and regionally. Overall, land use in the subbasin continues to improve its practices, like other areas of the Columbia Basin, and the ecological impacts of land management have been greatly improved over the last few decades in much of the subbasin.

Timber Harvest

Timber harvest in the Lower Middle Snake subbasin is not a primary land use due to the paucity of marketable trees. Some timber harvest has occurred in the Pine Creek watershed (USDA 1999). Woodcutting of juniper occurs in the Owyhee Mountains

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 for gold. The development of the most significant gold mining district in Idaho, the Boise Basin, occurred in 1962. One party found gold along Jordan Creek in the Owyhee Mountains, and soon after the Owyhee mining district was developed. Unlike many placer mining districts, millions of dollars were invested in Owyhee underground mines and mills which assured a long future for mining in the area (Idaho Mining Association 1998).

Mining has occurred throughout the subbasin. A wide variety of products have been extracted, including: gemstones, metals, minerals, geothermal resources, mercury, and earthen materials (Figure 12). Current mining activities (mineral-producing mines) are concentrated in the central portion of the subbasin. Sand and gravel are the primary products. In other areas, mineral-producing mines extract clay, gypsum, pumice, gold, gemstones, sand/gravel and zeolite.

Impacts of mining activity to natural resources are variable and depend on mine size and location, mining methods, products mined, and a number of other factors. Some species (e.g. bats) may benefit from the creation of mines, but most are adversely affected. The most common influences of mining activities on aquatic resources involve production of acidic wastes, toxic metals, and sediment (Nelson et al. 1991). Historic use of mercury in mining operations has resulted in increased mercury concentrations in river systems. Owyhee and Brownlee Reservoirs have experienced elevated mercury levels in fish tissue samples (Walt VanDyke, ODFW, personal communication, October 12, 2001).

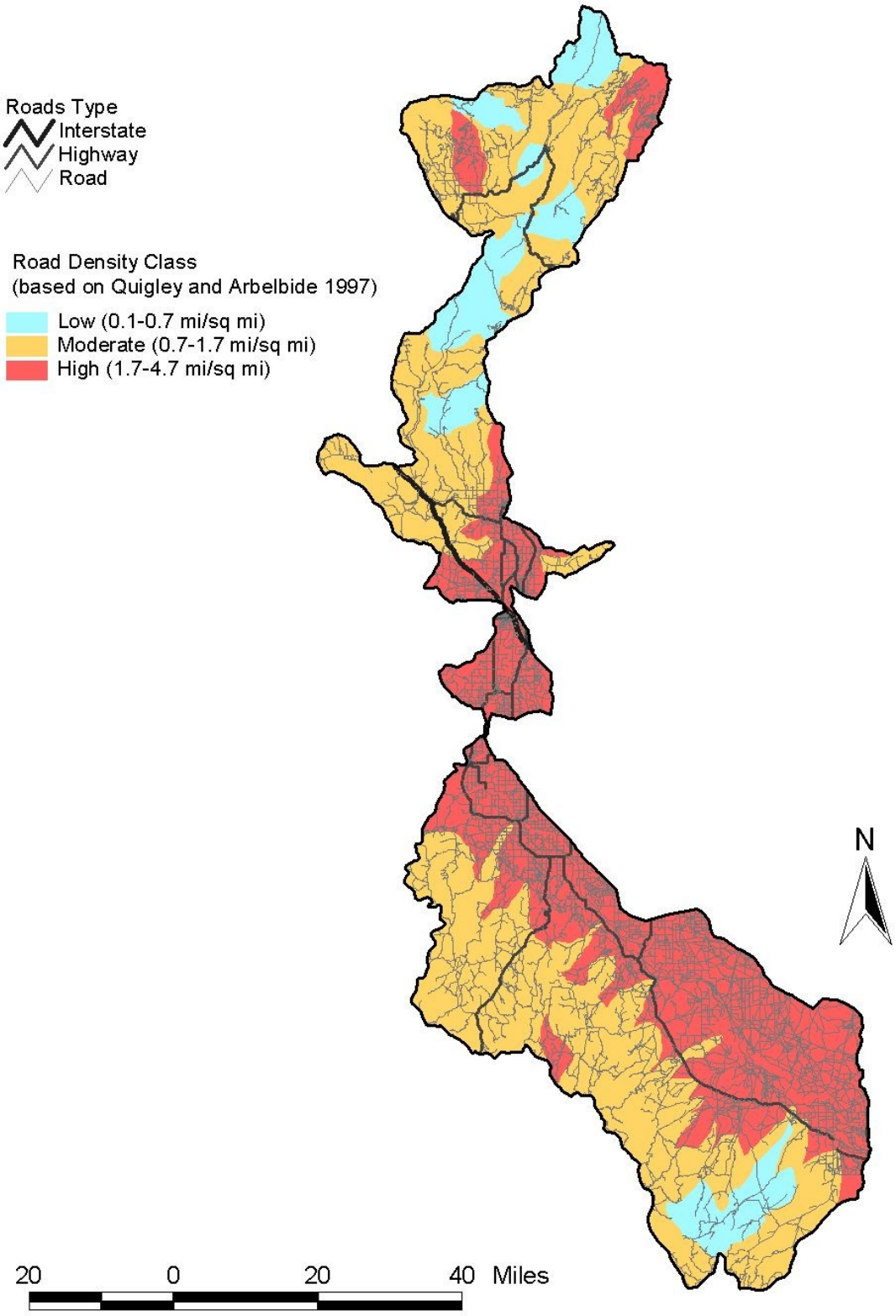

Figure 11. Road densities in the Lower Middle Snake subbasin.

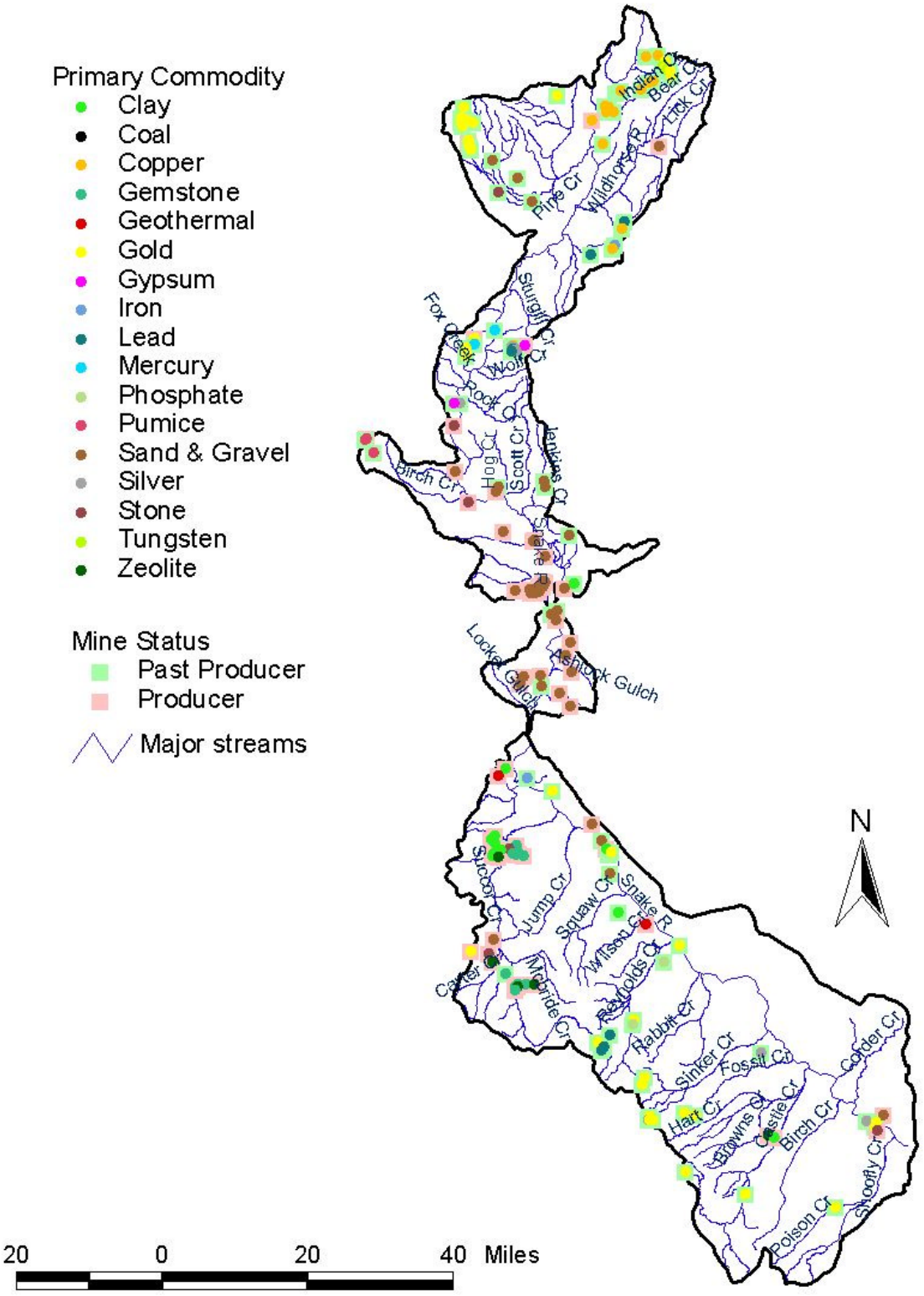

Figure 12. Historic and current mining areas in the Lower Middle Snake subbasin.

Urban Development

According to Land Use Land Cover (LULC) analysis of satellite imagery from the USGS, less than 1% of the Lower Middle Snake subbasin is in residential, commercial, industrial or transportation land uses. Populations of communities in the subbasin are relatively small. In 1990, none of the fourteen communities inside or immediately outside of the subbasin's boundaries had a population greater than 10,000 Figure 13, and only Payette and Ontario had a population greater than 5,000 (Figure 14). Recent county population figures indicate that communities in the Boise metropolitan area are significantly increasing and development and recreational use of the subbasin will likely follow suit (Table 8).

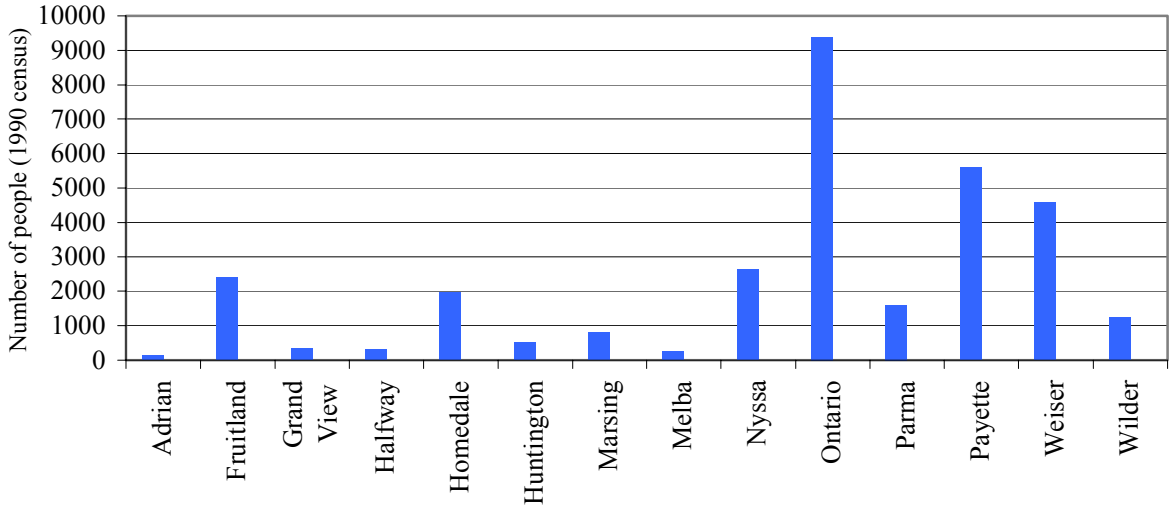

Figure 13. Population of communities in or directly outside the Lower Middle Snake subbasin.

Table 8. Changes in population in the counties of the Lower Middle Snake subbasin (ESRI 1999)

County Name	State Name	% of county in subbasin	Population 1990	Population 1997	Change
Ada	Idaho	26.7	205,775	266,546	+60,771
Adams	Idaho	19.5	3,254	3,959	+705
Canyon	Idaho	23.6	90,076	115,336	+25,260
Elmore	Idaho	2.9	21,205	24,311	+3,106
Owyhee	Idaho	19.6	8,392	10,262	+1,870
Payette	Idaho	21.8	16,434	20,396	+3,962
Washington	Idaho	27.6	8,550	10,009	+1,459
Baker	Oregon	15.1	15,317	16,527	+1,210
Malheur	Oregon	6.1	26,038	28,671	+2,633
Wallowa	Oregon	1.7	6911	7538	+627

Diversions, Impoundments, and Irrigation Projects

C.J. Strike Dam/Reservoir

C.J. Strike Dam is an earthen dam that is located on the Snake River southwest of Mountain Home, Idaho at RM 494. The C.J. Strike Power Plant began production in 1952 and has a generating capacity of 82,800 kilowatts (IPC 2001). The reservoir above the plant covers 7,500 surface acres, and has a storage capacity of 247,000 acre-feet (IPC 2001). In addition to power production, C.J. Strike provides recreational opportunities. Idaho Power is currently in the relicensing process.

Swan Falls Dam/Reservoir

The Swan Falls Dam is the oldest hydroelectric generating site on the Snake River. It is located approximately 40 miles south of Boise (RM 457.7; IPC 2001). When it was first constructed at the turn of the century, its 10 generators provided power to gold and silver mines in the nearby Owyhee Mountains. Idaho Power recently constructed a new power plant decommissioned the old plant (which will remain as a historical landmark). The reservoir behind the dam covers 1,525 surface acres, and has a storage capacity of 7,425 acre-feet (IPC 2001). The area is popular for tours, fishing, hunting, and rafting.

Hells Canyon Project

The Hells Canyon project is made up of three dams: Brownlee, Oxbow and Hells Canyon. Located on the Snake River between Idaho and Oregon, these three dams comprise two-thirds of Idaho Power Company's total hydroelectric generating capacity (IPC 2001). The Federal Power Commission (now the FERC) authorized the project in 1955. The Hells Canyon Project provides power, flood control, and recreational opportunities to the region.

Brownlee Dam/Reservoir

Brownlee Dam was completed in 1959 and is the most upstream (RM 285) of the three dams in the Hells Canyon Complex. The dam formed a reservoir 58 miles long (with 190 miles of shoreline)—the longest on the Snake River. The reservoir is 2,077 feet above sea level and has a total storage capacity of 975,000 acre-feet (total reservoir volume is 1,420,000 acre-feet). Full pool surface area covers 14,000 acres (IDEQ and ODEQ 2001). Average residence time (reservoir volume/avg. daily inflow volume) is 35 days based on data from 1961-2000, with a range of 15-70 days (Nurnberg and Brown and Caldwell 2001). The rock-filled dam has a generating capacity of 585 megawatts (IPC 2001).

Brownlee Reservoir was constructed for power production, but the Army Corps of Engineers (ACE) also operates it for flood control. NMFS provides consultation for anadromous fish production and passage (Nurnberg and Brown and Caldwell 2001). Idaho Power prefers keeping Brownlee at or near full pool because it provides the best conditions for power generation. However, withdrawals, seasonal weather fluctuations, and the need for flood control affect the ability to constantly keep the reservoir at maximum pool. The lowest reservoir elevation is typically in late April, with near-full status reached by late May. In most years, that level has been maintained from Memorial Day weekend through July Fourth weekend, which coincides with the majority of the crappie and bass spawning season (water level fluctuations during spawning season may negatively impact spawning success).

From early July through mid-August Idaho Power releases water to help anadromous fish migrate downstream. Brownlee then partially refills, but soon after Labor Day another salmon-related drawdown begins and typically lasts through mid-October. This creates room in Brownlee to store excess inflows between mid-October and mid-December while outflows from Hells Canyon Dam are held stable to protect spawning fall chinook downstream.

These operations originally were characterized as voluntary participation, but have become mandatory with the creation of federal endangered species laws. Protecting recreational access has become more difficult as a result, since many boat ramps are dewatered during drawdown conditions.

Oxbow Dam/Reservoir

Oxbow takes its name from a three-mile bend in the Snake River at river mile 273 that early settlers said resembled the U-shaped collar around an ox's neck. Oxbow Dam was the second dam of the Hells Canyon Project, completed in 1961. Today, the three-dam project supplies power, provides flood control, and provides recreation opportunities to the region (IPC 2001).

The rock fill dam contains a powerhouse with 4 generating units, having a total nameplate generating capacity of 190 megawatts (IPC 2001). Operating strategies and restrictions throughout the Hells Canyon Complex, including Oxbow Dam, are generally similar to those described above for Brownlee Dam.

Hells Canyon Dam/Reservoir

At river mile 247.6, Hells Canyon Dam, the third and last of the Hells Canyon complex, began generating electricity in 1967. Hells Canyon is the deepest canyon on the North American Continent. Today, the three-dam project supplies power, provides flood control, and provides recreation opportunities to the region.

The concrete gravity dam contains a powerhouse with 3 generating units, having a total nameplate generating capacity of 391 megawatts (IPC 2001). Operating strategies and restrictions throughout the Hells Canyon Complex, including Hells Canyon Dam, are generally similar to those described above for Brownlee Dam.

Protected Areas

Snake River Birds of Prey National Conservation Area

The 484,873-acre Snake River Birds of Prey National Conservation Area was established in 1993 to provide for the protection and enhancement of raptor populations and habitats (USDI 1995). Within this, 64,865 acres of essential nesting habitat were withdrawn from the operation of general mining laws, but not mineral lease laws. In addition, approximately 417,775 acres were withdrawn from agricultural operation. The area provides excellent habitat for falcons, eagles, and hawk, supporting the largest concentration of nesting raptors in North America. More than half (299,570 acres) of the Snake River Birds of Prey NCA lies within the Lower Middle Snake Subbasin (Figure 14).

Deer Flat National Wildlife Refuge-Snake River Sector

The Snake River Sector of the Deer Flat National Wildlife Refuge is composed of 94 islands distributed along 113 miles of the Snake River in southwest Idaho and eastern Oregon. Twenty-two of these islands occur in the Lower Middle Snake subbasin. The islands were acquired by

various methods starting with 36 islands set aside by Executive Order, by President Franklin Roosevelt in 1937. Public Land Orders, purchases, donations and mitigation gains brought the refuge to the present 94 islands totaling approximately 800 acres. The Deer Flat National Wildlife Refuge is managed by the U.S. Fish and Wildlife service with the goal of preservation and maintenance of habitat for all species of native wildlife. The islands are especially important to migratory birds (USFWS 2001a).

C.J. Strike Wildlife Management Area

The C.J. Strike Wildlife Management Area encompasses 20,725 acres of C.J. Strike Reservoir, adjacent marshes, ponds and wildlife food plots, extending 26 miles up the Snake River and 12 miles up the Bruneau River between the towns of Grand View and Bruneau, Idaho. Idaho Power Company, Idaho Department of Fish and Game, and the Bureau of Land Management own the land. Because the management emphasis for the area focuses on waterfowl and upland game bird production, much of the area is closed to the public from February 1 through July 31.

Hells Canyon National Recreation Area

Established in 1975, Hells Canyon National Recreation Area (HCNRA) encompasses 652,488 acres, of which 194,132 acres are designated as wilderness and 33,000 are privately owned (USDA1999; Figure 14). HRNCA is administered as part of the Wallowa-Whitman National Forest.

Research Natural Areas

Research natural areas are natural ecosystems that provide benchmarks for comparison with areas influenced by humans. These areas provide research areas for ecological studies and preserve gene pools for threatened and endangered plants and animals. Seven areas are proposed for designation as Research Natural Areas in the Lower Middle Snake subbasin (Figure 14). These areas were selected to represent particular plant associations, geological formations, or other needs outlined in state natural heritage plans. According to the Forest Plan "Proposed RNAs will be protected from uses which would reduce their suitability for RNA designation". Since their designation no logging has occurred in the proposed RNAs. Once officially established, an RNA management plan will be written and integrated into the Forest Plan (USDA 1999).

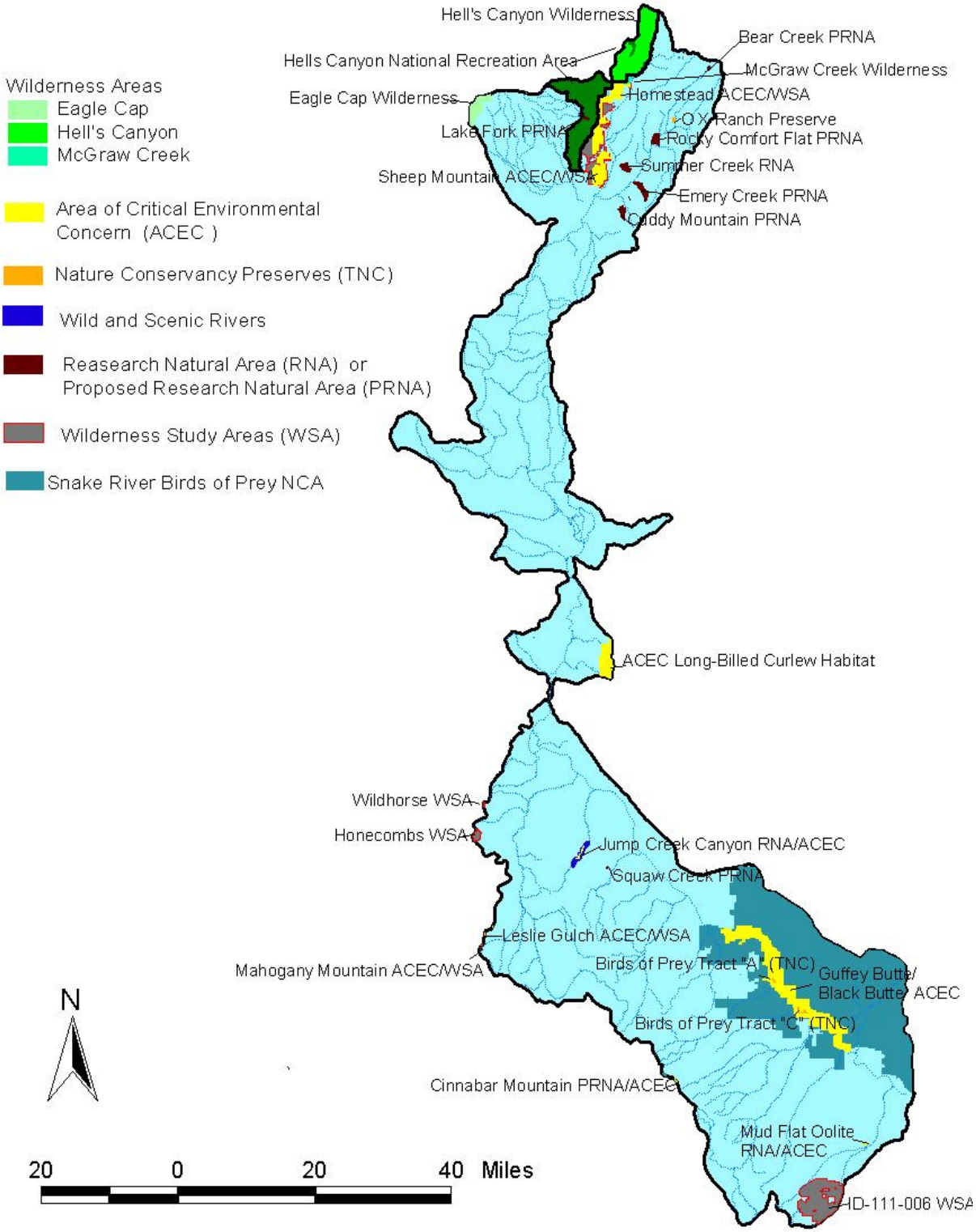

Figure 14. Areas in the Lower Middle Snake subbasin that are managed and/or protected using a conservation-based strategy.

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Prior to construction of hydropower dams, the Snake River from Shoshone Falls downstream, supported a diverse and rich aquatic community (Lance et al. 2001). Steelhead trout, white sturgeon, redband or rainbow trout, Pacific lamprey, bull trout (*Salvelinus confluentus*) and a host of other aquatic species, inhabited the river and could freely range throughout the Snake and Columbia river systems.

Construction of hydroelectric projects on the Snake River eliminated anadromous species such as chinook salmon, steelhead trout, and Pacific lamprey above the Hells Canyon Complex of dams (Northwest Power Planning Council 1986) and contributed significantly to the reduction of native redband trout, bull trout and white sturgeon (Lukens 1981, Cochnauer 1983, Quigley and Arbelbide 1997). Resident fish populations including bull trout, sturgeon and redband trout populations have been segmented into isolated habitat areas with no ability to interact with other populations. The Swan Falls Project, downstream of C.J. Strike Dam, was built in 1901 with a fish ladder designed to pass anadromous fish. The ladder worked well only when the reservoir was at or near full pool (Irving and Cuplin 1956). The ladder was more efficient at passing steelhead because they migrated in the spring when flows were typically high, whereas chinook reached the dam during the summer and fall low flow period. This likely reduced chinook salmon runs greatly in the Snake River above Swan Falls Dam. Due to a variety of factors, including the inefficiency of the Swan Falls ladder, only a small run of salmon and steelhead ascended the Snake River up to the C.J. Strike Dam at the time of closure (1952). As a result, a fish ladder was not constructed (Irving and Cuplin 1956) and thus, C.J. Strike became a complete barrier to all upstream migration.

Construction of Brownlee (1959), Oxbow (1961), and Hells Canyon (1967) dams progressively eliminated anadromous species from the remainder of the Lower Middle Snake River subbasin (Northwest Power Planning Council 1986). Numerous other dams and diversions had already blocked passage in the main tributaries and many of the smaller tributaries. The loss of anadromous fish impacted the basic biomass in the system, reducing overall nutrients, prey base and wildlife resources throughout the subbasin and associated tributaries.

The Lower Middle Snake subbasin is currently inhabited by at least 39 species of fish, 19 of which are native to the region (Table 9). Generally, habitat conditions in the subbasin are poor for native fish; the few exceptions are limited to small habitat patches. Poor quality habitat, reduced quantity of habitat, and isolation of populations in fragmented habitat reduces the viability of many species.

Currently, the dominant salmonid species throughout the subbasin include rainbow trout and mountain whitefish (IDEQ and ODEQ 2001). Reservoir rainbow trout populations are primarily comprised of hatchery-reared trout. Native redband rainbow trout are found in a limited number of tributary streams throughout the subbasin. Bull trout are found only in limited tributary systems between Hells Canyon Reservoir and Hells Canyon Dam, and in Hells Canyon Reservoir itself (IDEQ and ODEQ 2001). Prevalent non-salmonid game species throughout the reservoirs in this subbasin include largemouth and smallmouth bass, crappie, catfish and bullheads, and white sturgeon (IDEQ and ODEQ 2001). Yellow perch (*Perca flavescens*) are also common throughout much of the subbasin (Lance et al. 2001). Non-game species common

throughout the river and reservoir system(s) below C.J. Strike Dam include largescale sucker (*Catostomus macrocheilus*), northern pikeminnow (*Ptychocheilus oregonensis*), peamouth (*Mylocheilus caurinus*), and carp (*Cyprinus carpio*) (Lance et al. 2001).

Table 9. Fish species currently inhabiting the Middle Snake River subbasin (USDI 1997, USDI 1999, USDI 2001a)

Common Name	Species	Origin[1]	Location[2]	Status[3]	Comments
Banded killifish	*Fundulus diaphanus*	N			
Black crappie	*Pomoxis salmoides*	E	R	C	
Blue gill	*Lepomis macrochirus*	E	R	U	
Bridgelip sucker	*Catostomus columbianus*	N	R	C	
Brook Trout	*Salvelinus fontanalis*	E	R		
Brown trout	*Salmo trutta*	E			
Bull trout	*Salvelinus confluentus*	N		ESA T	
Bullhead, black	*Pomoxis nigrmaculatus*	E	R	U	
Bullhead, brown	*Ictalurus nebulosus*	E		R/I	
Bullhead, yellow		E			
Channel catfish	*Ictalurus natalis*	E	R	A	
Chiselmouth	*Acrocheilus alutaceus*	N	R and T	C	
Common carp	*Cyprinus carpio*	E	R	C,U	
Cutthroat trout (generic)	*Oncorhynchus clarki*	N		I	
Dace	*Rhinichthys spp*	N	R	C	
Flathead minnow	*Pimephales promelas*	E	R and T		
Flathead catfish	*Pylodictus olivaris*	E	R		
Largemouth bass	*Micropterus salmoides*	E	R	U	
Largescale sucker	*Catostomus macrocheilus*	N	R and T	A	
Longnose dace	*Rhinichthys cataractae*	N	R and T	C	
Mottled sculpin	*Cottus bairdi*	N	T	C	
Mountain sucker	*Catostomus platyrhychus*	N			
Mountain whitefish	*Prosopium williamsoni*	N	R	O,U	
Northern pikeminnow	*Ptychocheilus oregonensis*	N	R and T	C	
Oriental weatherfish	*Misqurnus angullicaudatus*				Found in ditches
Paiute sculpin	*Cottus beldingi*	N			
Peamouth chub	*Mylocheilus caurinus*	N	R	U	
Pumpkinseed	*Lepomis gibbosus*	E	R and T	U	
Redband trout	*Oncorhynchus mykiss*	N	R and T	U/C	Redbands=U; RBT=C
Redside shiner	*Richardsonius balteatus*	N	R and T	A	
Shorthead sculpin	*Cottus confusus*	N		C	
Smallmouth bass	*Micropterus dolomieui*	E	R and T	A	
Speckled dace	*Rhinichthys osculus*	N	R and T	A	
Tadpole madtom	*Noturus gyrinus*	E	R	U	
Torrent sculpin	*Cottus rhotheus*	N	T	R	
Tui chub	*Gila bicolor*	E			
Warmouth	*Lipomis gulosus*	E	R and T	R	
White crappie	*Pomoxis annularis*	E	R and T	A	
White sturgeon	*Acipenser transmontanus*	N	R	U	Sensitive - BLM
Yellow perch	*Perca flavescens*	E	R	C	

1 Origin: N=Native stock, E=exotic

2 Location: R=mainstem Snake River, T=tributaries

3 Relative abundance: A=abundant, R=rare, U=uncommon, C=common, and I=insufficient data; ESA T=listed threatened under Endangered Species Act; ESA E=listed endangered under Endangered Species Act

Limited information was found regarding the status and distribution of fish populations throughout the river, reservoir, and tributary systems within the subbasin. That which was located or made available for use in this summary is typically related to native species, and is summarized below.

White Sturgeon

White sturgeon were once widely distributed in the Columbia River Basin (CRB). Habitat degradation, loss of prey resources, and loss of connectivity between populations has reduced the CRB population to a fraction of historic estimates. Development of the Columbia River Basin hydroelectric system has created impoundments that have altered the habitat and movement of white sturgeon and their principal food resources in the Lower Middle Snake River subbasin between C.J. Strike and Hells Canyon dams. Traditionally, the Nez Perce people harvested white sturgeon in the Snake River for subsistence purposes. Sport harvest occurred prior to 1970, however a catch and release fishery has been implemented since then. Snake River white sturgeon are listed as a BLM and USFS sensitive species, and are a species of special concern in the State of Idaho. Snake River white sturgeon are presently not listed or proposed for listing under the Endangered Species Act.

Within the subbasin, white sturgeon are only found in the mainstem Snake River. USDI (1995) suggests that two populations of sturgeon are found in the Lower Middle Snake subbasin: they are the Brownlee to Swan Falls Dam and Swan Falls Dam to C.J. Strike Dam populations. Lance et al. (2001) state that white sturgeon are also present in the reaches from Brownlee Dam to Oxbow Dam, and from Oxbow Dam to Hells Canyon Dam. Presently, there is no documented natural spawning in Hells Canyon and Oxbow Reservoirs (IDFG 2000), and sturgeon populations are currently considered depressed throughout all reaches within the subbasin (Lance et al. 2001). Catch and release sturgeon fisheries exist in all of these reaches, and high concentrations of white sturgeon below C.J. Strike Dam make this section one of Idaho's most popular areas for sturgeon fishing (Lance et al. 2001). The Idaho record for a white sturgeon is 1,500 pounds, caught on a set line in the Snake River in 1898. The rod and reel record is 394 pounds, caught in the Snake River in 1956.

The following life history information is primarily summarized from the ICRB Aquatic Component Report (Quigley and Arbelbide 1997) unless otherwise cited. Cochnauer (1983) estimated ages to sexual maturity of white sturgeon in the Snake River to be 5 years for males and 12 years for females. Females grow faster than males, particularly in weight after 14 years. Average length at age is roughly 9 inches at one year, 20 inches at 5 years, 40 inches at 15 years, and 6 to 9 feet at maturity (25-60+ years).

The white sturgeon is a benthic feeder and feeds on most anything, dead or alive. Young feed largely on larval forms of aquatic insects, crustaceans, and mollusk. Fish form a high percentage of the diet of larger sturgeon. The sturgeon spends a large percentage of time in deep pools with a fine substrate. "Sturgeon holes" may often range from 30 to 100 feet in depth.

Across their range, individual sturgeon spawn only once every 3 to 11 years (Cochnauer 1983). The fish spawns during May and June in rocky bottoms near rapids and lays up to two million eggs. White sturgeon require deep run habitats with high velocities for spawning (Brink and Chandler 2000 cited in Lance et al. 2001), and the primary triggers for white sturgeon spawning migrations occur in the spring when these fish respond to increasing flows and water

temperatures approaching 10^0C (Paragamian and Kruse, in press cited in Lance et al. 2001). Substrate size and water velocity influence selection of spawning areas by white sturgeon. Spawning generally occurs in water over 3 meters in depth and over cobble substrate. In the Columbia River system, reproduction has been greater during years of high flows compared with years of low flow (Hanson et al. 1992). White sturgeon are broadcast spawners that release temporarily adhesive eggs into the current. The current is thought to be important for egg and larval dispersal and predator avoidance. Turbulent upwelling and deep pools near the spawning area are thought to be important factors determining spawning success (Lepla and Chandler 1995 cited in Lance et al. 2001). The adhesive eggs initially adhere to boulders in high velocity areas and are thus subject to less predation. As the eggs become less adhesive, they are washed from the high velocity areas and tend to settle out in slower velocity areas, often in shallow backwater habitats. These same habitats are some of the most susceptible to being exposed to the atmosphere and subsequent desiccation due to rapid flow fluctuations related to dam operations (Lance et al. 2001).

Bull Trout

Bull trout populations are limited to tributaries in the lower subbasin near Hells Canyon Dam (Figure 15). Pine Creek in Oregon and Indian and Wildhorse creeks in Idaho contain bull trout populations. The Hells Canyon Complex Recovery Unit (HCCRU) is comprised of the Snake River mainstem and tributaries in Oregon and Washington that drain to the Snake River within the Hells Canyon Hydroelectric Project (Hells Canyon, Oxbow, and Brownlee Dams and associated reservoirs). Two core areas[1] were identified in the HCCRU, the Pine/Indian/ Wildhorse Core Area consisting of the Pine Creek subbasin in Oregon and Indian and Wildhorse subbasins in Idaho. There are currently at least 7 local bull trout populations identified in this core area. Table 10 describes bull trout populations within the Lower Middle Snake subbasin.

Remaining bull trout populations in the subbasin are small, mostly resident, and isolated in headwaters within the core areas. Recent radio telemetry studies have documented movement of bull trout between Hells Canyon Reservoir and the Pine Creek Basin (USFWS 2001b). The use other bull trout populations make of the mainstem habitat and connectivity to other tributaries is unknown. Populations exist in major tributaries to the Snake River, including the Bruneau, Boise, Weiser, Malheur, Payette, and Powder rivers. Historic and current interactions among these populations is unknown, although presumably all historic bull trout populations were periodically interacting with other populations in the Snake River basin. Interaction is difficult or impossible currently, as most populations are isolated by fish barriers, primarily dams. Furthermore, Hells Canyon Dam and Oxbow Dam have effectively separated bull trout populations in Pine, Indian and Wildhorse creeks, and the Powder River, from those in the Imnaha, Grand Ronde, Salmon and Clearwater rivers downstream, and from populations in the Weiser, Payette, Malheur and Boise rivers. The Bruneau/Jarbidge River population is isolated behind C.J. Strike Reservoir, cut off from all other bull trout populations.

[1] Chapter 1 of the Draft Bull Trout Recovery Plan (In Press) defines core areas as follows: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (i.e., bull trout inhabiting core habitat) of bull trout.

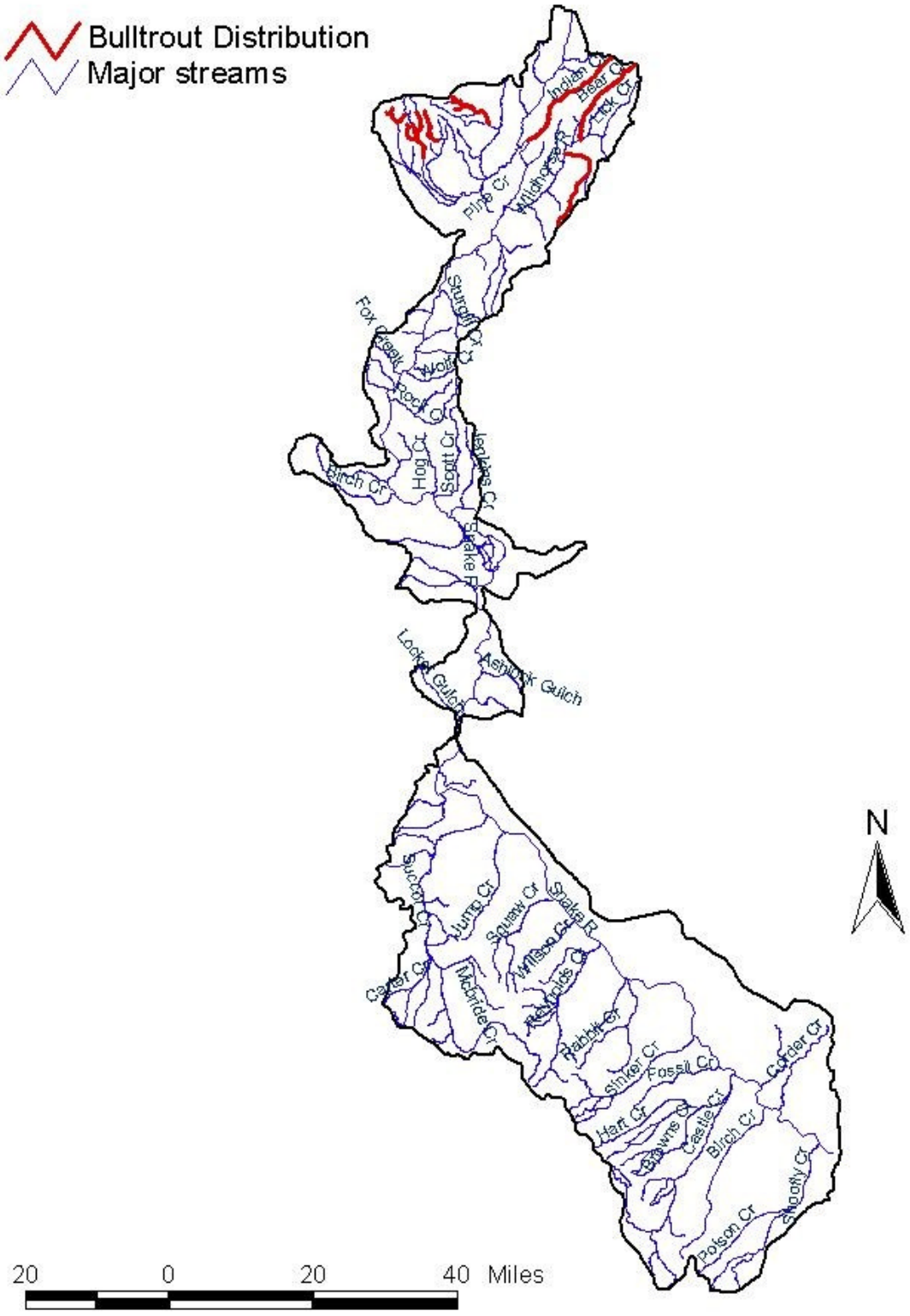

Figure 15. Bull trout presence in the Lower Middle Snake Subbasin

Table 10. Current bull trout populations in the Hells Canyon Complex Recovery Unit within the Lower Middle Snake subbasin (USFWS 2001b)

Core Area	Watershed	Local Populations
Pine/Indian/Wildhorse	Pine Creek	Upper Pine Creek (West Fork, Middle Fork, and East Fork Pine Creeks)
		Clear Creek (Clear, Trail, and Meadow Creeks)
		East Pine Creek
		Elk Creek (Aspen, Big Elk, Cabin, and Elk Creeks)
	Indian Creek	Indian Creek
	Wildhorse Creek	Bear Creek
		Crooked Creek

Redband Trout

Redband trout, the native rainbow trout, is listed as a species of special concern by the IDFG and the American Fisheries Society as well as a sensitive species by the USFS and BLM (Quigley and Arbelbide 1997). Historically, redband trout inhabited the Snake River and tributaries up to Shoshone Falls (Irving and Cuplin 1956; Behnke 1992; Quigley and Arbelbide 1997).

Redband trout are defined in the IDFG fish management plans (IDFG 1996; 2000) as the native rainbow trout in southwest and southcentral Idaho (including the Snake River Basin upstream to Shoshone Falls). Behnke (1992) identified three distinct subspecies of rainbow/redband trout, one being the native rainbow trout, including steelhead, found in the Columbia River Basin east of the Cascades to barrier falls on the Kootenai, Spokane and Snake Rivers (Shoshone Falls). Wallace (1981 cited in Schnitzspahn et al. 2000) states that redband trout "should be recognized and managed as unique populations of native trout specifically adapted to harsh desert environments". Zoellick (1999) identified populations in Castle, Shoofly Little Jacks and Big Jacks Creeks that tolerated temperatures above 26˚C, actively foraged at 26.2˚C and tolerating a maximum temperature of 29˚C.

Despite some knowledge of redband trout populations in the mainstem and tributaries, much remains unknown about their overall current status, genetic purity, or life history requirements across their historic range in the Lower Middle Snake River subbasin. Currently, redband trout are found only in select tributary streams throughout the subbasin (Figure 16) and often occur in low densities.

Limited information available suggests that redband trout densities are highly variable, both spatially and temporally within the subbasin (Table 11). Many of these areas move through dramatic loss of habitat quantity and quality during droughts, with a corresponding drop in populations and loss of age classes, to wetter cycles in which the populations rapidly recolonize restored habitat. Connectivity, especially to move to refugia and to recolonize, is therefore especially important for redband trout populations in the subbasin.

Redband trout generally occur in the upper reaches of perennial tributaries throughout the subbasin (Figure 16). Along the Owyhee Plateau, redband occur in low densities. These populations suffered declines through the drought that affected much of this area in the late 1980s and early 1990s. Redband populations on the Owyhee Plateau are isolated from each other because the fish no longer inhabit larger streams and rivers (Allen et al. 1998; USDI 1997; USDI 1999).

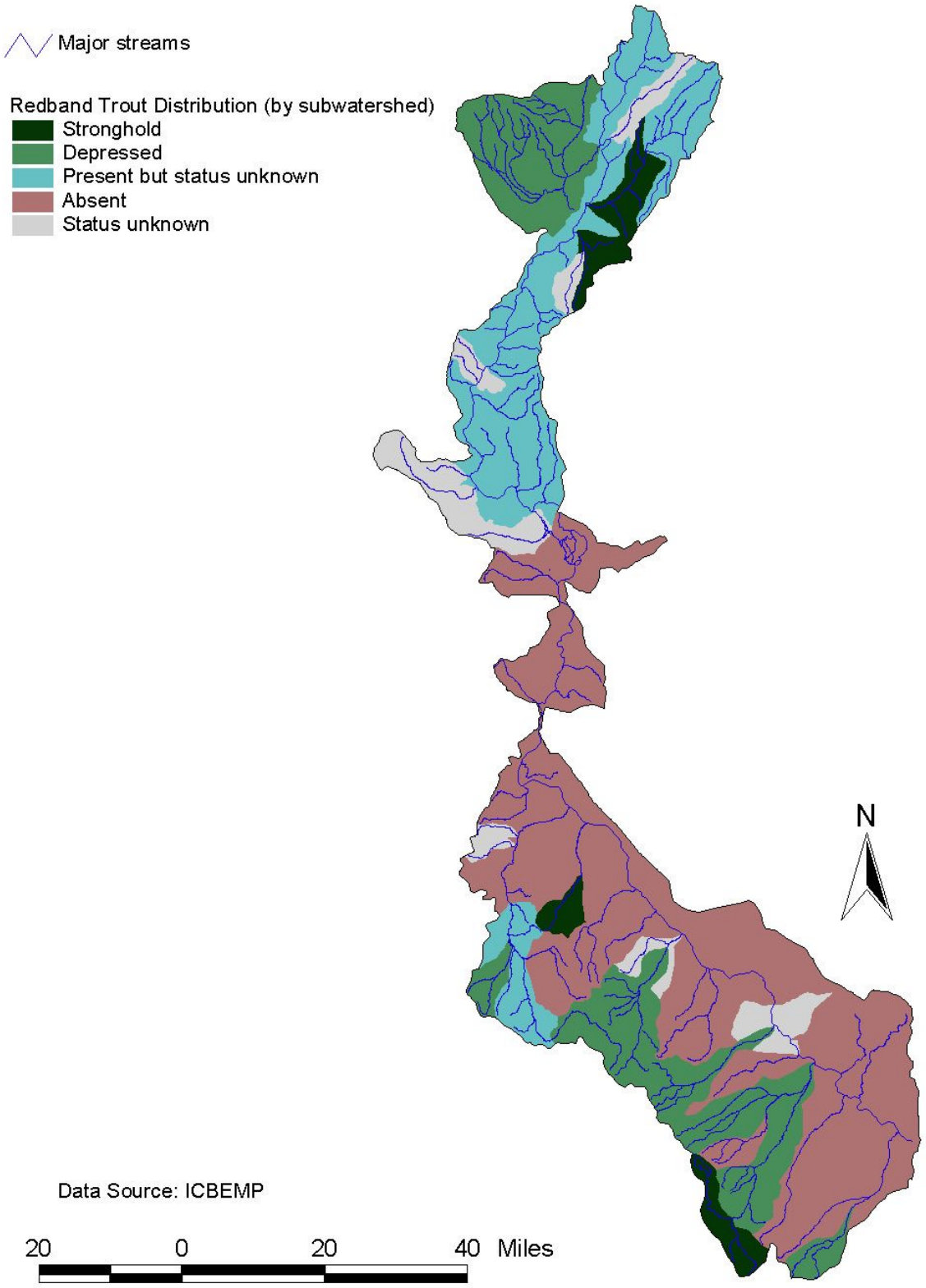

Figure 16. Redband trout distribution and relative status in the Lower Middle Snake subbasin.

Table 11. Summary of observed redband trout densities in the Lower Middle Snake subbasin (USDI 1999)

Stream	Year	Site[1]	Density (#/100m^2)
Castle Creek	1976	23.4	30.0
	1977	23.4	17.0
Jump Creek	1994	5.6	58.0
	1994	5.9	17.3
	1977	10.2	120.0
N Fk. Castle Ck.	1996	3.7	18.0
Reynolds Creek	1994	2.8	0.0
	1994	6.6	0.0
	1997	6.6	19.7
	1976	23.7	7.0
	1977	23.7	17.0
	1994	23.7	dry
	1997	23.7	20.0
Sinker Creek	1977	7.6	34.0
	1976	8.1	21.0
	1997	16.0	18.3
	1977	17.6	4.0
Squaw Creek (N)	1997	4.8	0.0
	1997	8.7	0.0
Squaw Creek (S)	1976	0.0	0.0
Succor Creek	1976	54.1	30.0

1 Sites are presumed to represent river miles, although this is not clearly defined in USDI 1999.

Redband trout occur throughout the entire Castle Creek drainage, with a stronghold[2] in the upper reaches (Figure 16; Table 12). They were absent during surveys in 1993 and 1994 at 24.8 miles and 16.2 miles upstream from the mouth, presumably as a result of low flows during the drought of 1992-1994 (USDI 1997). By 1995, they had recolonized down to stream mile 14.7. The age structure of the fish in Castle Creek drainage was 74% juveniles and 26% adults (USDI 1997).

Redband trout were also found in Magpie Creek, W. Fork Shoofly Creek, and Shoofly Creek (Table 12). Subsurface flow conditions existed in much of Magpie and W. Fork Shoofly Creek in summer of 1994. By June 1996, with more normal flows, redband recolonized the sites. Magpie Creek and W. Fork Shoofly Creek are considered important redband spawning creeks (USDI 1997).

Genetic analysis has been performed on redband trout populations in Castle Creek (Wishard et al. 1984), Reynolds Creek (Wishard et al. 1984; Leary et al 1983), and Sinker Creek (Leary et al. 1983). These studies show a relatively high degree of genetic heterozygosity in each population, suggesting that even though population levels are generally low, genetic

[2] Status designations are from the Interior Columbia Basin Ecosystem Management Project (ICBEMP) and described in Appendix A.

"bottlenecks" have not occurred in these populations. In addition, little to no evidence of hatchery introgression was thought to have occurred based on results of genetic analyses.

Table 12. Notes on redband trout distribution and status in tributaries within the Lower Middle Snake subbasin

Creek/tributary	Populations present	Comments
Shoofly Creek	Redband	Much of this system dries, especially during droughts. Redband are present low densities in all areas of upper creek.
Birch Creek	Redband	Absent from most of the creek, stronghold in the upper reaches, adjacent to upper South Fork Castle Creek
Castle Creek	Redband	Limited by high water temperatures and high sediment, stronghold in upper South Fork. Recolonized a number of areas where absent in 1994 (USDI 1997). Age structure in 1997 was 74% juvenile and 24% adult
Sinker Creek	Redband	Low fish densities (Allen et al. 1998).
Reynolds Creek	Redband, speckled dace	2 out of 4 sites with no redband in 1994 had been recolonized by 1997 (Allen et. Al 1998).
Jump Creek	Redband, shiners, suckers	A 60 foot falls provides passage barrier. UDSI (1999) considered the creek good quality average in potential volume of production

Mountain Whitefish

Mountain whitefish, a game fish and salmonid, is considered abundant in all major river drainages in Idaho, are considered the most abundant game fish in the state (Simpson and Wallace 1982), and are present in the river below C.J. Strike Dam (Lance et al. 2001). In many areas, mountain whitefish provide an important winter fishery because they feed more actively than most salmonids during this period. Mountain whitefish are fall spawners, typically spawning in riffle areas during late October or early November; in some instances, spawning is known to occur along gravel shores in lakes or reservoirs (Simpson and Wallace 1982). Eggs are adhesive, and stick to the substrate following spawning.

Whitefish do not appear to be common in tributaries to the Snake River in the upper part of the subbasin (USDI 1995). No information was located regarding mountain whitefish population status in other tributary and free-flowing river reaches of the subbasin.

Although no information was found pertaining to status of mountain whitefish in other reservoir systems within the subbasin, it is plausible that their status and trend would be similar to that described in and below C.J. Strike Reservoir. Idaho Power Company (IPC) sampled whitefish populations near C.J. Strike Dam from 1988 to 1996 (Brink, et al. 1997 cited in Lance et al. 2001). Whitefish were most abundant during 1990 but few have been collected since 1994. Most of the whitefish sampled were larger than 300 mm long. Although natural reproduction does occur in the study area, significant annual recruitment to the YOY life stage is not occurring (Lance et al. 2001). The IDFG believes the whitefish population is recruitment limited in this area (Lance et al. 2001).

Wildlife

The complex topography, varied soil conditions, and diverse vegetative communities of the Lower Middle Snake subbasin make it an ideal home for a large number of wildlife species. The majority of the subbasin has been identified as a Center for Biodiversity and/or a Center for Endemism and Rarity (Quigley and Arbelbide 1997). A list of vertebrate wildlife species thought to occur in the Lower Middle Snake 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 experience of local wildlife managers. Many species are listed as potentially occurring not because of documented observations, but because of expected habitat type use. For many species in many areas of the subbasin basic information on distribution and population trends has not been collected and represents a data gap. Even less information exists on the distribution of invertebrate species and with only a few exceptions it was impossible to discuss their distributions or population trends.

Due to the exceptional biodiversity of the area it was not possible to discuss the populations and habitat use of all the wildlife species found in the subbasin. This document concentrates on summarizing the existing data on the sixty-nine species listed as candidate, sensitive, threatened, or endangered by one of the land management agencies in the subbasin (Table 13), and economically important game species.

Reptiles and Amphibians

Portions of the Lower Middle Snake subbasin have been identified as having exceptional reptile and amphibian diversity, as great as any area in Idaho. The greatest diversity of reptiles is associated with the lower elevation Wyoming big sagebrush and salt desert shrub communities found in the upper subbasin. Amphibians are found both in backwater areas along the mainstem Snake River and in ponds, seeps and other wetland areas in its tributaries. Of the 10 amphibians and 19 reptile species that potentially occur within the subbasin, 4 amphibians and 6 reptiles are listed as a species of concern by one or more land management agencies in the subbasin (Appendix B; Table 13).

Ground Snake

Ground Snakes occur in desert areas with sandy soil, and only in or adjacent to talus slopes in the Snake River Canyon (Klott 1996). The Idaho Conservation Data Center (ICDC) documents two observations of ground snakes in the subbasin both near Swan Falls Dam (ICDC 2001). The ground snake is nocturnal and eats invertebrates (USDI 1995). The species is locally common in the upper subbasin and the fourth most abundant snake in the Snake River Birds of Prey National Conservation Area (NCA; USDI 1995). Populations of western ground snakes in the region are thought to be declining, due to loss of habitat and potentially as a result of rock collection for landscaping (Engle and Harris 2001)

Table 13. Listed wildlife species of the Middle Snake subbasin (USDI 1997, USDI 1995)

Species		Idaho State	Oregon State	BLM	Federal
Amphibians and Reptiles					
Ground snake	*Sonora semiannulata*	Special Concern	Not Applicable (N/A)	Sensitive	Watch
Longnose Snake	*Rhinocheilus lecontei*	Special Concern	N/A	Sensitive	Watch
Longnose Leopard Lizard	*Gambelia wislizenii*	Special Concern	Sensitive-undetermined	N/A	N/A
Mojave black-collared lizard	*Crotaphytus bicinctores*	Special Concern	N/A	Sensitive	Watch
Night snake	*Hypsiglena torquata*	N/A	N/A	Sensitive	N/A
Northern Leopard Frog	*Rana pipiens*	Special Concern	Sensitive- critical	Sensitive	SOC
Sagebrush lizard	*Sceloporus graciosus*	N/A	N/A	N/A	SOC
Columbia Spotted Frog	*Rana luteiventris*	Special Concern	Endangered	Sensitive	Candidate
Tailed Frog	*Ascaphus truei*	N/A	Sensitive-vulnerable	N/A	N/A
Western Toad	*Bufo boreas*	Special Concern	Sensitive-vulnerable	Sensitive	SOC
Birds					
Bald Eagle	*Haliaeetus leucocephalus*	Endangered	Threatened	Sensitive	Threatened
Ferruginous Hawk	*Buteo regalis*	Protected	Sensitive-critical	Sensitive	Candidate
Gyrfalcon	*Falco rusticolus*	N/A	N/A	Sensitive	N/A
Merlin	*Falco columbarius*	Protected	N/A	Sensitive	N/A
Northern Goshawk	*Accipiter gentilis*	Special Concern	Sensitive-critical	Sensitive	Candidate
Peregrine Falcon	*Falco peregrinus*	Endangered	Endangered	Sensitive	SOC
Prairie Falcon	*Falco mexicanus*	N/A	N/A	Sensitive	N/A
Swainson's Hawk	*Buteo swainsoni*	N/A	Sensitive-vulnerable	N/A	N/A
American white pelican	*Pelecanus erythororhynchos*	Special Concern	Sensitive-vulnerable (breeding)	Sensitive	N/A
Bank Swallow	*Riparia riparia*	N/A	Sensitive-undetermined	N/A	N/A
Black Tern	*Chidonias niger*	Special Concern	N/A	N/A	Candidate
Black-backed Woodpecker	*Picoides arcticus*	Special Concern	Sensitive-critical	Sensitive	N/A
Boreal Owl	*Aegolius funereus*	Special Concern	Sensitive-undetermined	Sensitive	N/A
Bufflehead	*Bucephala albeola*	N/A	Sensitive-undetermined	N/A	N/A
Burrowing owl	*Speotyto cunicularia*	Special Concern	Sensitive-Critical	Sensitive	N/A

Species		Idaho State	Oregon State	BLM	Federal
Columbian Sharp-Tailed Grouse	*Tympanuchus phasianellus columbianus*	Special Concern	N/A	N/A	SOC
Great Gray Owl	*Strix nebulosa*	Special Concern	Sensitive-Vulnerable	N/A	N/A
Flammulated Owl	*Otus flammeolus*	Special Concern	Sensitive- Critical	Sensitive	N/A
Lewis' woodpecker	*Melanerpes lewis*	N/A	N/A	N/A	N/A
Loggerhead Shrike	*Lanius ludovicianus*	Special Concern	N/A	Sensitive	SOC
Long-billed curlew	*Numenius americanus*	Special Concern	N/A	Sensitive	N/A
Mountain Quail	*Oreortyx pictus*	Special Concern	Sensitive-Undetermined	Sensitive	SOC
Northern Pygmy-owl	*Glaucidium gnoma*	Special Concern	Sensitive-Critical	N/A	N/A
Olive-sided Flycatcher	*Contopus borealis*	N/A	Sensitive-Vulnerable	N/A	SOC
Sage Grouse	*Centrocercus urophasianus*	N/A	Sensitive Vulnerable	N/A	N/A
Pileated Woodpecker	*Drycopus pileatus*	N/A	Sensitive-Vulnerable	N/A	N/A
Three-toed woodpecker	*Picoides tridactylus*	Special Concern	Sensitive- Critical	N/A	N/A
Trumpeter Swan	*Cygnus columbianus*	N/A	N/A	N/A	Candidate
White-face ibis	*Plegadis chihi*	N/A	N/A	N/A	Candidate
White-headed Woodpecker	*Picoides albolarvatus*	Special Concern	Sensitive-Critical	Sensitive	N/A
Willow flycatcher	*Empidonax adastus*	N/A	Sensitive-Undetermined	N/A	N/A
Mammals					
Fringed Myotis	*Myotis thysanodes*	Special Concern	Sensitive-Vulnerable	N/A	N/A
Long-eared Myotis	*Myotis evotis*	N/A	Sensitive-Undetermined	Sensitive	N/A
Long-legged Myotis	*Myotis volans*	N/A	Sensitive Undetermined	N/A	N/A
Northern Idaho ground squirrel	*Spermophilus brunneus brunneus*	Special Concern	N/A	Sensitive	Threatened
Pallid bat	*Antrozous thysandodes*	N/A	Sensitive-Vulnerable	N/A	N/A
Silver-haired Bat	*Lasionycteris noctivagans*	N/A	Sensitive-Undetermined	N/A	N/A
Southern Idaho ground squirrel	*Spermophilus brunneus endemicus*	Special Concern	N/A	Sensitive	SOC

Species		Idaho State	Oregon State	BLM	Federal
Spotted Bat	*Euderma maculatum*	Special Concern	N/A	Sensitive	Watch
Townsend's big-eared bat	*Plecotus townsendii*	Special Concern	N/A	N/A	Candidate
Western pipstrelle	*Pipistrellus Hesperus*	Special Concern	N/A	N/A	SOC
Western Small-footed Myotis	*Myotis ciliolabrum*	N/A	Sensitive-Undetermined	Sensitive	N/A
Yuma Myotis	*Myotis yumanensis*	N/A	N/A	N/A	N/A
American Marten	*Martes americana*	N/A	Sensitive-Vulnerable	N/A	N/A
Fisher	*Martes pennanti*	Special Concern	N/A	N/A	Watch
Bighorn sheep	*Ovis canadensis*	N/A	N/A	N/A	SOC
Kit Fox	*Vulpes velox*	Special Concern	N/A	Sensitive	Watch
Lynx	*Lynx canadensis*	SOC-Undetermined	N/A	Sensitive	Threatened
Merriam's shrew	*Sorex merriami*	N/A	Candidate	N/A	N/A
Pygmy rabbit	*Brachylagus idahoensis*	Special Concern	Sensitive- Vulnerable	N/A	Candidate
River otter	*Lutra canadensis*	N/A	N/A	Sensitive	N/A
White-tailed Jackrabbit	*Lepus townsendii*	N/A	Sensitive-Undetermined	N/A	N/A
Wolverine	*Gulo gulo*	SOC-Priority	Threatened	Sensitive	N/A
Invertebrates					
Bliss Rapids snail	*Taylorconcha serpenticola*	N/A	N/A	Sensitive	Threatened
California floater	*Anadonta californienis*	N/A	N/A	Sensitive	SOC
Idaho springsnail	*Pyrgulopsis idahoensis*	N/A	N/A	Sensitive	Endangered
Short-faced lanx	*Fisherola nuttali*	N/A	N/A	Sensitive	
Snake River physa snail	*Physa natricina*	N/A	N/A	Sensitive	Endangered
Utah valvata snail	*Valvata utahensis*	N/A	N/A	Sensitive	Endangered

[1]SOC = Species of Concern

Longnose Snake

Longnose snakes are found in most habitats, but seem to prefer sandy to sandy loam soils, burrows and shrub cover (Klott 1996). They are nocturnal and crepuscular, spending daylight hours in burrows. The species may be locally common in some areas in the upper subbasin, as it is a frequently observed prey item in red-tailed hawk nests (USDI 1995). Comparisons of trapping data from the Snake River Birds of Prey Natural Area in 1978 and 1998 indicates a 44% decline in occupied sites (Engle and Harris, 2001). Longnose snakes appear to be sensitive to habitat invasion by exotic species and conversion to agriculture (Engle and Harris 2001).

Mojave Black-Collared Lizard

Historically Mojave Black-collared lizards occupied Elmore, Canyon and Owyhee counties in Idaho. Their current range in Idaho is restricted to Owyhee county (Engle and Harris 2001). Mojave Black-collared lizards occupy arid, rocky canyons that are sparsely vegetated, and are most commonly found along canyon rims or in areas with boulders, piles of rocks and talus slopes at the base of cliffs (Klott 1996). They occur in the Snake River Birds of Prey NCA, but are uncommon (USDI 1995). They have also been found in the Jacks Creek drainage just to the south of the upper subbasin (Gerber et al 1997).

Night Snake

The night snake is nocturnal, mildly venomous and fees on lizards and frogs. It is found around rocky canyon rims and rock outcroppings. Night snakes were the second most abundant snake taken by drift fence trapping in the Snake River Birds of Prey NCA (USDI 1995).

Columbia Spotted Frog

In the upper west-side of the subbasin the Columbia spotted frog was found in high elevation (>4,600 ft) slow moving streams, oxbows, pools and ponds near Magpie Creek and Birch Creek (USDI 1997). In 1987, one adult Columbia spotted frog was collected at Johnston lakes in upper Succor Creek. Boise State University (BSU) field survey crews observed 21 adults at the same location in 1996 (ICDC 2001). Mike Mathis, BLM, observed several young spotted frogs on the North Fork of Castle Creek in 1995. BSU field survey crews observed 48 adults and estimated 1780 tadpoles along approximately 6 miles of Castle Creek and Gilmore Creek in 1999 (ICDC 2001). Research is ongoing to determine population, distribution and particular habitat needs in southwestern Idaho. Poor grazing management in riparian and spring areas, spring developments and loss of beaver are among the causes of decline for this species (USDI 1997).

Birds

The diversity of habitats in the Lower Middle Snake Subbasin supports more than 145 species of birds that regularly breed in Idaho. Many of these species are thought to use the subbasin during at least part of the year (Appendix A). The subbasin also supports nationally renowned populations of raptors, an abundance of waterfowl, a remnant population of sharp-tailed grouse, sage grouse, and numerous songbirds.

Raptors

The Lower Middle Snake Subbasin provides exceptional raptor habitat. A portion of the upper subbasin lies in the Snake River Birds of Prey NCA (see Figure 14). The NCA contains the highest density of raptors in the United States (USDI 1995). The Lower Middle Snake subbasin occurs in the southern and middle sections of the NCA The NCA stretches along the Snake and includes the north side of the subbasin for about a third of the distance between C.J. Strike Dam

and Swan Falls Dam. About a third of the NCA lies upstream of C.J. Strike Dam but more than half the NCA coincides with the Upper portion of the subbasin.

Fourteen species of raptors breed in the NCA and ten other species winter in or migrate through the area, seven of these species are of special concern to the land managers of the subbasin (Table 13; Table 14; USDI 1995). Bates (1997) surveyed raptors along the Owyhee front from points that drain into the Lower Middle Snake subbasin in the area west of Castle Creek. He found the highest number of raptor sightings per hour at Hayden Peak. This site was second only to the Goshutes Mountains raptor monitoring sites in raptors sighted per hour out of monitoring sites in western North America (Bates 1997). He identified one additional species to those identified at the Snake River Birds of Prey NCA, the turkey vulture.

Ferruginous Hawk

Ferruginous hawks are dependent on native prairie ecosystems and the densities of prey occurring within them (USDI 1995). As a higher order predator, the health of ferruginous populations can be indicative of the health of prey populations and in many cases the ecosystem as a whole. Fragmentation and conversion of the subbasin's native prairie ecosystems to agriculture, and loss of sage-steppe communities has reduced the subbasin's ability to support ferruginous hawks and their prey. This loss of habitat has contributed to rangewide population declines and has resulted in the listing of Ferruginous hawks as a special status species by all the management agencies in the subbasin. Ferruginous hawks are present in the Snake River Birds of Prey NCA. The ICDC has documented multiple nesting sites within the Snake River Birds of Prey NCA, some of which have been in use for more than twenty years (ICDC 2001).

Table 14. Raptors in the Lower Middle Snake Subbasin (USDI 1995; Bates 1997)

Common name	Species	Use of area
American kestrel	*Falco sparverius*	Breeding
Bald eagle	*Haliaeetus leucocephalus*	Migrating
Barn owl	*Tyto alba*	Breeding
Barred owl	*Strix varia*	Migrating
Burrowing owl	*Speotyto cunicularia*	Breeding
Cooper's hawk	*Accipiter cooperii*	Migrating
Ferruginous hawk	*Buteo regalis*	Breeding
Golden eagle	*Aguila chrysaetos*	Breeding
Great horned owl	*Bubo virginianus*	Breeding
Gyrfalcon	*Falco rusticolus*	Migrating
Long-eared owl	*Asio otus*	Breeding
Merlin	*Falco columbarius*	Migrating
Northern goshawk	*Accipiter gentiles*	Migrating
Northern harrier	*Circus cyaneus*	Breeding
Northern saw-whet owl	*Aegolius acadicus*	Breeding
Osprey	*Pandion haliaetus*	Migrating
Peregrine falcon	*Falco peregrinus*	Migrating
Prairie falcon	*Falco mexicanus*	Breeding
Red-tailed hawk	*Buteo jamaicensis*	Breeding
Rough-legged hawk	*Buteo lagopus*	Migrating
Sharp-shinned hawk	*Accipiter striatus*	Migrating
Short-eared owl	*Asio flammeus*	Breeding
Swainson's hawk	*Buteo swainsoni*	Breeding
Turkey vulture	*Cathartes aura*	Observed
Western screech-owl	*Otus kennicottii*	Breeding

Bald Eagle

Bald eagles are listed as a threatened species by the USFWS and Oregon state; they are listed as endangered by the state of Idaho. Populations were historically numerous in the area but have declined as a result of declining salmon runs, pesticides, poisons, and illegal shootings. Large trees and rock outcroppings adjacent to the water are important for nesting, roosting and perching. Bald eagles are winter residents along the Snake River in the Snake River Birds of Prey NCA (USDI 1995). They often establish their nests in cottonwood trees in the riparian zone or in conifers around reservoir shores. They are primarily dependant on fish, but will take other small prey (USBR 1998). Dams and reservoirs have caused changes in bald eagle distribution by concentrating populations to newly created food sources. Reservoirs increase the forage base of rough fish, and tailwater areas provide excellent forage by concentrating fish below dams. Bald eagles also concentrate below dams to feed on fish that are dead or wounded from passing through the turbines and spillways of the dams (USBR 1998). Brownlee Reservoir is heavily used by wintering bald eagles. Winter counts generally are 25 to 50 birds but have been more than 100 (USBR 1998).

The Idaho CDC has three records of bald eagle nests in the upper subbasin between Brownlee and Hell's Canyon Dams. In 1984 a nest occupied by one adult was observed along the Snake River just above the Hell's canyon reservoir. The nest site was surveyed frequently but was occupied from 1994 until it blew down in 1989. A nest located just below Brownlee was occupied but abandoned in 1988. In 1998, a successful nest that produced one young was located in a Ponderosa pine just below Oxbow dam (ICDC 2001).

Peregrine Falcon

Peregrine falcon populations in the US dramatically declined primarily due to DDT-induced reproductive failure. Protection as an endangered species under the ESA and captive breeding programs resulted in the recovery of peregrine falcon populations and the delisting of the species in 1999. Peregrines nest almost exclusively on cliffs, ledges, overhangs, or in small caves; the subbasin contains many ideal sites. Peregrine falcons are rare migrants in the upper subbasin. A single female peregrine resided in the area below Swan Falls Dam for four years from 1972 through 1975. BLM and the Peregrine Fund attempted to reintroduce the peregrine falcon into the Snake River Birds of Prey NCA between 1977-1979, but the program was abandoned for lack of success (USDI 1995).

Prairie Falcon

Prairie falcons are a BLM Sensitive Species. Populations in Idaho appear to be stable, but are declining overall in the West (Klott 1997). Prairie falcon habitat consists of sagebrush/grass, desert grassland, or other arid habitats that are typically treeless with nearby cliffs suitable for nesting. Open mountains, short grass prairie and mountain tundra have also been identified as suitable habitat (Klott 1997). Prairie falcons breed in hilly and mountainous grasslands and shrublands. They usually nest in cavities, on ledges, and/or in other raptor and raven nests on cliffs, outcroppings and pinnacles (USDI 1995). Between 1990 and 1994, the number of nesting pairs averaged 182 with the lowest number of pairs (160) recorded in 1994 (USDI 1995). The average number of young per pair has varied from 1.45 in 1982 to 3.34 in 1992. The birds arrive in early spring as Townsend's ground squirrels are first emerging from hibernation. Although many different species of animals are taken as prey, only the Townsend ground squirrel is abundant and large enough to feed the large numbers of prairie falcons and other raptors in the

area (USDI 1995). Prairie falcons have experienced significant population declines in recent years as a result of habitat conversions due to wildfires (Lehman and Barrett 2000).

Northern Goshawk

In the upper subbasin, northern goshawks nest in a variety of habitat including deciduous, coniferous and mixed forests, however, nesting areas are usually older taller forests and are somewhat associated with openings and near water. The nest itself is frequently in a fork of a deciduous tree or next to the trunk of a large conifer with horizontal branches (Klott 1996). In the Hells Canyon portion of the subbasin northern goshawk are associated with mature and old-growth forests, particularly during the nesting season. The goshawk nests in large diameter green trees in close proximity to water, often foraging over very large areas. Prey species important to goshawk depend on the snags, downed logs, and vegetative layering found in old growth habitat (USDA Forest Service 1999).

A number of northern goshawk nests are monitored on the HCRNA, some for more than 20 years. Nests occur predominantly in mature mixed conifer stands, activity at the nests varies from year to year (USDA Forest Service 1999). The Idaho CDC documents several successful northern goshawk nests in older conifer stands in the lower portion of the subbasin (ICDC 2001). Northern goshawks also use the river corridors during migration. In the Snake River Birds of Prey NCA, northern goshawks migrate through the area in spring and fall, and a small population winters in the area. The wintering hawks are usually found in wooded areas (USDI 1995). The northern goshawk is thought to be declining in population over portions of its range however it appears to be stable in Idaho (Engle and Harris, 2001).

Golden Eagle

Golden eagles usually nest in hilly or mountainous country, generally on cliff ledges, but also sometimes in trees or on artificial structures (USDI 1995). In the upper subbasin, golden eagle productivity is closely associated with the black-tailed jackrabbit population cycle. During years of high rabbit numbers, more eagles lay eggs, there are more eggs per nest and more young are fledged (USDI 1995). Other prey species of importance include Nuttall's cottontail (*Sylvilagus nuttallii*), ring-necked pheasants (*Phasianus colchicus*), yellow-bellied marmots (*Marmota flaviventris*), and Townsend's ground squirrels. In the Snake River Birds of Prey NCA, 36 nesting territories on cliffs have been identified (USDI 1995). Golden eagles have experienced significant population declines in recent years as a result of habitat conversions due to wildfires. (Lehman and Barrett 2000).

Red-tailed Hawk

The red-tailed hawk primarily feed on ground squirrels in the upper subbasin, but also feed on gopher snakes, kangaroo rats, and rabbits when ground squirrel numbers are low. They nest on cliffs, in trees and on artificial structures. There are approximately 130 red-tailed hawk nest territories in the Snake River Birds of Prey NCA (USDI 1995). Approximately 60 of these are occupied in any given year. The highest number of nesting pairs was recorded in 1980 at 71 pairs. Some adults are year around residents, but most disperse from the area in the fall.

Northern Harrier

The northern harrier is one of the most common raptors in the upper subbasin (USDI 1995, Jim Klott 2001). Northern harriers build a platform nest on the ground in thick vegetation in marshes, fields, riparian vegetation, and in pockets of dense residual or live vegetation in the

desert (USDI 1995). Harriers prey on smaller mammals, birds, reptiles, and amphibians, but can take prey as large as cottontail rabbits and ducks. There is usually an increase in harriers in the fall, indicating a migration into the area. Northern harrier populations in Idaho and Montana have had significant and steady declines (Klott 1996).

Swainson's Hawk

This hawk occupies open country, including grasslands, and nests primarily in trees and shrubs. In the Snake River Birds of Prey NCA, Swainson's hawks are found in association with riparian areas and agricultural lands. Fourteen nesting territories have been identified, with only three occupied during any given year (USDI 1995).

Merlin and Gyrfalcon

The merlin and gyrfalcon are uncommon migrants, or winter residents in the subbasin. No special management actions are required (USDI 1995).

Colonial Nesting Birds

The American white pelican, double-crested cormorant, great blue heron, black-crowned night heron and great egret are colonial nesting birds thought to inhabit the subbasin (Appendix A). All are piscivorous and require a good fishery for survival. They nest in groups and use large trees adjacent to wetlands as nesting structure. Operational conditions of the hydrosystem on the Snake River are the most important factor in the survival of this wildlife group (USBR 1998).

American White Pelican

Transient white pelican numbers appear to be increasing in southern Idaho, most of these birds probably come from nesting colonies at Great Salt Lake (Engle and Harris 2001). In 1993, 30 white pelicans were observed 40 miles upstream of the subbasin, these birds had built 15 nests that were flooded by high water (ICDC 2001). American white pelicans are common summer birds along the Snake River in the upper subbasin, but do not nest in the area currently.

Shorebirds and wading birds

Other shorebirds and wading birds include the black-necked stilts, avocets and greater yellowlegs. The Snake River system provides important migratory habitat for shore birds that nest in the Artic. Black-necked stilts and avocets nest annually in southern Idaho (USBR 1998). These species are most numerous in the wetland/mudflat habitat s created in drawdown zones of large reservoirs, but also are found on exposed mudflats and sandbars along the river. Loss and degradation of migration and wintering habitats are the two most important threats to shorebirds.

White-face Ibis

The breeding range of the white-faced ibis includes southern Idaho, along with the northern Great Plains, Texas, and portions of Nevada, Utah, Colorado, Oregon, and California. White-faced ibises arrive at their breeding sites within marshes or swamps, or near ponds or rivers in the spring to construct their nests on the ground or low in trees or shrubs. Ibises forage in wetlands and in irrigated agricultural fields (DAF 1998). White-faced ibis are occasionally found in the upper subbasin, usually in ponds or irrigated fields (USDI 1995).

Waterfowl

Waterfowl in the subbasin include numerous species: wood duck, mallard, northern pintail, blue-winded teal, green-winged teal, cinnamon teal, goldeneye, common and red-breasted

merganser, lesser scaup, ring-necked duck, northern shoveler, gadwall, American widgeon, bufflehead, ruddy duck, snow goose, and Ross's goose (USBR 1998). A diverse wetland community is critical to waterfowl, especially during the nesting period. Islands are preferred nesting sites if vegetated. Several cavity nesting species such as goldeneye and bufflehead require trees with cavities, usually in old growth or standing dead timber located a short distance from water. When wetlands freeze in the winter, rivers increasingly important as habitat. Bufflehead ducks are listed as sensitive by the State of Oregon but little is know about their populations in the subbasin.

Grouse

Sage Grouse

The largest of North American grouse, sage grouse males range from 27 to 34 inches in length and weigh five to seven pounds, while females are 18-24 inches in length and weigh two to three pounds (Northeastern Nevada Stewardship Group, Inc. 2001). Historically, sage grouse were found throughout most of the western United States sagebrush range. It is considered a sagebrush ecosystem obligate species, being dependant on sagebrush habitats during one or more seasons of the year. Conversion of large areas of the subbasin from sage-steppe to annual grassland has reduced its suitability for sage grouse. Sagebrush/grass communities are essential to the species for winter survival. The winter diet of sage grouse consists almost exclusively of sagebrush leaves. Sagebrush also offers shelter, protection and nesting cover (Northeastern Nevada Stewardship Group, Inc. 2001). Summer habitat consists of sagebrush mixed with areas of wet meadows, riparian, or irrigated agricultural fields. Sage grouse avoid extensive aspen and mountain mahogany communities and rarely use mountain shrub habitats (Klott 1997). High quality nesting habitat includes adequate sagebrush cover and a variety of perennial grasses and forbs. During drought, sage grouse congregate near meadows, hay fields, and other areas with succulent vegetation and water (Klott 1997). Sage grouse seem to avoid deep narrow canyons, but use flat, rolling topography and steep open hills if sagebrush cover is present (Klott 1997). Sage grouse populations can be migratory or non-migratory. Migratory populations generally move up in elevation from spring through fall as snow melt and plant growth advance. Movement in winter is usually associated with snow depths and food quality and availability.

Sage grouse have been observed at leks in Succor, Jump, Squaw, Hard Trigger, Wilson, Rabbit, Sinker, Fossil, Catherine and Castle Creeks in surveys conducted since 1995 (IDFG unpublished data). Sage grouse have been document to inhabit the Snake River Birds of Prey NCA (USDI 1995). Suitable and marginal nesting habitats for sage grouse were identified in the BLM's Henley Basin Management Unit which contains the Hog Scott and Rock creek drainages in the mid-lower subbasin. No breeding populations of sage grouse have been documented in the area and birds are only occasionally sighted (USDI 2001b). A limited hunting season for sage grouse is still open for the upper southern portion of the subbasin but is closed for the remainder (IDFG 2001e).

Columbian Sharp-tailed grouse

Sharp-tailed grouse have declined throughout North America. Of the six recognized subspecies the Columbian sharp-tailed grouse is the rarest. Currently, Columbian sharp-tailed grouse occupy less than 10% of their historic range in Idaho (Hays et al. 1998). Columbian sharp-tailed grouse were extirpated from Oregon by the 1960's; the last populations probably lived in Baker County. Sharp-tailed grouse have since been reintroduced into Wallowa county Oregon (Crawford and Coggins 2000). Sharp-tailed grouse populations in southwestern Idaho have been

reduced to remnant flocks in Washington, Adams and Payette counties (IDFG 2001e). This population is estimated to be comprised of roughly 200 to 300 birds (USFWS 2000b). It is protected from hunting and though small and isolated, is considered stable (USFWS 2000a, IDFG 2001e).

Birds from the southwestern Idaho Columbia sharp-tailed grouse population use habitat in the Lower Middle Snake subbasin. The BLM has identified approximately 19,000 acres of sharp-tail habitat in the subbasin (BLM 2001b). The Jenkins Creek allotment has an active sharp-tail lek (BLM 2001b). The Idaho CDC has one record of sharp-tail grouse occurrence in the subbasin; 6 males were observed in Upper Rock Creek in 1985. The Nature Conservancy's Hixon Sharp-tail Preserve lies just outside the subbasin boundary.

Other Bird Species of Special Concern

Burrowing Owl

Burrowing owls inhabit open country and use burrows dug by other animals or natural cavities in rock outcroppings. They feed on insects, amphibians, reptiles, birds and mammals ranging in size to cottontail rabbits (USDI 1995). In 1994, 87 occupied burrowing owl sites were found in the Snake River Birds of Prey NCA.

Long-eared Owl

Long-eared owl density of wintering and breeding is associated with prey abundance, with few birds remaining in the area when prey abundance is low. They prey on small rodents and juvenile cottontail rabbits (USDI 1995). Long-eared owls generally nest in raptor or corvid stick nests, in cliff or tree cavities, or on the ground. Sixty-three pairs nested in the Snake River Birds of Prey NCA in 1980, 41 pairs in 1981, and 10 pairs in 1985 (USDI 1995). Fledging owls disperse to nearby mountains for summer and fall and then return to the upper subbasin in late fall to join winter roosts in willow thickets and Russian olive groves. These roosts can contain 50 or more birds (USDI 1995).

Loggerhead Shrike

The loggerhead shrike preys on small mammals, birds and reptiles and large insects in semi-open to open shrublands. The availability of perches on rocks, trees, shrubs, fences and utility wires posts is an important element in shrike habitat. The upper subbasin in part of one of the most northern areas supporting a wintering population of these birds (USDI 1995). The loggerhead shrike is a common nester in the shrub habitats of the upper subbasin, however nesting populations have been reduced by loss of shrub-steppe habitat from fire (USDI 1995).

Black Tern

The species is thought to be experiencing a major population decline virtually rangewide for the last 20 years. This decline is primarily due to loss of freshwater marsh habitat, invasion of habitat by exotic vegetation, human disturbance of nesting sites, and pesticide use (Engle and Harris 2001). Black terns migrate along the Snake River in spring and fall. They use aquatic habitats with extensive stands of emergent vegetation and large areas of open water (USDI 1995). The ICDC has no information on black tern occurrence in Idaho since 1994, population censuses are need to better understand the population dynamics of this species (Engle and Harris 2001).

Mountain Quail

Mountain quail are dependent on dense shrubby vegetation near water during all phases of their lives. Mountain quail migrate seasonally between higher elevation breeding areas and lower wintering sites. Quail habitat is variable and includes dense undergrowth on mountainsides, coniferous forests, forest and meadow edges, open forest, and logged or burned over forests (DAF 1998). They are often associated with riparian vegetation in the bottom of canyons with reliable water and heavy shrub cover (USDI 1989). In arid environments, mountain quail are usually found adjacent to sagebrush uplands (Klott 1996). Mountain quail have declined dramatically since the 1950s (USDI 1989). Both forks of Shoofly Creek were identified as mountain quail habitat, but no quail were found in a 1991 survey (USDI 1997).

Introduced Game Birds

Introduced, non-native game birds in the subbasin include ring-necked pheasant, chukar, gray or Hungarian partridge and turkey. Pheasant and turkey use riparian habitats along the Snake River and pheasants use the vegetated islands for refuge and cover (USBR 1998). Pheasant habitat includes agricultural areas, cottonwood riparian, riparian shrub and sedge meadows. Wild turkey habitat includes coniferous forests, cottonwood riparian, oak and mixed deciduous forest, woodland-chaparral, and agricultural areas. Both chukar and gray partridge use the more upland dry basin-prairie shrublands and mountain-foothills shrublands (IDFG 2001e). Any negative operational impacts to the riparian zone will negatively impact pheasant and wild turkey habitat along the river.

Mammals

Bats

Perkins and Peterson (1997) surveyed juniper woodlands in the Owyhee Mountains, including along the north side of the Owyhee mountains that are a part of the Lower Middle Snake subbasin. Their survey sites include two bats not found in the Snake River Birds of Prey NCA: western small-footed myotis and long-eared myotis (Table 15). They conclude that the juniper woodlands in the Owyhee Mountains in southwest Idaho have a paucity of bats because of a lack of high quality day roosts.

Table 15. Bat species in the Lower Middle Snake Subbasin (USDI 1995; Perkins and Peterson 1997)

Species	Common name
Antrozous pallidus	Pallid bat
Eptesicus fuscus	Big brown bat
Euderma maculatum	Spotted Bat
Myotis californicus	California myotis
Myotis ciliolabrum	Western small-footed myotis
Myotis evotis	Long-eared myotis
Myotis leibii	Eastern small-footed myotis
Myotis lucifugus	Little brown bat
Myotis volans	Long-legged myotis
Myotis yumanensis	Yuma myotis
Plecotuss townsendii	Townsends' big-eared bat
Pipistrellus hesperus	Western pipistrell

Pygmy Rabbit

The pygmy rabbit is found in greasewood, big sagebrush and sagebrush/juniper habitat with deep loose soils. Dense, tall big sagebrush is its preferred habitat and makes up as much as 99 percent of its winter diet and 51 percent of its summer diet (USDI 1995). Pygmy rabbits have been observed just north of Swan Falls Dam in big sagebrush stands along Swan Falls Road in the vicinity of Initial Point (USDI 1995). The highest count was 27 sightings in 1987. Loss of big sagebrush from wildfires has likely reduced their distribution (USDI 1995). Pygmy rabbits were observed in two separate locations in the Succor creek drainage in 1997 by Mike Mathis of the BLM (ICDC 2001).

Northern Idaho Ground Squirrel

Both subspecies of Idaho ground squirrel are rare, spatially restricted to western Idaho, and have declining populations. The northern Idaho ground squirrel's smaller size and different pelage coloration distinguish it from the southern Idaho ground squirrel. The differences in coloration are an adaptation to differences in the soils on which the two subspecies live. Northern Idaho ground squirrels are found in areas with shallow reddish parent soils of basaltic origin, while the southern Idaho ground squirrel lives on lower elevation, paler colored soils formed by granitic sands and clays (Yensen 1985 and 1991 cited in USDA 2000c).

The northern Idaho ground squirrel has the most restricted geographical range of any *Spermophilus* taxa, and one of the smallest ranges among North American mainland mammals. It is found only in Valley and Adams county Idaho at elevations ranging from 3,800 to 5,200 feet (USFWS 2000c). Twelve of the 21 occurrences of this subspecies contained in the Idaho Conservation Data Center database occur in the Lower Middle Snake subbasin. The northern Idaho ground squirrel was listed as threatened by the US Fish and Wildlife service, May 5 2000 (USFWS 2000c). Populations of this subspecies have declined from approximately 5,000 animals in 1985 to fewer than 1,000 in 1998 (USFWS 2000c). The total estimated population of this subspecies was less than 250 in 2000. A 1993 computer-simulated population viability analysis calculated that all but one population of the subspecies would become extinct by 2013 (USFWS 2000c).

All known occurrences of the northern Idaho ground squirrel in the Lower Middle Snake subbasin are in the Wildhorse Creek drainage, which flows into Hell's canyon reservoir. Northern Idaho ground squirrels utilize meadow habitats bordered by coniferous forests of ponderosa pine and/or Douglas-fir. The primary threat to the northern Idaho ground squirrel is meadow invasion by conifers (Sherman and Yensen 1994 in USFWS 2000c). Fire suppression and the dense regrowth of conifers resulting from past logging activities have significantly reduced meadow habitats suitable for northern Idaho ground squirrels. Reductions in the frequency of small meadow patches among forest habitats has reduced dispersal corridors resulting in the extirpation of small isolated populations of the subspecies (USFWS 2000c).

Southern Idaho Ground Squirrel

The southern Idaho ground squirrel subspecies occurs at elevations ranging from 2,200 to 3,200 ft in the low rolling hills and valleys in Gem, Payette, and Washington and extreme southern Adams county Idaho (Engle and Harris 2001). The population of this subspecies was estimated at 40,000 in 1985. No current population estimate was available but the subspecies appears to be

in decline. In 1999 squirrels were observed at only 19 sites (37% of the historically occupied sites visited) at 18 of these site only a single individual was observed. Active burrows of southern Idaho ground squirrels occur in the Lower Middle Snake subbasin along the banks of Hog, Jenkins and Scott creeks (BLM 2001 b).

River Otter

River otters occupy large streams, rivers and lakes with adequate prey. They require relatively unpolluted water and good riparian habitat (Klott 1997). They are found in the Snake River and just upstream of the subbasin in the Bruneau River (USDI 1995).

Kit Fox

The distribution of kit foxes is closely associated with semi-arid and desert regions of western North America, with southern Idaho being the northernmost limit of its range (USDI 1997). Shadscale habitat south of the Snake River in the Lower Middle Snake subbasin has been identified as potential kit fox habitat. No kit foxes are known to occur in the subbasin, although IDFG was considering reintroducing the species in the Shoofly to Castle Creek area (USDI 1997).

The principal cause for the observed declines in available habitat is the alteration of sagebrush to other cover types, primarily agriculture, juniper, and exotic forbs-annual grasses. Lack of suitable loose textured soil may be a natural limiting factor for kit foxes in southeastern Oregon. Land uses that increase soil compaction or cause the destabilization of dunes may inhibit burrow establishment (Wisdom et al. 2000)

Wild Horses

Three horse management units exist along the Snake between Homedale and Murphy along the base of the Owyhee mountains: Sands Basin, Hardtrigger and Black Mountain Horse Management Units (USDI 1999). Wild horses are fenced into these areas, and are managed through a pasture rotation system. The Owyhee PRMP and ROD establish a population level of 129-254 horses (Schnitzspahn et al. 2000).

Canada Lynx

The current population status and distribution of the Canada lynx in the Lower Middle Snake subbasin is unknown (USDA Forest Service 1999). The lynx was recently listed federally as threatened. Preferred habitat for the lynx consists of high elevation (> 4500') stands of cold and cool forest types with a mosaic of structural stages for foraging and denning (Wisdom *et al.* 2000). The upper elevations of the subbasin may contain suitable lynx habitat but the secretive nature of the lynx makes it difficult to establish species presence or absence. The Idaho Conservation Data Center database has no records of lynx sightings in the subbasin (ICDC 2001). The Oregon Department of Fish and Wildlife considers the lynx extirpated from the state although occasional observances still occur. Recent surveys by the Forest Service did not detect the species in the subbasin (USDA Forest Service 1999).

Wolverine

Wolverines are typically found in open forests at higher elevations and in alpine areas (Csuti 1997). Forest Service biologists verified the presence of the wolverine on the HCRNA through winter track counts and bait stations with cameras, although they are extremely rare. (USDA

Forest Service 1999). The Idaho Conservation Data Center and the Oregon Natural Heritage database have no records of wolverine sightings in the subbasin (ICDC 2001).

Gray Wolf

Wolves are thought to have been extirpated from the area in 1900. No confirmed sightings have been documented since. Suitable habitat probably exists in the subbasin and wolf populations may eventually reestablish from neighboring populations in central Idaho (USDA Forest Service 1999).

Bighorn Sheep

Bighorn sheep were extirpated from the subbasin around 1945 (IDFG et al 1997). They have since been successfully reintroduced and both subspecies now inhabit the subbasin in spatially separated populations .

In the southern portion of the subbasin, California bighorn sheep (*Ovis canadensis californiana*) occur in the Shoofly Creek drainage, including the range of hills between Shoofly Creek and the Mudflat Road, and in lower Castle Creek (USDI 1997). The current population immigrated into the area from a 1967 transplant of 12 animals into Little Jacks Creek. Approximately 75 California bighorns inhabited the Shoofly drainage in 1995. They have been observed in lower Castle Creek since 1988 (USDI 1997).

The Sheep Mountain habitat area on the Oregon side of the Oxbow reservoir contains a herd of Rocky Mountain bighorns. The Sheep Mountain herd was one of 14 herds in the Hells Canyon project area of the "The Hells Canyon Initiative," which is an interagency and interorganizational effort to restore self-sustaining bighorn sheep herds in the Hells Canyon area (BLM 1997). The population size of the Sheep Mountain herd was 65 animals with an annual population growth rate of 22% (BLM 1977). In 1996, 11,000 acres were burned in an effort to improve bighorn habitat in the Sheep Mountain habitat area (BLM 1997).

A population of bighorn sheep also exists on the west side of Brownlee Reservoir in the vicinity of Lookout Mountain. The herd was established through 1993 releases near Fox Creek, and is currently estimated at approximately 75 head (Walt VanDyke, ODFW, personal communication, October 12, 2001).

The primary factor limiting the success of transplants and the restoration of bighorns in the mid-Snake and throughout much of the U.S. is disease. The disease causing high rates of mortality in bighorns is pneumonia, which has likely been introduced by livestock, particularly domestic sheep, and possibly other species such as domestic goats (Coggins 1988, Cassirer et al. 1996, Martin et al. 1996, Miller 2000). Pasturella haemolytica and multicida bacteria have been identified as the primary causes of pneumonia in bighorns. Notable declines in bighorn sheep populations in the Hells Canyon area of the subbasin occurred in 1972-1977, 1983-1984, 1991 and 1995-1996 (IDFG et al 1997).

Mule Deer

Mule deer *(Odocoileus hemionus)* in portions of the Lower Middle Snake subbasin were drastically reduced in the late 1800s by extensive hunting and habitat alteration due to heavy livestock grazing and fire suppression (IDFG 2001d). Subsequent limitations on hunting lead to increases in the herds which were then susceptible to winter kill in some areas and raised concern over the status of winter range vegetation (IDFG 2001d). Controversial winter feeding programs

are commonplace in these areas with herds in some areas being supplemented two out of every 5 winters. The feeding stations are focused on the Boise Front, Garden Valley, and the Weiser/Brownlee Reservoir areas (IDFG 2001d).

Mule deer prefer rim rock, canyons and riparian zones for spring, summer and fall habitat. They are commonly found in shrub dominated landscapes throughout the Lower Middle Snake subbasin, including sagebrush-grass and juniper communities. The shrub dominated landscapes which allowed mule deer populations to increase have more recently been burned and reseeded with crested wheatgrass to benefit livestock grazing, or have been invaded by cheatgrass (IDFG 2001d). Mule deer also commonly utilize agricultural areas, although this is generally considered undesirable due to the potential for agricultural depredation (IDFG 2001d).

Information presented in IDFG (2001d) suggests that mule deer populations in portions of the subbasin may migrate considerable distances to find suitable seasonal habitats, sometimes moving between those in Oregon, Nevada, and Idaho. The majority of the herd from western Owyhee County spends winter in Oregon while deer from the eastern side of Owyhee County migrate north from Nevada to winter in Idaho (IDFG 2001d). It is not clear if mule deer herds in other portions of the subbasin migrate similar distances on a seasonal basis.

Pronghorn Antelope

Pronghorn antelope are found in low densities and small groups in the southern portions of the Lower Middle Snake subbasin (USDI 1977; USDI 1995). The Kane Springs area at the upper end of the Rabbit Creek drainage provides crucial winter habitat for an estimated 75 pronghorn. Less concentrated use occurs in the Reynolds Creek and Castle Creek area (USDI 1999). Pronghorn antelope are very mobile animals, requiring large, open spaces. Shrubs, primarily sagebrush, constitute about 85% of their yearlong diet. New growth grasses, bitterbrush, elderberry, serviceberry, arrowleaf balsamroot, clover, lupine and phlox provide small amounts of their diet and are important to overall nutritional health (USDI 1989).

Elk

Rocky Mountain elk are distributed throughout the Lower Middle Snake subbasin, although both summer and winter habitats exist in a patchy manner (Figure 17). Most of the elk herd(s) within the subbasin occupy southern desert habitats dominated by sagebrush to northern cedar-hemlock forests. Elk herds in the northern portion of the subbasin tend to spend summers at higher elevations, and move into lower elevation canyons to winter. Herds in the southern portion of the subbasin are thought to use similar areas as both summer and winter habitat (Figure 17). The Andrus Wildlife Management Area, in the southwest portion of the zone, includes approximately 8,000 acres managed for elk and mule deer winter range.

IDFG (2001c) suggests that the largest management issue for elk in the Idaho portions of the subbasin is access to habitat, a situation which is likely common in other areas throughout the subbasin. The majority of elk habitat areas are managed by Federal agencies, including the USFS and BLM. Privately owned lands within the subbasin are commonly managed for dryland grazing or agricultural production of grain or hay. This privately owned land is an important component of elk winter range, and is threatened by yellow starthistle (*Centaurea solstitialis*) and white-top (*Cardaria draba*; IDFG 2001). There is some concern on both public and private lands that conversion of sage brush-dominated habitats to crested wheatgrass/cheatgrass-dominated habitats could pose a threat to habitat diversity and negatively impact elk herds (IDFG 2001).

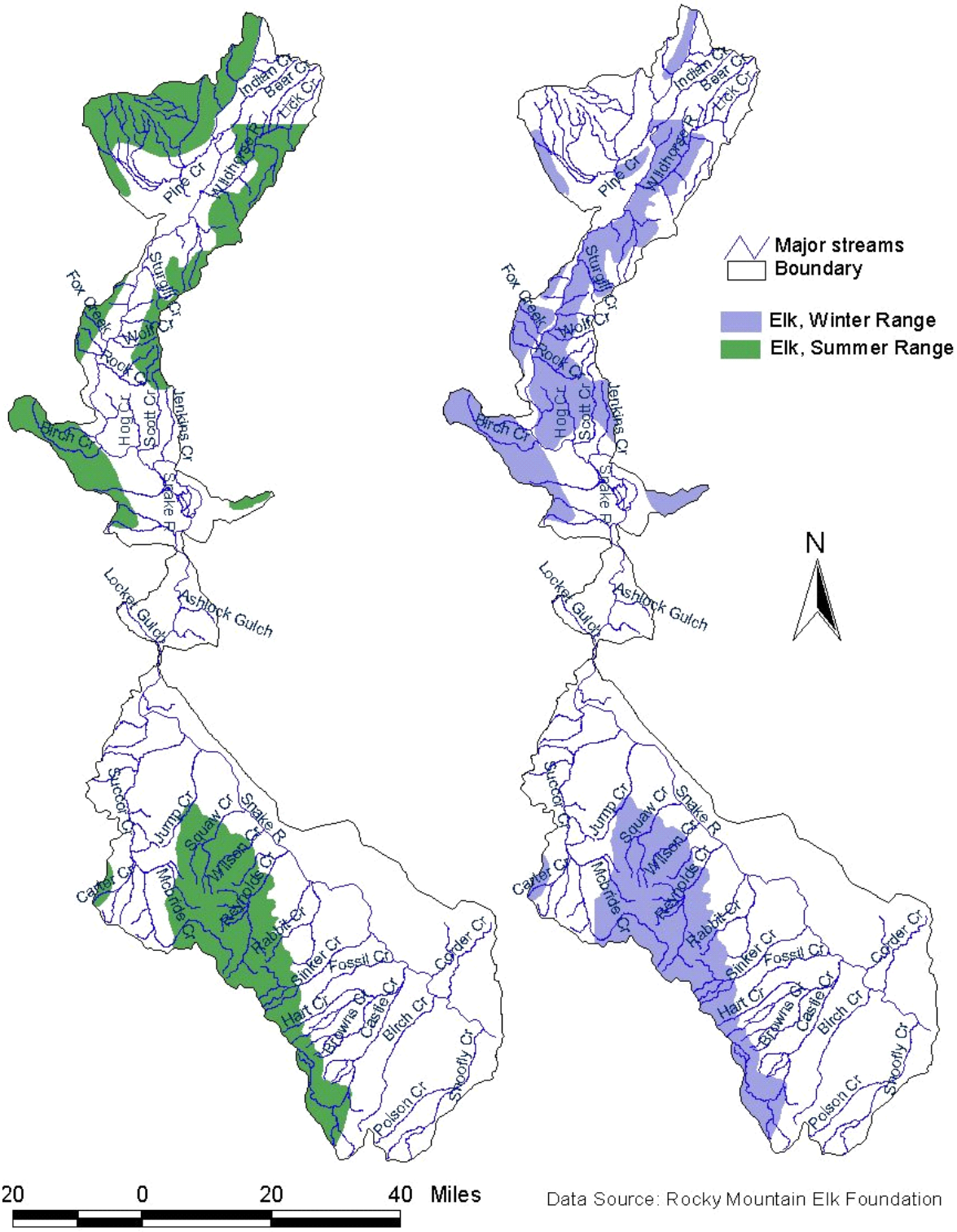

Figure 17. Defined distribution of elk summer and winter range in the Lower Middle Snake subbasin

Elk populations in some areas of the subbasin have not reached their habitat potential, but have reached a tolerance threshold among concerned user groups (IDFG 2001). Elk/human conflicts occur throughout the subbasin, particularly during the summer and fall months when elk enter agricultural fields. In addition to crop depredation, private landowners are commonly concerned about damage to livestock fencing and loss of private rangeland forage.

Habitat Areas and Quality

Aquatic Habitat

Very limited data pertaining to aquatic habitat condition was located or made available for use in this subbasin summary. That which was obtained is summarized below, and is commonly not species specific and often limited in spatial extent.

An overriding problem with fish habitat in the subbasin is fragmentation (Allen et al. 1998; USDI 1999; USDI 1997; USFWS 2001b). In the upper subbasin, redband and bull trout populations are isolated from each other by passage barriers and poor habitat conditions. All populations of resident fish in the subbasin are influenced by disconnection from other areas due to five impassable dams in the mainstem Snake. This is especially important for white sturgeon, which utilize only mainstem habitats within the subbasin.

Temperature is a substantial habitat constraint in tributary habitats throughout the subbasin, few of which fully support cold water biota as a beneficial use (USDI 1995). Many streams are ephemeral, and most perennial streams are impacted by irrigation withdrawals, and depleted or lack of riparian vegetation, further exacerbating temperature problems.
Riparian habitat and functional conditions were summarized for various streams throughout the subbasin during assessment of various Federal land management units (USDI 1997, 2001a, 2001b, 2001c). Riparian functional condition as described in these assessments is presented in Table 16. Riparian aquatic habitat condition as described in these assessments is summarized in

Table 17. In general, the two data sets illustrate similar trends across the four management units, with the best riparian function and associated aquatic habitat areas generally found in the Brownlee Management Unit, and the worst conditions in the Castle Creek Management Unit. Conditions are most variable in the Henley Management Unit.

The larger, perennial tributaries, such as Castle Creek, Sinker Creek and Succor Creek suffer from excess sediment and water temperatures, with large portions of their subbasin drying up during the late summer and during drought years. During the drought of 1992-1994, many streams were perennial in their headwaters and then dried up at lower elevations (USDI 1997). Temperature and sediment conditions in the mainstem Snake River also negatively impact fish habitat.

Small patches of high quality or satisfactory habitat exist. Jump, Reynolds, Sinker, Succor, and Castle Creek all have reaches in good condition (USDI 1999). Birch Creek also supports redband trout, in addition to other species. No bull trout exist in any of these creeks, although a fluvial bull trout population exists in the nearby Jarbidge River system (Parrish 1998; Partridge and Warren 2000).

Based on the influence to both aquatic and terrestrial habitat, further discussion of riparian and wetland habitat conditions is included in the following section (Wildlife Habitat).

Table 16. Miles of stream defined as having various riparian functional conditions within the Lower Middle Snake subbasin (USDI 1997, 2001a, 2001b, 2001c)

		Riparian Functional Condition (miles)			
Management Unit	Streams	Properly Functioning	Functioning-At Risk [1]	Non-Functioning	Unknown
Castle Creek MU	Multiple [2]	3.5	3.2 (D) 5.9 (S) 3.9 (U)	27.8	
Brownlee MU	Wayle Ck	0.6			
	Sheep Ck	1.3			
	Lick Ck		1.6 (S)		
	Sheep Ck	1.3			
	Sturgill Ck	0.3			
	Corral Ck				0.6
	Lone Pine Ck	2.7			
	Jackson Gulch	1.1			
	Cave Ck	0.2			
	Spring Ck	0.8			
	Wildhorse Ck	1.8			
	Bisbee Ck				3.0
	June Ck				0.8
	No Business Ck	0.6			
	Starveout Ck	0.8			
	Wildhorse Tribs	2.4			
	Salt Ck	1.2			
	Summer Ck	1.6			
	Tarantula Ck	0.8			
	Scorpion Ck	0.5			
	Warm Springs Ck	0.7			
	Williamson Ck	1.2			
	Cougar Ck	0.6			
	Jacobs Ladder Ck	0.6			
	Myra Tree Ck	1.7			
	Limestone Gulch	0.6			
	Indian Ck	1.0			
	Blue Ck	0.3			
McChord Butte MU	Rock Ck	3.0			
	Trail Ck		0.6 (N)		
	N Fk Trail Ck		0.7 (N)		
	Wolf Ck		1.1 (N)		
	Thorn Springs Ck		1.7 (N)		
	Sumac Ck		4.9 (N)		
	Golden Goose Ck	1.8			
	Dennett Ck	2.4	0.8 (N)		
	Raft Ck				
Henley Basin MU	Rock Ck		0.4 (S),1.3(D)	1.2	
	Hog Ck		0.3	0.4	
	Henley Ck		0.8	0.9	
	Scott Ck	4.4			
	Jenkins Ck		0.9		
	Grouse Ck		0.9(S), 0.9(D)		
	Trail Ck		1.6	0.8	

1 D=declining trend, S=Static trend, N=No trend

2 Includes portions of Rock, Castle, Juniper, Pixley, Birch, Magpie, Battle, Poison, and Shoofly Creeks

Table 17. Miles of stream defined as having various riparian habitat conditions within the Lower Middle Snake subbasin (USDI 1997, 2001a, 2001b, 2001c)

		Riparian Habitat Condition (miles)			
Management Unit	Streams	Poor	Fair	Good	Excellent
Castle Creek MU	Multiple [1]	35.7	14.2	0.1	
Brownlee MU	Wayle Ck			0.6	
	Sheep Ck			1.3	
	Lick Ck		1.6		
	Sturgill Ck		0.9		
	Wildhorse Ck			3.3	
	Wildhorse Tribs			0.4	
	Salt Ck			0.3	
	Summer Ck			1.6	
	Scorpion Ck			0.5	
	Williamson Ck			1.2	
	Cougar Ck			0.6	
	Jacobs Ladder Ck			0.6	
	Limestone Gulch			0.6	
	Indian Ck			1.0	
	Blue Ck			0.3	
McChord Butte MU	Rock Ck			3.0	
	Wolf Ck			1.1	
	Dennett Ck		3.1		
	Raft Ck				0.7
Henley Basin MU	Rock Ck	0	1.4	0	
	Hog Ck	0.7	0.3		
	Henley Ck	1.4			
	Scott Ck	0	0	5.4	
	Jenkins Ck		0.5		
	Holy Moly Ck	0.1			
	Ougly Ck	0.3			
	Grouse Ck	0	0.9	0	
	Trail Ck		1.5		

1 Includes portions of Rock, Castle, Juniper, Pixley, Birch, Magpie, Battle, Poison, and Shoofly Creeks

Wildlife Habitat

Wildlife species composition and numbers naturally fluctuate as weather conditions, competition, predation, and parasitism and other environmental processes alter vegetative and wildlife communities. Manipulation of these natural processes by humans has shifted some habitat conditions in the Lower Middle Snake subbasin outside the natural range of variability (USDA Forest Service 1999). Habitats for wildlife have become increasingly fragmented, simplified in structure, and infringed upon or dominated by exotic plants (Quigley and Arbelbide 1997).

The habitat in the Lower Middle Snake subbasin cannot be understood in isolation. The sagebrush-steppe of the Owyhee Plateau contains one of the largest remaining contiguous areas of sagebrush-steppe habitat left in the west (Schnitzspahn et al. no date). This habitat area is approximately 19,000 square miles in size in Idaho, Oregon and Nevada, from the Snake River plains to the north, the Great Basin drainage divide, abutting Bull Run, Independence and Jarbidge Mountains (Schnitzspahn et al. no date).

Sagebrush and Salt Desert Communities

The area between the Snake River and the Owyhee Plateau is often termed the Owyhee Front and is known for its high species diversity. The climate is very dry and salt desert shrub communities cover large areas. Wild horses winter and summer range occurs between Castle and Reynolds creeks along this front (USDI 1999). The plateaus and deep canyons provide habitat for California bighorn sheep, deer and antelope. The area is considered of high quality for a potential for sharp-tailed grouse reintroduction (USDI 1997). Shoofly Creek has been identified as having dense, brushy riparian cover preferred by mountain quail, however the species was not detected following BLM surveys in 1996. Based on its habitat characteristics, Shoofly Creek has been identified by IDFG as a possible mountain quail reintroduction site (USDI 1997). The Owyhee front also constitutes the northernmost edge of a sage grouse habitat area that centers in the Owyhee River subbasin. A number of active sage grouse leks exist in the area between Castle Creek and Succor creeks (USDI 1998). The area contains a variety of rare or sensitive plant species, many of which are specially adapted volcanic ash beds (Schnitzspahn et al. no date).

Habitat quality in the sagebrush and salt desert communities in the subbasin has been reduced due a multitude of factors including, invasion by exotic annual grasses and noxious weeds juniper expansion and wildfire (see limiting factors). Big game habitat in the area, including that occurring between Shoofly and Castle Creek, is generally rated poor (60% of upland habitat for California bighorn sheep, 84% of mule deer winter range, and 89% of pronghorn winter range was rated poor in 1983-4; USDI 1997). Eighty-five percent of sage grouse habitat in the Shoofly to Castle Creek area was rated in fair to poor condition in 1980, with 76% of winter habitat rate as poor (USDI 1997).

Forest Habitat

Forested areas are concentrated in the lower portion of the subbasin (see Figure 8). Ponderosa pine (*Pinus ponderosa*) and mixed conifer communities are most prevalent at lower elevations, while Douglas-fir (*Pseudotsuga menziesii*) and subalpine fir (*Abies lasiocarpa*) dominate at higher elevations. Grand-fir (*Abies grandis*), Lodgepole pine (*Pinus contorta*),and Western Larch (*Larix occidentalis*) are also present in small quantities. Some timber harvest has occurred

in the Pine Creek watershed (USDA 1999). Fire suppression has resulted in higher forest densities and has favored more shade tolerant species (USDA 1999).

Riparian Habitat

Mainstem Snake

Soils in the snake River Canyon are generally very rocky and well-drained and streambanks slope steeply towards the river. Riparian vegetation in these areas may be sparse or non-existent and is usually restricted to areas immediately adjacent to the mean high water line. These areas are dominated by coyote willow, a few species of shrub, grasses and forbs (USDA 1999). Alluvial areas that often more at the confluences with tributaries have shallower slopes and more extensively developed soils that support more diverse riparian communities. In these areas more extensive stands of coyote willow, peachleaf willow and black cottonwood occur (USDI 1995).

C.J. Strike Dam to Owyhee River

Riparian habitat in upper portion of the subbasin is generally limited to narrow bands along the Snake River and a few small perennial streams, notably along Jump, Reynolds and tributaries, and Birch and Shoofly creeks. Much of the flow of tributaries in this area is diverted for agriculture and that has reduced the amount and diversity of riparian vegetation (USDI 1995). Of 50 miles of streams surveyed from Shoofly Creek to Castle Creek during 1993-1994 most were rated in non-functioning condition: 27.8 miles in non-functioning condition, 3.2 miles in proper functioning condition at risk in a downward trend, 5.9 miles were in proper functioning condition at risk in a static trend, 3.9 miles were in proper functioning condition at risk upward trend, and 3.5 miles were rated in proper function condition (Table 16; USDI 1997).

Snake River Breaks

Riparian habitat condition in the breaklands of the upper subbasin was assessed by the BLM. With few exceptions, canopy cover was insufficient to protect streams from excessive solar heating. Sedges and rushes were present at low densities due to a lack of suitable sights due to channel entrenchment associated with steep channels and seasonal flow regimes that did not support hydric vegetation.

Streams accessed by livestock are often moderately to heavily disturbed by livestock induced bank shearing. In some areas encroachment and invasion of upland forb species and Scotch thistle occurred in riparian zones, but was not common in the A+ streams; however, adjacent terraces along Wildhorse Creek were occasionally infested by patches of scotch thistle interspersed among exotic annual graminoids such as Kentucky bluegrass, bulbous bluegrass cheatgrass, and medusahead rye. Human activities have compacted soils and disturbed vegetation along the lower segments of Wildhorse Creek. Compacted soils were common along livestock trails and livestock concentration sites along terraces.

Pine Creek

The most common plant community is grand fir/common snowberry. Other common communities include Douglas fir/Rocky mountain maple and Englemann spruce/ arrow-leaf groundsel. The mainstem North Fork Pine Creek was severely modified by a series of headwater debris torrents during the 1997 flood. Most of the stream banks were denuded and eroded, the erosion problem was compounded by the need to rebuild road 39. North Pine Creek is recovering from damaged caused by the flood of 1997 but the stream is still much warmer than prior to the flood due to increased exposure to solar radiation caused by riparian vegetation loss.

Riverine Islands

Islands in the Snake River provide additional riparian habitat and should be considered a significant habitat resource of the Snake River. The islands range in size from less then one acre to 58 acres (USFWS 2001a). Islands provide excellent substrate for cottonwood colonization, provide protection for waterfowl from predators and human disturbance during nesting. They are especially important in areas where little floodplain habitat exists such as canyon habitat. Mule deer are known to utilize islands for fawning, feeding and resting. Islands in the upper subbasin have grass/sagebrush middles and are ringed with thick brushy edges. Islands toward the lower subbasin tend to be more heavily vegetated by trees such as maples, box elders and cottonwoods. The islands provide opportunities for recreation and wildlife watching throughout most of the year but are closed to all public entry from February 1 to May 31 to provide to maximum protection for nesting migratory birds (USFWS 2001a).

Wetland Areas

The most important wetland types that exist on the Snake River in the Lower Snake River subbasin include aquatic bed, emergent wetland, scrub/shrub wetland and forested wetland classes. Aquatic bed wetlands include a diverse group of plant communities that require surface water for optimum growth and reproduction. They are found in the drawdown zones of reservoirs and in slack water areas on the river and are either attached to the substrate or float free. Aquatic bed wetlands are an important habitat resource for both food and cover for waterfowl and for macroinvertebrates that are an important food source for fish and wildlife. Plant species in this group include widgeon grass (*Ruppia maritime*), wild celery (*Vallisneria Americana*), floating-leaf pondweed (*Potamogeton natans*), water smartweed (*Polygonum amphibium*), duckweeds (*Lemna, Spirodela*), and water lettuce (*Pistia stratiotes*; USBR 1998).

Emergent wetlands include marshes, wet meadows, fens, prairie potholes and sloughs. Vegetation is usually erect rooted herbaceous and hydrophytes. These plants provide food, cover and nesting for waterfowl, shorebirds, marsh birds, wading birds and aquatic forbs (USBR 1998). Plants in this group include cattails (*Typha* spp.), bulrushes (*Scirpus* spp.), reed grass (*Pyragmites australis*), purple loosestrife (*Lythrum salicaria*), water willow (*Decodon verticillatus*), and many species of smartweeds (*Polygonum* spp.; USBR 1998). Purple loosestrife is a invasive exotic that develops into monotypic stands that outcompete native vegetation and provides no wildlife benefits (USBR 1998).

Scrub-shrub wetlands include areas dominated by woody vegetation less than 20 feet tall. This vegetation is less resistant to flooding and cannot survive long periods of deep flooding. This type of wetland provides nesting substrate and cover for many species of bird life and is important as browse for many large ungulates. Plant species found within scrub-steppe wetlands include alder (*Alnus* spp.), willow (*Salix* spp.), red osier dogwood (*Cornus stolonifera*), and narrowleaf cottonwood (*Populus angustifolia*). This type of wetland occurs along the riparian zone of the Snake River where flooding is temporary or infrequent and within the upper portions of the reservoir drawdown zone where flooding conditions are short and of shallow depth (USBR 1998). Aquatic macrophytes occur in these shallow water and drawdown zones of lakes or slack water areas of the river. This type of vegetation provides important food and cover for many wildlife species (USBR 1998).

Forested wetlands are made up of woody vegetation 20 feet tall or more and are common along rivers. Forest vegetation cannot survive deep or long duration flooding. Forested wetlands

are essential habitat for bald eagles, osprey and several species of colonial bird species (USBR 1998). This type of wetland also provides essential habitat for many neotropical bird species that nest and migrate along the Snake River. The important and sensitive cottonwood forest that exists along the river is an example of this type of wetland.

Caves

Natural caves are abundant within the subbasin. Cave types vary from rock shelters, solution tubes in limestone formations, and fault-block and talus caves where lithic breakdown has occurred. There are also occasional "tree-cast" and superceded stream caves within and between basalt flows (USDA Forest Service 1999). Caves provide critical habitat particularly for bat species in the subbasin. The number of caves has not changed from historic to current times but recreation related disturbance may be reducing their ability to support bats (Wisdom e*t al* 2000). The HCNRA contains 16 caves on the national significant caves list.

Agricultural and urban habitat areas

Agricultural and urban areas support relatively limited wildlife populations but some species thrive here. Magpies, squirrels, raccoons, and 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 their predators including coyotes and red-tailed hawks (Csuti et al. 1997). The Conservation Reserve Program (CRP) has helped to increase the quantity and quality of wildlife habitat in the agricultural portions of the subbasin.

Watershed Assessment

The following section lists citations and brief descriptions of various assessments known to have been completed within the Lower Middle Snake subbasin.

Idaho Department of Environmental Quality and Oregon Department of Environmental Quality (2001). Draft Sub-Basin Assessment for the Snake River--Hells Canyon Total Maximum Daily Load (TMDL).

This document represents the subbasin assessment and preliminary problem statement for the Snake River-Hells Canyon Total Maximum Daily Load (TMDL). The project area extends from RM 409 to RM 188, incorporating approximately one half of the Lower Middle Snake subbasin.

Nurnberg, G. and Brown and Caldwell. (2001). Assessment of Brownlee Reservoir water quality, 1999-2000 study period. Prepared for Boise City.

This is a water quality and limnological report for the 1999-2000 study period of conditions in Brownlee Reservoir. The evaluation was undertaken to provide information for the nutrient component of the Snake River-Hells Canyon Total Maximum Daily Load.

Owyhee SCD. 1995. Jump Creek Watershed Planning Project.

Discusses water quality and riparian protection efforts in the Jump Creek watershed as part of the State Agricultural Water Quality Program.

USDI Bureau of Land Management. 1997. Castle Creek Allotment Analysis, Interpretation, and Evaluation. Bruneau Resource Area. Lower Snake River District of Bureau of Land Management.

This document provides detailed information about monitoring of grazing impacts and influence by the BLM in the Castle Creek Allotment. The information presented is used to determine if grazing management is accomplishing specific land use management objectives, and provides technical rationale for making necessary adjustments in livestock management.

USDI Bureau of Land Management. 1999. Proposed Owyhee Resource Management Plan and Final Environmental Impact Statement. 3 volumes. Lower Snake River District. Boise, Idaho.

This document provides detailed information about the BLM Owyhee Resource Area. In the areas included relevant to the Lower Middle Snake subbasin include coverage of tributaries to the Snake from Castle Creek to the Oregon border.

USDI Bureau of Land Management. 2001a. Allotment Assessments for the Brownlee Management Unit. Lower Snake River District. Boise, Idaho.

This document provides detailed information about monitoring of grazing impacts and influence by the BLM in the Brownlee Management Unit. The information presented is used to determine if grazing management is accomplishing specific land use management objectives, and provides technical rationale for making necessary adjustments in livestock management.

USDI Bureau of Land Management. 2001b. Allotment Assessments for the Henley Basin Management Unit. Lower Snake River District. Boise, Idaho.

This document provides detailed information about monitoring of grazing impacts and influence by the BLM in the Henley Basin Management Unit. The information presented is used to determine if grazing management is accomplishing specific land use management objectives, and provides technical rationale for making necessary adjustments in livestock management.

USDI Bureau of Land Management. 2001c. Allotment Assessments for the McChord Butte Management Unit. Lower Snake River District. Boise, Idaho.

This document provides detailed information about monitoring of grazing impacts and influence by the BLM in the McChord Butte Management Unit. The information presented is used to determine if grazing management is accomplishing specific land use management objectives, and provides technical rationale for making necessary adjustments in livestock management.

USDI Bureau of Reclamation. 1998. Bureau of Reclamation Operations and Maintenance in the Snake River Basin Above Lower Granite Reservoir, Biological Assessment. Pacific Northwest Region. Boise, Idaho.

The focus of this BA is Reclamation's hydrologic operations and maintenance program in the Snake River basin above Lower Granite Reservoir, and the effects on listed, proposed, and candidate ESA species.

As the designated agency for grazing and agricultural activities under Idaho water quality law, Idaho Soil Conservation Commission coordinates development of the agricultural component of TMDL implementation plans. The following agricultural implementation plans are currently under development in the Lower Middle Snake subbasin: Brownlee Reservoir, Middle Snake – Succor, and Middle Snake – Payette (Biff Burleigh, ISCC, personal communication, Oct. 16, 2001).

Limiting Factors

Fish

The broadest scale limiting factor for native fish species in the Lower Middle Snake subbasin is population fragmentation due to habitat degradation and dam construction. Although natural salmonid populations are still present in various small tributaries throughout the subbasin, the habitat in the lower reaches of some of these tributaries has been degraded, preventing passage to and from the Snake River, as well as other occupied habitat areas (Lance et al 2001). Lack of fish passage at dams on the Snake River has fragmented habitats, resulting in a loss of connectivity and genetically isolated populations that once mixed freely. Lack of passage has also blocked access to spawning areas needed by white sturgeon (Lukens 1981; Cochnauer 1983), anadromous fish, and other fish species (Lance et al. 2001). Over the long term, population fragmentation may reduce the long term persistence of populations by limiting genetic exchange, recolonization of areas following disturbance, and effective population size of existing metapopulations.

Tributary Habitats

The limiting factor to tributary habitat along the Snake River is degraded riparian habitat. Loss of riparian vegetation can exacerbate existing high water temperature conditions in streams through reduced shading. Devegetation of riparian areas can also increase sedimentation rates through reduced bank stability, negatively impact baseflow conditions by lessening water storage, and decrease productivity through loss of organic inputs such as leaves and grasses.

Most tributary watersheds in the Lower Middle Snake subbasin are in poor condition due to loss of native riparian vegetation due to grazing, exotic weed invasion, changed fire regimes and surface and groundwater withdrawals. Large areas where these tributaries meet the Snake River have been converted to agricultural production through irrigation.

Mainstem Habitats

Mainstem reservoirs have altered the ability of the Snake River to support self-sustaining recreational fisheries. The conversion of a free-flowing river into a slack water environment eliminates important habitat for many native species and does not always provide adequate habitat for desirable non-native species (Lance et al. 2001). Naturally produced salmonids are nonexistent or much reduced in Snake River reservoirs due to siltation of spawning areas and changes in food production (Lance et al. 2001). Irving and Cuplin (1956) reported that daily flow fluctuations in the tailwaters of several Snake River dams are detrimental to trout, whitefish, and white sturgeon spawning. Insects and other invertebrate communities have been altered by impoundment, impacting the food supply of rainbow trout, mountain whitefish, and white sturgeon (Lance et al. 2001). Irving and Cuplin (1956) found that reservoir habitats

produced a greater number of invertebrates than the river downstream of the dams, but that the vast majority were sediment dwelling tubifex worms that are not available as food to the sport fish. Almost all of the primary fish food invertebrates (mayflies, dragonflies, caddis flies, amphipods, crayfish, beetle larvae, and snails) were produced in lower numbers in reservoirs compared to riverine reaches below the dams (Irving and Cuplin 1956).

Water level fluctuations resulting from dam operations may degrade downstream riparian areas and adversely affect fish habitat and populations both above and below dams (Lance et al. 2001). Although exact impacts are site-specific, generally, flow (and associated water level) fluctuations can strand fish, alter or obstruct fish migrations, disrupt spawning activity, wash out or strand redds resulting in reduced hatching success, cause the desiccation of eggs, and limit the critical near bank habitat that provides low velocity habitats for juvenile fish rearing (Lance et al. 2001). Water level fluctuations caused by dam operations are typically more pronounced in riverine habitats below the dam than in reservoirs above the dam. Lance et al. (2001) state that water level fluctuations associated with C.J. Strike Dam average 0.3 feet/day in the reservoir, but range from 3-5 feet/day in the tailwaters below the dam.

Additional actual and potential impacts of hydropower system on aquatic resources within the Lower Middle Snake River subbasin are summarized from USBR (1998):

- Irrigation return flows impact aquatic resources through poor water quality
- Delivering water downstream for anadromous fish may impact resident aquatic resources
- Changes in flow timing and ramping rates which are different from natural hydrograph can provide false cues for spawning
- Low reservoir pool volumes can reduce or destroy reservoir habitats and/or fisheries
- Drawdowns and spills, particularly over winter, reduce habitat, increase mortality and increase entrainment
- High water surface elevations in reservoirs can inundate upstream channel habitat allowing nonnative fish access into native fish spawning and rearing areas
- Flows from C.J. Strike Reservoir to Brownlee Reservoir during irrigation season are often not adequate to sustain fisheries

White Sturgeon

White sturgeon populations are thought to be depressed throughout the Lower Middle Snake subbasin. White sturgeon populations in Hells Canyon and Oxbow Reservoirs are limited by a lack of spawning habitat (IDFG 2000). The sturgeon population in the C.J. Strike Reach was characterized as being low in abundance with the lack of spawning habitat most likely limiting population size (Cochnauer 1983). Very few YOY and juvenile sturgeon exist in the C.J. Strike Reach and IDFG concludes that the sturgeon population is recruitment limited (Lance et al. 2001), also suggesting a limitation of adequate spawning and/or rearing habitat.

The magnitude of the water year substantially influences dam operations throughout the mainstem Snake River, and Chandler and Lepla (1997 cited in Lance et al. 2001) concluded that magnitude of the water year was the single most important factor influencing spawning success below C.J. Strike Dam. Idaho Power Company (2000b cited in Lance et al. 2001) states that suitable spawning conditions exist in the C.J. Strike tailrace only during periods of high outflow and the habitat rapidly becomes unsuitable as flows decrease from maximum plant capacity of 15,000 cfs. No spawning habitat exists in the tailrace at flows of 5,000 cfs or less.

White sturgeon spawning habitat in mainstem reaches is most limited and potentially the most affected by dam operations, particularly load following (IPC 2000b cited in Lance et al. 2001). The greatest impact to white sturgeon from load following has been on the spawning, incubation, and larval life stages during low to average water years. (Lance et al. 2001). Daily load following during the spring spawning period may disrupt the pattern of environmental cues necessary to initiate spawning behavior. Anders and Beckman (1993) documented that sustained and uninterrupted increases in discharge are an important cue for spawning. Parsley and Beckman (1994) reported a reduction in recruitment to YOY white sturgeon corresponding to years of reduced runoff and subsequent lower amounts of spawning habitat.

Poor water quality has impacted sturgeon at times in the Snake River, although it is unclear to what degree this may limit populations throughout the subbasin. In 1990, 27 sturgeon died in the upper end of Brownlee Reservoir when dissolved oxygen levels dropped to lethal levels (USDI 1995).

Other species

The decline of other aquatic species within the subbasin is, in part, due to the IPC hydropower complex which fragmented the Snake River and its tributaries and adversely affected native salmonids including redband trout, bull trout, and mountain whitefish (Lance et al. 2001). Natural populations of rainbow trout and whitefish are reduced or nonexistent in some mainstem reservoirs due to siltation of spawning areas and changes in food production following impoundment (Irving and Cuplin 1956).

Abundance of redband trout populations in the subbasin is limited, at least in part, by habitat availability during drought years. Because of the significant reduction of habitat during drought years, redband populations decline during drought and then recolonize and expand during wetter years (USDI 1997). Under reduced habitat conditions, adult redband trout appear to be limited by lack of adequate pool cover (USDI 1997).

Degradation of water quality in the Snake River has reduced and limited the distribution and number of native salmonids within the subbasin (Lance et al. 2001). In July 1990, large numbers of whitefish died in the Swan Falls reach of the river; whitefish kills have been common in the river and appear to be caused by high water temperatures (USDI 1995). Numerous smallmouth bass, crappie, channel catfish and large scale suckers died in the Brownlee Reservoir reach of the Snake River in 1990, presumably also due to high water temperatures (USDI 1995), suggesting that mainstem temperature condition may limit the success of numerous species throughout the subbasin.

The paucity of whitefish in mainstem habitats within the subbasin cannot be attributed entirely to poor water quality or other factors (Lance et al. 2001). Although natural reproduction does occur, whitefish populations within the mainstem portion(s) of the subbasin are believed to be recruitment limited (Lance et al. 2001). Survival of whitefish eggs can be limited by flow fluctuations in the tailrace reaches below dams (Irving and Cuplin 1956; Wade et al. 1978 cited in Lance et al. 2001).

Warm water fish populations in the reservoirs are limited, at least in part, by detrimental effects of water level fluctuations on spawning success, as well as egg, fry, and juvenile survival (Irving and Cuplin 1956). Bass and other warm water species typically spawn and rear in the shallow edges of the reservoirs. These habitats are the most susceptible to dewatering associated with fluctuating water levels.

Threats to bull trout in the HCCRU include habitat destruction from a variety of activities (mining, agriculture, harvest, road building), loss of connectivity among populations and prey base (anadromous species) due to dams constructed without fish passage, and competition and hybridization with introduced brook trout.

Wildlife

Reductions in quantity and quality of sagebrush and perennial grassland habitat

The big sagebrush ecosystems and native perennial grasslands of the subbasin are threatened by invasion on both sides of the structural spectrum. The area extent of juniper woodlands in the region has increased significantly from the historical to current period. This expansion has come primarily at the expense of sagebrush cover types (Quigley and Arbelbide 1997). Cheatgrass and other exotic annual grasses have reduced the prevalence of native grasslands in the subbasin and shortened the fire return interval in many areas, reducing their suitability to the fire sensitive sagebrush (USDI 1998).

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, reduced the availability of fine fuels and combined with fire suppression resulted in a lengthening of fire return intervals. (USDI 1999). Juniper expansion is prevalent in the southern potion of the subbasin particularly in the area of Reynolds Creek (USDI 1999). Most expansion has been into big sagebrush communities, although open meadows, grasslands, aspen groves, and riparian communities have also been impacted (USDI 1999).

Even though the life span of western juniper exceeds 1,000 years, the oldest living western juniper currently reported over 1,600 years old; the vast majority of the juniper plants in the subbasin are <100 years. These young juniper stands appear to be considerably denser than the pre-settlement stands preceding them (Quigley and Arbelbide 1997).

Juniper expansion can increase habitat suitability for some wildlife populations while reducing it for others. Juniper expansion into sagebrush habitats results in reduced understory forage production reducing mule deer winter range and browse availability for deer and 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 populations (Quigley and Arbelbide 1997). Juniper expansion into the riparian zone has contributed to the reduction or elimination of quaking aspen a species with exceptional importance to many wildlife species (USDI 1999). In some areas western juniper has been implicated in reduced infiltration and increased runoff and 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 considered in an attempt to halt or slow juniper expansion (USDI 1999). This technique needs to be employed with caution though as fire also negatively impacts sagebrush populations and can increase the areas susceptibility to invasion by noxious weeds and 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

High livestock stocking levels combined with 14 years of below normal precipitation that culminated in the severe drought of 1934, resulted in drastic reductions in native understory grasses. The decline in native understory vegetation cover provided exotic annuals such as Russian thistle (*Salsola iberica*), tumble mustard (*Sisymbrium altissimum*) cheatgrass (*Bromus tectorum*), halogeton (*Halogeton glomeratus*), bur buttercup (*Ranunculus testiculatus*), and medusahead wildrye (*Taeniatherum caput-medusae*) the opportunity to invade (USDI 1995). These species are now widespread in grassland, sagebrush and riparian communities in the subbasin (USDI 200c, USDI 1995, USDI 1999).

The addition of cheatgrass and other annuals to the sagebrush/bunchgrass community, has resulted in a shortening of fire return intervals (USDI 1999). Cheatgrass dries earlier in the season than native bunchgrasses forming a continuous, fine fuel source that ignites easily and allows fire to spread rapidly (DAF 1998). Cheatgrass produces heavy seed crops and readily reseeds itself after fires (USDI 1995). In years when above average precipitation falls in the spring more and larger fires develop due to increased grass production and a greater availability of fine fuels once these grasses dry (USDI 1998). Big sagebrush is highly susceptible to fire injury and slow growing; in areas where fires are now much more common than they were historically sagebrush and other shrub species have been reduced or eliminated.

From 1981 through 1986 wildfires resulted in extensive loss of shrub communities within the Snake River Birds of Prey NCA. During this period, over half of the shrub cover in the area burned causing a massive conversion of shrub communities to annual vegetation types. Attempts to rehabilitate the burned shrub stands through reseeding or natural replacement was largely unsuccessful due to the effects of 7 years of drought from 1987 to 1993 (USDI 1995). Large fires have also occurred in the lower and Middle subbasin recently, the largest occurred in 1999 and burned approximately 5000 acres (USDI 2001b).

Reductions in the extent of perennial grass and shrub communities have resulted in reduced suitability of the subbasin for a multitude of wildlife species. Perennial grass species are preferred as browse over annual grasses by many species including the Townsend's ground squirrel. Lack of shrub cover has been shown to result in reductions in black-tailed jack rabbit populations. Townsend's ground squirrel and black-tailed jack rabbits are the primary prey species of raptors in the Snake River Birds of Prey area and reductions in their populations would eventually reduce the ability of the subbasin to support raptors (USDI 1995). Loss of shrub species in has reduced the suitability of the subbasin for sharp-tailed grouse and likely contributed to their reduced range. Reductions in sagebrush cover may have negatively effected sage grouse and other sagebrush dependent species. Reductions in perennial grass coverage and loss shrubs has reduced the range of big game species in the subbasin (USDI 2001b).

Noxious Weeds

Noxious weeds occur in the subbasin and are increasing in prevalence (USDI 1999). These plants often outcompete native flora reducing the suitability of habitat for wildlife. Common noxious weeds in the subbasin include yellow starthistle, spotted, diffuse, and Russian knapweed, white top, scotch thistle, leafy spurge, rush skeleton weed, yellow starthistle, purple loosestrife and knapweed (Table 6).

Destruction of Biological Crusts

Biological crusts, also called microbiotic soil crusts, cryptobiotic and cryptogamic crusts, form a dense low-growing community of various combinations of algae, mosses, liverworts, cyanobacteria, microfungi, bacteria and lichens (USDA 1999). Biological crusts are an important component of the shrub-steppe and grassland ecosystems in the subbasin. Biological crusts grow slowly and are vulnerable to damage from grazing, humans, off-road vehicles, exotic plant invasion and fire (USDA 1999). These crusts improve soil stability, productivity, and moisture retention. They moderate surface temperature extremes, and enhance seedling establishment (Wisdom et al. 2000).

Biological crusts in many areas of the subbasin 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. No date).

Loss and Reductions in Quality of Riparian and Wet Meadow Habitats.

Riparian habitats are of critical importance to large number of wildlife species. Over grazing, flow manipulations, timber harvest, and exotic species have reduced the quality of many of the riparian habitats in the subbasin (Table 16, Table 17).

Changes in Forest Structure and Composition

Logging and fire suppression have altered the structure and composition of the forests in the Lower Middle Snake Subbasin. Historically ponderosa pine forests in the region were maintained by regular underburning. In the absence of fire this forest type has likely declined with a corresponding increase in the prevalence of Douglas-fir and Grand fir communities (USDA 1999). Stands tend to be denser and are encroaching into forest meadow habitats resulting in a decline in the diversity of available habitats (USFWS 2000c). Conifer encroachment has reduced the availability of meadow habitats for northern Idaho ground squirrels (USFWS 2000c).

Increases in Human Activity

The increasing population of the subbasin and surrounding area will result in increases to the often detrimental impacts humans have on wildlife species.

Off Highway Motor Vehicles (OHMV's)

OHMV's are becoming increasingly popular and their use in the subbasin and surrounding area is expected to increase by 70% over the next twenty years (UDSI 1999). The relative proximity of the subbasin to the Treasure valley and the long riding season in low elevation areas, make it very popular with OHMV users. OHMV use is particularly concentrated in the Owyhee front area of the subbasin especially in the area surrounding Rabbit Creek, which contains an OHMV trailhead (USDI 1999). Between 1987 and 1998 a minimum estimate of ninety miles of new trails were developed in this area (USDI 1999).

Off-road vehicle use in the subbasin sometimes occurs within critical or important wildlife habitats, cultural sites, and sensitive plant habitats. Negative impacts on ash dwelling endemics and other special status plants were observed at several locations (USDI 1999). Amphibians, reptiles, birds and small mammals have all been shown to suffer serious impacts from OHMV activity (USDI 1999). Special status animal species identified by the BLM to be most likely to be negatively impacted by increases in OHMV use include, western toad, western

ground snake, longnose snake, long-billed curlew, burrowing owl, ferruginous hawk, multiple neotropical migrant birds and kit fox. These impacts include, direct mortality, loss of habitat, burrow collapse, depletion of prey species and disturbance of breeding or migration patterns (USDI 1999). For example lack of suitable loose textured soil may be a natural limiting factor for kit foxes. Increased soil compaction or destabilization of dunes due to OHMV use may inhibit burrow establishment (Wisdom et al. 2000)

Landscaping Rock Collecting

Rapid population growth within southwest Idaho has resulted in an increased demand for decorative rock for use in landscaping and building construction. This has resulted in an increase in both the legal and illegal removal of rock from the area. These activities result in reduced habitat suitability for the many species that use rock talus and cliffs including Mojave black-collared lizard, western ground snake, longnose snake, ringneck snake, and bats (USDI 1999).

Disturbance of Caves

Human caused disturbance of cave sites in the subbasin may limit bats and other cave-dependent wildlife species. Obligate bat species that use caves as overwintering habitat may be disturbed from their state of torpor by invasion of spelunkers or through other human activities. The "reawakening" from torpor requires a large caloric output, and repeated disturbance can lead to starvation. Furthermore, the negative stigma surrounding bats often leads to intentional harassment and even killing (Wisdom et al. 2000). Caves and mine shafts that are used for hibernation should be protected from disturbance from November 1 to April (USDA 1999).

Roads

The high road densities of the Lower Middle Snake subbasin are a potentially limiting factor to its wildlife populations. More than 65 species of terrestrial vertebrates in the interior Columbia River basin have been identified as being negatively affected by road-associated factors (Wisdom et al. 2000). Road-associated factors can negatively affect habitats and populations of terrestrial vertebrates both directly and indirectly (Table 18). For example the most commonly reported cause of raptor mortality in the Snake River Birds of Prey NCA is automobile collisions (USDI 1995).

Table 18. Thirteen road-associated factors with deleterious impacts on wildlife (Wisdom et al 2000)

Road-associated Factor	Effect of Factor in Relation to Roads
Snag reduction	Reduction in density of snags due to their removal near roads, as facilitated by road access
Down log reduction	Reduction in density of large logs due to their removal near roads, as facilitated by road access
Habitat loss and fragmentation	Loss and resulting fragmentation of habitat due to establishment and maintenance of road and road right-of-way
Negative edge effects	Specific case of fragmentation for species that respond negatively to openings or linear edges created by roads
Over-hunting	Nonsustainable or nondesired legal harvest by hunting as facilitated by road access
Over-trapping	Nonsustainable or nondesired legal harvest by trapping as facilitated by road access
Poaching	Increased illegal take (shooting or trapping) of animals as facilitated by road access
Collection	Collection of live animals for human uses (e.g., amphibians and reptiles collected for use as pets) as facilitated by the physical characteristics of roads or by road access
Harassment or disturbance at specific use sites	Direct interference of life functions at specific use sites due to human or motorized activities, as facilitated by road access (e.g. increased disturbance of nest sites, breeding leks or communal roost sites)
Collisions	Death or injury resulting from a motorized vehicle running over or hitting an animal on the road
Movement Barrier	Preclusion of dispersal, migration or other movements as posed by a road itself or by human activities on or near a road or road network
Displacement or avoidance	Spatial shifts in populations or individual animals away from a road or road network in relation to human activities on or near a road or road network
Chronic negative interaction with humans	Increased mortality of animals due to increased contact with humans, as facilitated by road access

Artificial Production

A number of attempts have been made to improve the fisheries in the Snake River and small tributaries through artificial production. In the tributaries most of the attempts are historical and no longer continuing (Table 19). Although stocking of rainbow trout and other species in the mainstem Snake River and associated reservoirs throughout the Lower Middle Snake subbasin has occurred for extended periods (and currently continues), no mainstem/reservoir stocking records were located or made available during the writing of this subbasin summary.

Table 19. Known occurrences of fish stocking into tributaries to the Snake River within the Lower Middle Snake subbasin (USDI 1999)

Stream	Year	Location	Species
Castle Creek	1956	unknown	catchable rainbow
Reynolds Creek	1953	Probably Reynolds or Highway crossing	catchable rainbow
Sinker Creek	1953	Probably Silver City Road or Highway Crossing	catchable rainbow
Squaw Creek	1953	Unknown	catchable rainbow
Succor Creek	1956	Unknown	catchable rainbow

Existing and Past Efforts

Summary of Past Efforts

Idaho Power Company has been studying the status of white sturgeon populations in the Snake River. As part of the C.J. Strike relicensing process, Idaho Power sought input from federal, state, and local government agencies as well as American Indian Tribes and other non-governmental agencies with interests in the Snake River. These diverse groups formed a collaborative team whose comments and suggestions were used to help shape studies to determine the project's impacts upon the environment, fisheries, wildlife habitat, and recreation.

In 1987 Swan Falls Dam became the subject of a statewide water rights agreement to conduct studies on the timing, quantity, and quality of instream flows to protect, enhance, and mitigate fish and wildlife resources, including anadromous fish and related habitat of the Snake River.

Other projects known to have occurred within the subbasin are presented in Table 20 along with any pertinent information which was made available.

Table 20. Past and existing fish and wildlife projects within the Lower Middle Snake subbasin

Activity	Project Description	Responsible Agency	BPA #	Dates
Sand Hollow West	None Given	Canyon SCD	N/A	None Given
Environmental Quality Incentives Program	None Given	Weiser River SCD	N/A	None Given
Snake R. catfish study		ODFW, IDFG		Completed 1997
Snake River Native Salmonid Assessment	Investigate the life histories, habitat needs, stock status, population trends, threats and limiting factors of native salmonids (bull trout, redband trout, cutthroat trout, and whitefish) in the Snake River and tributaries in Idaho above Hells Canyon Dam.	IDFG	199800200	ongoing
GAP analysis: ODFW	Evaluate & prioritize the potential mitigation projects identified through the Oregon Trust Agreement Planning Project by determining prioritization criteria. Include data on potential mitigation areas into GIS. Assess proposed sites from a state context.	ODFW	199506500	1995
Bull trout life history project: NE Oregon	None Given		199405400	None Given
Flow volume provisions/support	Determine the feasibility of securing 1,000,000 acre feet of water from the Snake River Basin.	Bioanalysts Inc	199304300	1993-1996
Water acquisition pilot project	Analyzes and demonstrate the linkages between changes in river operations for salmon recovery and resulting changes in Columbia River hydropower system production and air pollution levels.	Environmental defense fund	199304400	
Land/water acquisition legal support	Provide specialized legal advice regarding a pilot water acquisition project and a lost opportunity habitat project (the Skyline Farm and Conforth Ranch in eastern Oregon).	Kottkamp & O'rourke	199305700	1993-1994
Idaho water rental: Fish and wildlife impacts	Quantify changes in resident fish and wildlife habitat in the upper Snake basin due to the release of water from upper Snake River reservoirs for anadromous fish flow augmentation. Develop a plan to track water releases and habitat changes.	IDFG	199106700	1992-ongoing
Snake River fall chinook brood program	None Given		198200700	1982-1993

Present Subbasin Management

Existing Management

Federal Government

Bonneville Power Administration (BPA)

The 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 the damages caused to fish and wildlife populations and habitat from federal hydropower development and operation.

Columbia Basin Fish and Wildlife Authority (CBFWA)

The 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 U.S. 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. Technical assistance for these programs is provided by NRCS. Delivery of programs is completed through county offices usually located at the county seat.

Natural Resource Conservation Service

NRCS provides consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. NRCS assists in developing conservation plans, provides technical field-based assistance including project designs, 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, Wildlife Habitat Improvement Program, Environmental Quality Incentives Program, and Wetlands Reserve Program.

National Marine Fisheries Service

The 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 for listed species in the subbasin. NMFS is also involved in primary research on anadromous and marine species to provide knowledge required for fisheries management.

NMFS developed the recent FCRPS Biological Opinion and the Basinwide Salmon Recovery Strategy, which 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 by

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.

Northwest Power Planning Council

The Northwest Power Planning Council was created by Congress under the Northwest Power Act of 1980. The intent was to give citizens a stronger voice in determining issues related to hydropower and fish and wildlife in the Columbia River basin. The Northwest Power Planning Council is made up of eight members, with the governors of Idaho, Oregon, Washington, and Montana each appointing two members. The Northwest Power Planning Council has three principal mandates:

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

U.S. Army Corps of Engineers

The USACE has major responsibility for river and harbor development. The Federal Water Pollution Control Act of 1972 gave the USACE authority to enforce section 404 of the Act dealing with discharge of dredged or fill material into waters of the US, including wetlands. Amendments to the Act in 1977 exempted most farming, ranching, and forestry activities from 404 permit requirements. The Act was amended again in 1987 to modify criminal and civil penalties and add administrative penalties. The USACE is also responsible for flood protection by such means as building and maintaining levies, channelization of streams and rivers (also for navigation), and regulating flows and reservoir levels. The USACE is also responsible for the operation of some federal dams, including fish passage on dams in the Columbia and Snake Rivers. They don't seem to be active in the subbasin.

U.S. Bureau of Land Management

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 grass lands and desert within 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 of these lands are grazing and mining. Wildlife, wilderness, archaeological and historic sites, and recreation are also managed on BLM lands. The BLM is also responsible for mineral leasing on all public lands including the outer continental shelf.

U.S. Bureau of Reclamation (USBR)

The primary activity of the USBR is providing irrigation water for the arid west. This was accomplished through an aggressive dam building and reservoir creation program. Although no longer building dams, the USBR continues to run many large dams and irrigation projects in the

western United States. The BOR is also involved in multiple use resource management on its lands and facilities, including recreation and wildlife conservation.

U.S. Environmental Protection Agency

Formed in 1970, the USEPA administers the Federal Air, Water, and Pesticide Acts. EPA sets national air quality standards, which require states to prevent deterioration of air quality in rural areas below the national standards for that particular area (depending on its EPA classification). The EPA also sets national water quality standards (Total Maximum Daily Load or TMDL) for water bodies that the states must enforce. These standards are segregated into "point" and "nonpoint" source water pollution, with point sources requiring permitting. Although controversial, most farming, ranching, and forestry practices are considered nonpoint sources and thus do not require permitting by the EPA. The EPA provides funding through Section 319 of the CWA for TMDL implementation projects. Section 319 funds are administered by the ODEQ and IDEQ in each state respectively.

U. S. Fish and Wildlife Service

The USFWS administers the ESA for resident fish and wildlife species. The USFWS also enforces the Lacey Act (1900) to prevent interstate commerce in wildlife taken illegally, and enforcement of the North American Migratory Bird Treaty Act. The USFWS distributes monies to state fish and wildlife departments raised 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 also manages a national system of wildlife refuges and provides funding that emphasizes restoration of riparian areas, wetlands, and native plant communities through the Partners in Wildlife Program.

The Hells Canyon Complex Recovery Unit (HCCRU) Chapter of the USFWS draft Bull Trout Recovery Plan is being prepared with input from the HCCRU Team and with guidance from the USFWS. The Team consists of state, federal, and private technical experts from the basin as well as other affected interests. When completed the plan will address current population status, factors limiting production, and identify goals, objectives, and recovery actions to restore bull trout populations in the HCCRU. Publication of the draft recovery plan is expected in 2001 (USFWS 2001b).

U. S. Forest Service

The USFS was established under the Organic Act of 1897 and 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 National Forests of the Columbia Basin are currently preparing to update their forest plans based on the preferred alternative of the ICBEMP.

U. S. Geological Survey

The USGS monitors hydrology, and maps soil, geological and geomorphological features. The USGS also carries on the fish and wildlife research for the country formerly done by the USFWS. USGS has been active in the Bruneau River subbasin collecting information and modeling the geothermal aquifer and determining potential sources of water for irrigation.

United States v. Oregon

The November 9, 1987 Columbia River Fish Management Plan was an agreement resulting from the September 1, 1983 Order of the United States District Court for the District of Oregon (Court) in the case of United States et al. v. Oregon, Washington et al., (Case No. 68-513). The purpose of the management plan was to provide a framework within which the parties could exercise their sovereign powers in a coordinated and systematic manner in order to protect, rebuild, and enhance upper Columbia River fish runs while providing harvests for both treaty Indian and non-Indian fisheries. The agreement established goals (rebuild weak runs and fairly share harvest), means (habitat protection, enhancement, artificial production and harvest management), and procedures (facilitate communication and resolve disputes) to implement the plan. Many production activities are guided by the U.S. vs. Oregon, agreements, which create a framework within which fish and wildlife restoration proceeds. The legal obligation to provide treaty harvest must be followed as well as Endangered Species Act requirements.

Tribal Governments

Nez Perce Tribe

The Nez Perce Tribe is responsible for managing, protecting, and enhancing treaty fish and wildlife resources and habitats for present and future generations. The Nez Perce Tribe has treaty reserved fishing, hunting and gathering rights pursuant to the 1855 Treaty with the United States. Article 3 of the 1855 treaty states, in part:

> "The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."

The Nez Perce Tribe individually and/or jointly (with state and federal agencies) implements fish and wildlife restoration and mitigation activities throughout areas of interest and influence in north-central Idaho. These lands include but are not limited to the entire Clearwater subbasin in which the Nez Perce Tribe held aboriginal title.

The Tribe's Department of Fisheries Resources Management has offices in Enterprise, OR and Orofino and Lapwai ID responsible for conducting fisheries management in the Lower Middle Snake subbasin. The vision of the Department is to manage fisheries resources to provide for healthy, self-sustaining populations of historically present species, and to manage and promote healthy ecosystem processes and rich species biodiversity. Inherent in this vision is the desire to provide for harvestable fish populations.

Nez Perce Tribal fish and wildlife activities relate to all aspects of management, including recovery, restoration, mitigation, enforcement, and resident fish programs. Nez Perce Tribal policies and plans applicable to subbasin management include the *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon* (Columbia River Inter-tribal Fish Commission 1996a, 1996b), the Nez Perce Fish and Wildlife Code, Reports to General Council, and Nez Perce Tribe Executive Committee Resolutions.

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 Lower 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 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 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 2001).

ISDA is composed of divisions in the areas of agriculture inspection, agriculture resources, animal industries, plant industries, marketing, and support. Through its divisions, ISDA monitors pesticide use and application, groundwater, wildlife, noxious weeds (ISDA 2001).

Idaho Department of Environmental Quality (IDEQ)

The IDEQ is responsible for protecting human health and preserving the quality of Idaho's environment. IDEQ administers core federal environmental protection programs such as identification of problem areas; regulation of facilities that generate air, water and hazardous waste pollution; air and water quality monitoring; clean-up of contaminated sites; and providing education 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 2001).

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 Conservation Data Center (ICDC)

The ICDC, located within the IDFG, was initially 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.

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 dealing with land management. IDL is composed of five Bureaus: Administration, Fire Management, Forest Management, Forest Assistance, and Lands (IDL 2001).

"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 2001).

"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 2001). Revenue from the sale of forest products from endowment lands is used for the support of Idaho public schools.

"The Forest Assistance Bureau coordinates and administers Urban/Community forest management, Service Forestry assistance to small forest landowners, the Idaho Forest Practices Act, and the Insect and Disease Program to protect state and private forest of Idaho" (IDL 2001).

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 also 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 2001).

Idaho Department of Parks and Recreation (IDPR)

The IDPR was initiated by Idaho Code 67-4219. The department was charged to formulate and execute 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 1992 by an act of the Idaho Legislature. The purpose of the commission is to "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 2001).

Idaho Geological Survey (IGS)

IGS is the special public service and research agency at the University of Idaho that collects and disseminates geologic and mineral data for the state. The Survey studies and reports on the general geology, environmental geology and geological hazards, metallic and nonmetallic deposits, surface and ground water, and energy resources in the state. The information is made available through oral and written communication and in publications. The Survey is governed by an Advisory Board, whose members represent the mining industry, public agencies, higher education, and earth sciences (IGS 2001).

Idaho Rangeland Resource Commission (IRRC)

IRRC was created by House Bill No. 910, Chapter No. 14, Title No. 58, Idaho Code. 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 2000). IRRC is a flagship for the industry's important long-term information and education needs through implementation of their mission statement. (IRRC 2000).

Idaho Soil and Water Conservation Districts (Biff Burleigh, personal communication, Oct. 2001)

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, updating the plan annually. 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 Resource Conservation Plans are available from each SWCD

In the Lower Middle Snake River subbasin, Idaho SWCDs (and locations) are Adams SWCD (Council, ID), Canyon SCD (Caldwell, ID), Owyhee SCD (Marsing, ID), Payette SWCD (Payette, ID), and Weiser River SCD (Weiser, ID).

Idaho Soil Conservation Commission (ISCC) (Biff Burleigh, personal communication, Oct. 12001)

The ISCC consists of five members appointed to five-year terms by the Governor. A twenty five 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 Natural Resources Conservation Service:

- 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.

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 of fish and wildlife and their habitats is guided by ODFW policies via Oregon Administrative Rules (OAR), collaborative efforts with affected tribes, and federal and state legislation. Direction for ODFW fish and wildlife management and habitat protection is based on the amendments and statutes passed by the Oregon Legislature through the 2001 session. OAR 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.

Oregon Department of Forestry (ODF)

ODF enforces the Oregon Forest Practices Act (OFPA) regulating commercial timber production and harvest on state and private lands. 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 that cross streams in the subbasin. Under the initiative of 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 movement of 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 Plan for Salmon and Watersheds

Passed into law in 1997 by Executive Order, the *Oregon Plan for Salmon and Watersheds* and the *Steelhead Supplement to the Oregon Plan* 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 Plan Monitoring Program, successfully implemented in coastal watersheds, provides the necessary approach for rigorous sampling design to answer key monitoring questions, which will be applied to the Mid-Snake Subbasin. The Oregon Watershed Enhancement Board facilitates and promotes coordination among state agencies, administers a grant program, and provides technical assistance to local Watershed Councils and others to implement the Oregon Plan through watershed assessments and restoration action plans.

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, but enforcement against negligent counties appears minimal. 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 Senate Bill 1010

Under this plan, which was developed by the Oregon Department of Agriculture, county-specific agricultural water quality issues are identified and addressed through a committee process. Landowners are encouraged to develop a farm plan to meet the intent of the strategy. Efforts will reduce water pollution from agricultural sources and protect beneficial uses of watersheds. These plans are then incorporated in the Total Maximum Daily Load as a section of the Water Quality Management Plan.

Oregon State Police (OSP)

The Fish and Wildlife Division of the OSP is responsible for enforcement of fish and wildlife regulations in the state of Oregon. 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. The need for continued fish protection is a priority in accordance with Governors Executive Order 99-01.

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

Local Government

Counties

The Lower Middle Snake subbasin spans 10 counties; seven in Idaho and three in Oregon (Figure 18). The Idaho Association of Counties acts as a spokesperson for counties at state and national levels of government. Some of the natural resource-related issues that mid-Snake Idaho counties face include noxious weeds, parks and waterways/recreation, and solid waste management. Farming is primarily from irrigation because of the semi-arid climate, with approximately 80,000 acres receiving one or more irrigations per year in Owyhee County. Washington County has 840,000 acres in agriculture or rangeland, with about half this much under government ownership.

The Association of Oregon Counties also serves as a legislative representative, as well as providing public services. Mid-Snake counties in Oregon focus on environmental health, economic development, land use planning, and recreation.

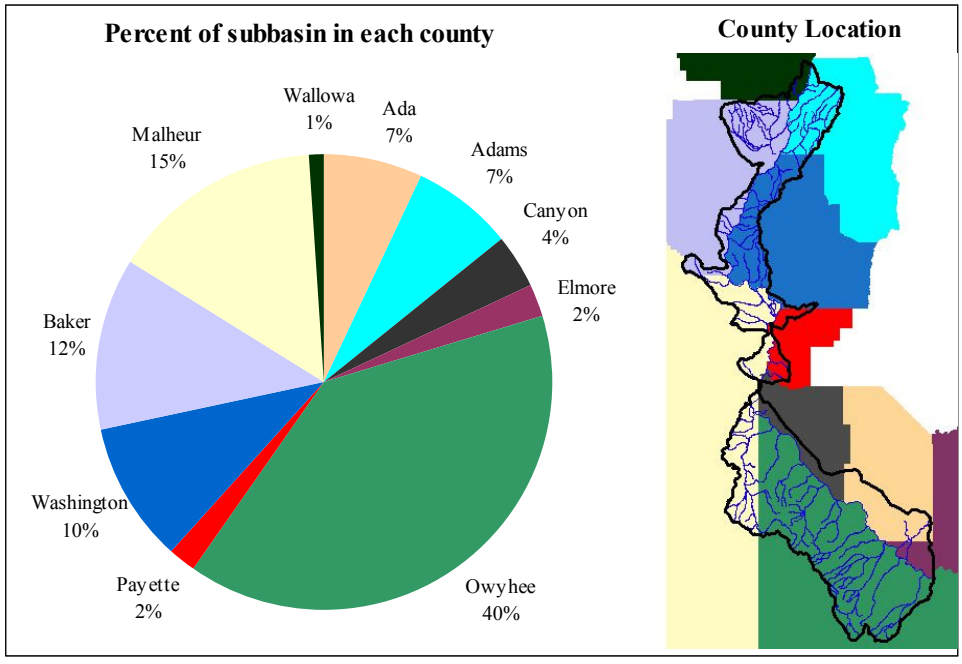

Figure 18. Counties partially contained in the Lower Middle Snake subbasin

Other Entities and Organizations

Columbia River Basin Forum

Formerly called The Three Sovereigns, the Columbia River Basin Forum is designed to improve management of fish and wildlife resources in the Columbia River Basin. The process is an effort to create a new 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 included as 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, five of which are within the Lower Middle Snake subbasin (Brownlee, C.J. Strike, Hells Canyon, Oxbow, and Swan Falls). It also owns interest in three coal-fired generating stations.

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 one conservation site, Succor Creek, within the Lower Middle Snake subbasin that provides exceptional opportunities for conservation of biological diversity. The Succor Creek Conservation Site encompasses roughly 684,000 acres within the watershed of Succor Creek and areas east of Owyhee Reservoir in both Idaho and Oregon. The area includes important areas of native vegetation and a substantial population of California bighorn sheep.

The area includes Leslie Gulch and other areas of exposed volcanic ash beds that provide habitat for several species of rare and endemic plants.

Existing Goals, Objectives, and Strategies

The Middle Snake subbasin has diverse populations of fish and wildlife and unique areas of habitat that are of economic and ecological significance to the people of Oregon, Idaho, Washington, and the Northwest, and of special cultural significance to members of the Nez Perce Tribe. The overall goal for the Middle Snake subbasin is to restore and/or maintain the health and function of the ecosystem to ensure continued viability of these important populations. Numerous federal, state, and local entities are charged with maintenance and protection of the natural resources of the Middle Snake subbasin.

Federal Government

National Marine Fisheries Service and Federal Caucus

Habitat Goal

The habitat goals of the Basinwide Salmon Recovery Strategy include protecting high quality habitats, restoring degraded habitats and connecting them to other functioning habitats, and preventing further degradation of tributary and estuary habitat and water quality. Near-term (5-10 year) objectives for tributary habitat within the Middle Snake subbasin include:

Objective 1. Restore and increase tributary flows to improve fish spawning, rearing, and migration.

Objective 2. Screen diversions, combine diversions, and rescreen existing diversions to comply with NMFS criteria to reduce overall mortality.

Objective 3. Reduce passage obstructions to provide immediate benefit to migration, spawning, and rearing.

- Strategy 1. Federal agencies, state, and other to address all flow, passage, and screening problems over the next 10 years in the Middle Snake subbasin.
  - Action 1.1. USBR to implement actions in the Upper Middle Snake subbasin in 2001
  - Action 1.2. BPA to expand on measures under the NWPPC program to complement USBR's actions.
  - Action 1.3. NMFS to provide USBR with passage and screening criteria and methodologies for determining instream flows that satisfy ESA requirements.
- Strategy 2. BPA funds protection of currently productive non-federal habitat, especially if at risk of being degraded.
  - Action 2.1. BPA and NMFS will develop criteria and priorities by June 2001.
  - Action 2.2. Protect habitats through conservation easements, acquisitions, or other means.
  - Action 2.3. BPA works with non-profit land conservation organizations and others to achieve habitat protection objectives.
- Strategy 3. Increase tributary flows through innovation actions.
  - Action 3.1. Establish a water brokerage as a transactional strategy for securing flows.

Action 3.2. Develop a methodology acceptable to NMFS for ascertaining instream flows that meet ESA requirements.

Strategy 4. Action agencies to coordinate efforts and support off-site habitat enhancement measures undertaken by others

Action 4.1. Support development of state/tribal §303(d) lists and TMDLs by sharing water quality and biological monitoring information.

Action 4.2. Participate in TMDL coordination or consultation meetings

Action 4.3. Build on and use existing data management structures to improve data sharing.

Action 4.4. Share technical expertise and training with federal, state, tribal, regional, and local entities.

Action 4.5. Leverage funding resources through cooperative projects, agreements, and policy development

The program for tributary habitat is premised on the idea that securing the health of these habitats will boost productivity of listed stocks.

Hatchery Goal

The overarching goal for hatchery reform is reduced genetic, ecological, and management effects of artificial production that are adverse on the natural population. Objectives relevant to the Middle Snake subbasin include

Objective 1. Manage the number of hatchery-produced fish that escape to spawn naturally.

Objective 2. Employ hatchery practices that reduce unwanted straying of hatchery fish into the Middle Snake subbasin (i.e. appropriate acclimation in target streams). For naturally spawning populations in critical ESU habitats, non-ESU hatchery-origin fish do not exceed 5%; ESU hatchery fish do not exceed 5%-30%.

Objective 3. Mark hatchery-produced fish to distinguish natural from hatchery fish on spawning grounds and in fisheries.

Objective 4. Design and conduct fishery programs so fish can be harvested without undue impacts on weaker stocks.

Research Monitoring and Evaluation Goal

Identified trends in abundance and productivity in populations of listed anadromous salmonids.

Objective 1. Conduct population status monitoring to determine juvenile and adult distribution, population status, and trends.

Objective 2. Monitor the status of environmental attributes potentially affecting salmonid populations, their trends, and associations with salmonid population status.

Objective 3. Monitor the effectiveness of intended management actions on aquatic systems, and the response of salmonid populations to those actions.

Objective 4. Assess quality of available regional databases, in terms of accuracy and completeness, which represent habitat quality throughout the basin.

Objective 5. Monitor compliance of management actions toward proper implementation and maintenance.

Strategy 1. Conduct Tier 1 sampling to monitor broad-scale population status and habitat conditions.

Strategy 2. Conduct Tier 2 monitoring to obtain detailed population assessments and assessments of relationships between environmental characteristics and salmonid population trends.

Strategy 3. Conduct Tier 3 monitoring to establish mechanistic links between management actions and fish population response.

Basinwide Salmon Recovery Strategy (from Federal Caucus 2000)

Federal Caucus goals

1. Conserve species. Avoid extinction and foster long-term survival and recovery of Columbia basin salmon and steelhead and other aquatic species.
2. Conserve ecosystems. Conserve the ecosystems upon which salmon and steelhead depend.
3. Assure tribal fishing rights and provide non-tribal fishing opportunities. Restore salmon and steelhead populations over time to a level that provides a sustainable harvest sufficient to allow for the exercise of meaningful tribal fishing rights and provide non-tribal fishing opportunities.
4. Balance the needs of other species. Ensure that salmon and steelhead conservation measures are balanced with the needs of other native fish and wildlife species and do not unduly impact upriver interests.
5. Protect historic properties. Consistent with the requirements of the national historic preservation act and other applicable law, assure that effects of recovery measures on historic properties are identified and addressed in consultation with all interested and affected parties.
6. Consider resources of cultural importance to tribes. In implementing recovery measures, seek to preserve resources important to maintaining the traditional culture of basin tribes.

Biological Objectives

1. Maintain and improve upon the current distribution of fish and aquatic species, and halt declining population trends within 5-10 years.
2. Establish increasing trends in naturally-sustained fish populations in each subregion accessible to the fish and for each ESU within 25 years.
3. Restore distribution of fish and other aquatic species within their native range within 25 years (where feasible).
4. Conserve genetic diversity and allow natural patterns of genetic exchange to persist.

Ecological Objectives

1. Prevent further degradation of tributary, mainstem and estuary habitat conditions and water quality.
2. Protect existing high quality habitats.
3. Restore habitats on a priority basis.

Water Quality Objective

1. In the long term, attain state and tribal water quality standards in all critical habitats in the Columbia River and Snake River basins.

Socio-Economic Objectives

1. Select actions to restore and enhance fish and their habitat that achieve the biological and ecological objectives at the least cost.
2. Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives.
3. Seek adequate funding and implementation for strategies and actions.
4. Coordinate restoration efforts to avoid inefficiency and unnecessary costs.

5. Restore salmon and steelhead to population levels that will support tribal and non-tribal harvest.
6. Select actions that consider or take into account tribal socio-economic or cultural concerns.

Strategies for Habitat:

1. Protection: to prevent further degradation of habitat conditions and water quality for all life stages.
2. Restoration: to increase the amount of high quality habitat and high water quality for spawning, rearing, and migration.
3. Complexity: to restore the complexity and range of habitat conditions for all life stages.

Strategies for Harvest:

1. Fishery management: to manage fisheries in a manner that prevents overharvest and does not thwart recovery efforts.
2. Sustainable fisheries: to provide sustainable fisheries for the meaningful exercise of tribal fishing rights and non-tribal fishing opportunities consistent with the recovery effort.

Strategies for Hatcheries:

1. Hatchery reform: reduce potentially harmful hatchery practices.
2. Conservation hatchery actions: use "safety net" program on an interim basis to avoid extinction while other recovery actions take place; use hatcheries in a variety of ways and places to aid recovery.

USFS and BLM (INFISH)

Fish and Fish Habitat Goals

1. Restore water quality that provides for stable and productive riparian and aquatic ecosystems.
2. Restore stream channel integrity, channel processes, and sediment regimes under which riparian and aquatic ecosystems developed.
3. Restore instream flows supporting healthy riparian and aquatic habitats, stable and effectively functioning stream channels, and rerouted flood discharges.
4. Restore natural timing and variability of the water table elevation in meadows and wetlands.
5. Restore diversity and productivity of native and desired non-native plant communities in riparian zones.
6. 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.
7. Restore riparian and aquatic habitats necessary to foster the unique genetic fish stocks that evolved within the specific geo-climatic region.
8. 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.
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

BLM Snake River Birds of Prey National Conservation Area (from USDI 1995)

1. Provide for conservation, protection and enhancement of raptor populations and habitats, and the scientific, cultural and educational resources and values of the NCA.
2. Provide for continues and divers public uses consistent with the objectives of protecting raptor populations and conserving and enhancing their habitat.
3. Coordinate research and studies of raptors, raptor prey and their habitats to support needs identified by BLM management.
4. Demonstrate vegetation and habitat management and enhancement practices and techniques that may be applied elsewhere.

5. Enhance public understanding of and appreciation for natural processes and special resources and values through public education and interpretive programs.

USDA Natural Resources Conservation Service

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

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).

HCCRU Team and USFWS: The Hells Canyon Complex Recovery Unit Chapter of the USFWS draft Bull Trout Recovery (USFWS 2001b).

The goal for recovery of bull trout in the Hells Canyon Complex Recovery Unit is to have a sustained, healthy population complex in which the local populations attain full productivity, genetic interaction, and opportunity to re-populate available habitat as environmental conditions improve to meet their needs.

In order to achieve this goal the following objectives have been identified for the recovery unit:

1. Current distribution of bull trout within the core area is maintained and expanded in the future to all habitats that are, or become suitable within the Hells Canyon Complex Recovery Unit. Re-establishment of a bull trout population into their historic range in Eagle Creek, a tributary to the Powder River, and other streams yet to be identified would be expected in a recovered state.
2. Increasing trends in abundance of bull trout in the Hells Canyon Complex Recovery Unit are sustained.
3. Suitable habitat conditions for all bull trout life history stages and strategies are restored and maintained.
4. Genetically diverse populations of bull trout populations within the Hells Canyon Complex Recovery Unit are conserved by providing opportunities for genetic exchange between the local populations within the Pine/Indian/Wildhorse Core Area including Hells Canyon and Oxbow reservoirs; and between the local populations within the Powder Core including connectivity with Brownlee Reservoir to facilitate connectivity between core areas in the future.

Specific actions to recover bull trout in the HCCRU fall under seven broad categories:

1. Protect, restore, and maintain suitable habitat conditions for bull trout.
2. Prevent and reduce negative effects of nonnative fishes and other nonnative taxa on bull trout.
3. Establish fisheries management goals and objectives compatible with bull trout recovery, and implement practices to achieve goals.
4. Characterize, conserve, and monitor genetic diversity and gene flow among local populations of bull trout.
5. Conduct research and monitoring to implement and evaluate bull trout recovery activities, consistent with an adaptive management approach using feedback from implemented, site-specific recovery tasks.
6. Use all available conservation programs and regulations to protect and conserve bull trout and bull trout habitats.
7. Assess the implementation of bull trout recovery by recovery units, and revise recovery unit plans based on evaluations.

Tribal Government

Shoshone-Paiute Tribes (Duck Valley Indian Reservation)

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, Bruneau, and Lower Middle Snake River systems.
- Work cooperatively with federal, state, county and private entities throughout the Middle Snake Province to enhance, protect and/or restore fish and wildlife habitat.

Objectives and Strategies:

- 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 and BLM biologists to develop data collection methods.
    - Strategy 3: Share wildlife information with appropriate agencies (Nevada's Natural Heritage Program, Idaho Conservation Data Center).
    - 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 Group) to gather and share information and to identify collaborative opportunities .
    - Strategy 2: Work with IDFG, NDOW and BLM resource area 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 the Middle Snake Province.
    - 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 Province.
    - Strategy 3: Work collaboratively with interested entities in the Province including, but not limited to: Nature Conservancy, IDFG, NDOW, local sage grouse working group, Owyhee Initiative Workgroup, BLM, USFS, and NRCS.
    - Strategy 4: Explore opportunities to develop "grass banks" in the Middle Snake Province.

- Explore opportunities to protect Blue Creek wetland complex 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

- Protect streams 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 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 to develop a research and monitoring plan to fill those gaps

Nez Perce Tribe

Nez Perce Tribe Fisheries and Watershed Program

The Fisheries and Watershed program vision focuses on protecting, restoring, and enhancing watersheds and treaty resources within the ceded territory of the Nez Perce Tribe under the Treaty of 1855 with the United States Federal Government. These activities are accomplished using a holistic approach, which encompasses entire watersheds, ridge top to ridge top, emphasizing all cultural aspects. The result of our work strives toward maximizing historic ecosystem productive health, for the restoration of anadromous and resident fish populations. (General Council Report 1999)

Goals

1. Restore anadromous fishes to the rivers and streams that support the historical, cultural and economic practices of the Nez Perce Tribe (CRITFC 1995).
2. Emphasize restoration strategies that rely on natural production and healthy river systems (CRITFC 1995).
3. Protect Tribal sovereignty and treaty rights (CRITFC 1995).
4. Reclaim the anadromous fish resource and the environment upon which it depends for future generations (CRITFC 1995).
5. Conserve, restore and recover native resident fish populations including sturgeon, westslope cutthroat trout, and bull trout (NPT DFRM 2000).
6. Restore anadromous fish in rivers and streams at levels to support the historical, cultural, and economic practices of the tribes.
7. Restore degraded stream and riparian habitat in order to create healthy river systems

Habitat Objectives (CRITFC 1995)

1. Increase anadromous and resident fish populations through tribal, federal, and state coordinated supplementation, management, and habitat restoration.
2. Restrict or eliminate land management activities such as logging, road building, grazing, and mining that are harming the health of riparian ecosystems including water quality degradation, stream habitat degradation, loss of riparian vegetation, streambank destabilization, and altered hydrology.

3. Improve water quality including reducing temperatures (for cold water biota T<60F), sedimentation, and agricultural runoff.
4. Restore riparian ecosystems
5. Restore in-stream habitat to natural conditions.
6. Restore spawning and rearing habitat

Habitat Strategies

1. Coordinate habitat protection and restoration as co-managers with federal, state, and local agencies.
2. Develop watershed assessments to help prioritize restoration work, resource management, and planning efforts.
3. Continue and implement projects designed to restore hillslope hydrology.
4. Reduce sedimentation, cobble embeddedness, stream temperature to CRITFC water quality standards for streams supporting cold water biota.
5. Continue and implement projects designed to protect and restore riparian areas, restore wetlands and floodplain areas, and restore the hydrologic connectivity between terrestrial and aquatic ecosystems.
6. Continue and implement projects to reduce grazing impacts on stream systems and riparian areas.
7. Implement projects that investigate the impacts of invasive exotic plants and participate in coordinated control efforts.
8. Implement projects to restore areas impacted by mining activity.
9. Continue and implement projects to reduce road densities
10. Inventory and evaluate natural and artificial passage barriers.
11. Provide passage for aquatic species as a part of developing sustainable and productive aquatic ecosystems.
12. Develop a monitoring and evaluation program to determine the extent and quality of habitat available to anadromous and resident fishes.
13. Continue and expand monitoring to evaluate the success of restoration projects.
14. Coordinate monitoring programs at the subbasin scale in order to facilitate data sharing.
15. Use data from all monitoring and evaluation efforts to improve watershed-scale planning, decision-making, as well as refine management and restoration practices.
16. Inventory riparian and wetland areas
17. Acquire lands for improved habitat protection, restoration, and connectivity and for mitigation of lost fisheries/wildlife habitat

Management Objectives

1. Restore and recover historically present fish species.
2. Provide for harvestable, self-sustaining populations of anadromous and resident fish species in their native habitat.
3. Manage salmon and steelhead for long-term population persistence.
4. Manage aquatic resources for healthy ecosystem function and rich species biodiversity.
5. Rebuild resident fish populations in order to restore and sustain traditional subsistence fisheries for native resident fish species.
6. Developed intensive resident fishery opportunities in support of traditional Nez Perce resident fishing rights.

7. Integrate the use of artificial production with other fisheries management tools in achieving the program vision.
8. Implement and enforce existing federal laws for protection of water quality, habitat and aquatic resources.
9. Protect and enhance treaty fishing rights and fishing opportunities.
10. Provide optimum tributary stream flows to meet life stage specific habitat requirements of resident and anadromous fish species and all other aquatic species.
11. Provide optimum mainstem river flows for anadromous fish passage and water spill at mainstem dams to maximize fish survival.
12. Integrate aquatic habitat and species management with terrestrial species management.
13. Maintain a natural smolt-to-adult survival rate of 2 to 6% for salmon and steelhead.
14. Meet federal fisheries mitigation responsibilities for LSRCP program.
15. Provide for Tribal hatchery production needs in federal and state managed facilities.
16. Address key limiting survival factors at mainstem hydroelectric facilities.
17. Coordinate with the National Marine Fisheries Service and U.S. Fish and Wildlife Service to fund and implement actions identified in the Biological Opinions, and to implement other emergency actions that address imminent risk to listed salmon, steelhead, and bull trout populations.
18. Develop conservation hatcheries for supplementation of ESA listed fish populations.

State Government

Idaho Department of Fish and Game

Overall Department Goals

GOAL I. Preserve, protect, perpetuate, and manage Idaho's 500+ fish and wildlife species, as steward of public resources.

Objective 1. Minimize the number of Idaho species identified as threatened or endangered under provisions of the Endangered Species Act of 1973, as amended.

Strategy 1.1.1: Protect, preserve, and perpetuate fish and wildlife resources for their intrinsic and ecological values, as well as their direct benefit to humans.

Strategy 1.1.2: Actively support and participate in efforts to protect or enhance the quality of water in Idaho's lakes, rivers, and streams.

Strategy 1.1.3: Advocate land management practices that protect, restore and enhance fish and wildlife habitat, especially habitats such as wetlands and riparian areas that benefit a wide variety of fish and wildlife species.

Strategy 1.1.4: Be an advocate for wildlife and wildlife users in legislation, land and water use activities, policies, or programs that result in significant and unwarranted loss of fish and wildlife habitat or populations, and encourage project designs that eliminate or minimize such losses.

GOAL II. Increase opportunities for Idaho citizens and others to participate in fish- and wildlife-associated recreation.

Objective 1. Emphasize recreational opportunities associated with fish and wildlife resources.

Strategy 2.1.1: Support hunting, fishing, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.

Strategy 2.1.2: Manage fish and wildlife resources for recreational and other legitimate benefits that can be derived primarily by residents of Idaho.

Strategy 2.1.3: Manage fish and wildlife to provide a variety of consumptive and nonconsumptive recreational opportunities as well as scientific and educational uses.

Strategy 2.1.4: Manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.

Strategy 2.1.5: Use the best available biological and social information in making and influencing resource decisions.

Overall Fisheries Bureau Goals

GOAL I. To provide viable fish populations now and in the future for recreational, intrinsic, and aesthetic uses.

Objective 1. Provide the diversity of angling opportunities desired by the public, within guidelines for protection of existing fish populations.

Strategy 1.1.1. Develop and implement statewide fisheries programs.

Strategy 1.1.2. Operate fish hatcheries to provide eggs and fish for the angling public.

Strategy 1.1.3. Prepare and distribute information to the general public about fishing areas, rules, and techniques for angling.

Strategy 1.1.4. Maintain and enhance the quality of fish habitat so natural production of fish can be maintained.

Strategy 1.1.5. Provide access sites and related facilities for the boating and fishing public.

GOAL II. To preserve Idaho's rare fishes to allow for future management options.

Objective 1. Maintain or restore wild populations of game fish in suitable waters.

Strategy 2.1.1. Provide technical expertise to the Executive and Legislative branches, Idaho Northwest Power Planning Council representatives, Idaho Fish and Game Commission and to the citizens of Idaho.

Strategy 2.1.2. Work closely with other regulatory agencies to provide adequate passage for anadromous fish to and from Idaho and the ocean environment.

Strategy 2.1.3. Assist in recovery of rare species through captive rearing projects, supplementation, and protection.

Strategy 2.1.4. Provide input to land management agencies on how fishery resources may be affected by various proposed activities.

Strategy 2.1.5. Conduct periodic surveys of Idaho anglers to determine their preferences and opinions.

Objective 2. Maintain and improve habitats, including water quantity and water quality, to preserve aquatic fauna.

Strategy 2.2.1. Provide technical guidance to land management agencies and private landowners to minimize impacts to aquatic habitats from their activities.

Strategy 2.2.2. Coordinate with Natural Resources Policy Bureau, Department of Water Resources, and the Division of Environmental Quality to develop minimum stream flows and lake levels, water quality standards, and riparian habitat standards that maintain or improve habitats.

GOAL III. To maintain and increase sport fishing participation.

Objective 1. To educate anglers and potential anglers on the enjoyment, value, and satisfaction of fishing as a lifetime sport.

Strategy 3.1.1. Conduct periodic surveys of Idaho anglers to determine their opinions and preferences.

Strategy 3.1.2. Provide expertise to Departmental information and education specialists, and the news media about sport fishing activities.

Strategy 3.1.3. Develop more user friendly fishing rules brochures for easier compliance of fishing rules.

Strategy 3.1.4. Provide technical data in non-technical language, or in other non-technical forums, to anglers for better understanding of fish biology.

Statewide Fisheries Management Goals (from Idaho Department of Fish and Game 2001).

Goal 1. Increase sport-fishing opportunities in Idaho.

Strategy 1.1. Develop fishing ponds in areas where stream-fishing opportunity is limited by conservation efforts on native fishes

Goal 2. Provide a diversity of angling opportunities of types desired by the public.

Strategy 2.1. Practice current public review process for developing management plans and regulations.

Goal 3. Maintain or enhance the quality of fish habitat.

Strategy 3.1. Use spatial databases to assist in prioritization of habitat improvement projects.

Strategy 3.2. Coordinate with other agencies and landowners to develop comprehensive conservation and restoration plans.

Goal 4. Fully utilize fish habitat capabilities by increasing populations of suitable fish species to carrying capacity of the habitat.

Strategy 4.1. Control non-native brook trout where interactions with native salmonids limit the survival and production of native salmonid populations.

Goal 5. Maintain or restore wild native populations of fish in suitable waters and historic habitats.

Strategy 5.1. Implement restrictive fishing regulations where warranted.

Strategy 5.2. Assess population/metapopulation dynamics of fluvial populations of salmonids.

Strategy 5.3. Improve understanding and knowledge about current distribution and population status of native nongame species and the role they play in ecological communities through research and monitoring.

Strategy 5.4. Develop species management or conservation plans for native fishes including plans that address fish assemblages containing native sport and nongame fish.

Resident Fish Management

Objective 1. Where desirable and feasible, some lakes will be maintained as fishless. Fishless lakes will allow for maintenance of natural conditions for native fauna within alpine ecosystems.

Strategy 1. Coordinate with other agencies on data availability and identify additional data gaps.

Objective 2. Maintain genetic integrity of wild native stocks of fish and naturally managed fish when using hatchery supplementation.

Objective 3. Wild native populations of resident and anadromous fish species will receive priority consideration in management decisions.

Strategy 1. By 2003, ascertain the genetic purity status of wild westslope cutthroat trout stocks in the subbasin to aid in the prioritization of fishery management decisions.

Action 1. Conduct DNA-based genetic inventories of westslope cutthroat stocks.

Action 2. Evaluate "natural" introgression rates between native rainbow trout and westslope cutthroat stocks in the subbasin.

Strategy 2. By 2005, evaluate the current status of all major bull trout metapopulations within the subbasin.

Action 1. Summarize trends in bull trout densities for all available general parr monitoring sites with existing data and expand field sample locations as needed to provide sufficient statistical power for effective monitoring.

Action 2. Estimate effective population sizes of bull trout stocks residing in all 4th code HUCs within the subbasin using DNA sampling and linkage disequilibrium techniques.

Action 3. Validate accuracy of genetically derived bull trout EPS estimates in a sub-sample of HUCS using density estimates, maturity schedules, and longevity.

Action 4. Evaluate bull trout extinction risk (PVA) using existing literature guidelines and EPS estimates.

Action 5. Conduct DNA genetic inventory of a random sample of subbasin bull trout populations to assess brook trout introgression rates and identify unique bull trout stocks.

Strategy 3. By 2005, determine the status and distribution of redband trout in the subbasin.

Action 1. Describe the basic life history, geographic distribution and habitat utilization of redband populations in sympatry and allopatry with steelhead populations.

Action 2. Collect baseline genetic profiles and relationships of populations within and outside the subbasin.

Action 3. Develop strategies to protect, improve and restore degraded habitat.

Strategy 4. By 2005, determine the status and distribution of white sturgeon populations in the subbasin.

Action 1. Describe the population size, age structure, and recruitment.

Action 2. Determine the connectivity with Salmon River sturgeon populations.

Action 3. Evaluate the effects of tribal harvest on the population.

Action 4. Protect, improve and restore habitat.

Action 5. Develop plan to ensure population viability.

Native Salmonid Assessment Research

Goal I. 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 electrofishing 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.

Idaho Conservation Data Center (ICDC).

The ICDC works with federal, state, and private agencies and organizations to maintain high quality information on the conservation of biological diversity. ICDC staff contribute to conservation planning efforts within the subbasin through dissemination and synthesis of information on the distribution and abundance of species populations and habitats. Availability of high quality information on biological diversity allows proactive conservation planning and reduces administrative delays related to fulfillment of regulatory procedural requirements.

Goal 1. Maintain biodiversity information within the Idaho portion of the subbasin.

Objective 1. Maintain high quality, accurate, and timely information on the occurrence of rare, threatened, and endangered plant and animal species.

Strategy 1. Conduct appropriate population inventory monitoring work for priority species.

Strategy 2. Maintain and develop sufficient funding to provide adequate facilities and staffing for the acquisition, maintenance, and dissemination of information on species populations.

Objective 2. 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.

Strategy 1. Conduct appropriate inventories of, and monitor, priority plant and animal habitats and plant communities.

Action 1. Inventory and map the current and potential distribution of ponderosa pine-dominated plant communities within the subbasin. Inventory, map, and gather population data for ponderosa pine associated wildlife and plant species.

Action 2. Inventory and map the distribution of canyon grasslands within the subbasin.

Action 3. Inventory and map the distribution of whitebark pine communities within the subbasin.

Action 4. Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands of the subbasin.

Strategy 2. Serve as an information repository for ecological data regarding the distribution, composition, and structure of vegetation within the subbasin.

Action 1. Acquire existing data sets where possible and compile meta-data information according to national standards.

Strategy 3. Develop and disseminate descriptive information on high quality reference stand structure, composition, and ecological functions.

Strategy 4. Maintain and develop sufficient funding to provide adequate facilities and staffing for the acquisition, maintenance, and dissemination of information on plant and animal habitats, representative ecological reference areas, and plant communities.

Goal 2: Assist with conservation actions within the subbasin.

Objective 1. Assist with species and ecosystem conservation management actions within the subbasin.

Strategy 1. Provide recommendations for conservation site selection and management. Protect high quality, representative stands of priority plant associations and habitats.

Action 1. Inventory and prepare conservation plans for high quality, representative stands of canyon grasslands within the subbasin.

Action 2. Inventory and prepare conservation plan for high quality, representative stands of sagebrush steppe within the subbasin.

Action 3. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for priority plant communities and for mitigation of lost wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).

Strategy 2. Provide recommendations for the establishment and management of ecological reference areas.

Action 1. Monitor use of existing reference areas to assure consistency with the maintenance of ecologic values.

Action 2. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.

Action 3. Establish and maintain permanent baseline monitoring systems for priority ecosystems and species.

Strategy 3. Provide recommendations for species conservation and management. Prepare and update species conservation management plans.

Idaho Soil and Water Conservation Districts

The following descriptions of existing goals, objectives, and strategies are not separated into fish and wildlife conservation/restoration categories. Each action agency described conducts work on watershed scales, emphasizes natural resource conservation, fish and wildlife protection, habitat improvement, and has Clean Water Act priorities in particular nonpoint source pollution. These groups serve, although not exclusively, private land ownership in Idaho State. Standards and specifications for agricultural Best Management Practices (BMPs) to reduce nonpoint pollution and conserve soil and water derive from the U.S. Natural Resources Conservation Service Field Office Technical Guide. Other standards and specifications derive from partnership agencies with relative expertise in the project. The following sections do not represent entire documents but have been paraphrased, except where noted, for use in this review.

(Idaho SWCD Annual Work Plan/Five Year Resource Conservation Plan, 2001)

Goals

1. Encourage and promote BMPs to reduce soil erosion, and enhance water quality
2. Improve water quality on §303(d) listed streams
3. Improve fish and wildlife habitat

Objectives

1. Enhance education and information program
2. Coordinate with NRCS and other state and federal agencies engaged in conservation

Strategies

1. Encourage and provide assistance for conservation planning on private lands
2. Encourage and provide assistance for riparian and upland BMP implementation
3. Design and implement road treatments in cooperation with Idaho County Road Department
4. Design and implement animal waste treatment plans, riparian and crop management plans, and septic system plans through the CWA Section 319 program and Div II-wide WQPA project.

Oregon Department of Fish and Wildlife

ODFW's vision is that "Oregon's fish and wildlife are thriving in healthy habitats due to cooperative efforts and support by all Oregonians" (ODFW 2000). The vision for the Lower Middle Snake subbasin is to improve habitat health and function for the enhancement and productivity of wild spring chinook salmon, summer steelhead, native resident trout, and numerous wildlife species (ODFW 1990).

Oregon Wildlife Diversity Plan (1993)

The goal of the Oregon Wildlife Diversity Plan is to maintain Oregon's wildlife diversity by protecting and enhancing populations and habitats of native non-game wildlife at self-sustaining levels throughout natural geographic ranges. To accomplish this goal, the Plan relies upon the following objectives and strategies:

Objective 1. Protect and enhance populations of all existing native non-game species at self-sustaining levels throughout their natural geographic ranges by supporting the

maintenance, improvement or expansion of habitats and by conducting other conservation actions.

Strategy 1.1: Maintain existing funding sources and develop new sources of public, long-term funding required to conserve the wildlife diversity of Oregon.

Strategy 1.2: Identify and assist in the preservation, restoration and enhancement of habitats needed to maintain Oregon's wildlife diversity and non-consumptive recreational opportunities.

Strategy 1.3: Monitor the status of non-game populations on a continuous basis as needed for appraising the need for management actions, the results of actions, and for evaluating habitat and other environmental changes.

Objective 2. Restore and maintain self-sustaining populations of non-game species extirpated from the state or regions within the state, consistent with habitat availability, public acceptance, and other uses of the lands and waters of the state.

Strategy 2.1: Identify, establish standards and implement management measures required for restoring threatened and endangered species, preventing sensitive species from having to be listed as threatened or endangered, and maintaining or enhancing other species requiring special attention.

Strategy 2.2: Reintroduce species or populations where they have been extirpated as may be feasible.

Objective 3. Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife.

Strategy 3.1: Develop broad public awareness and understanding of the wildlife benefits and conservation needs in Oregon.

Strategy 3.2: Increase or enhance opportunities for the public to enjoy and learn about wildlife in their natural habitats.

Strategy 3.3: Seek outside opportunities, resources and authorities and cooperate with other agencies, private conservation organizations, scientific and educational institutions, industry and the general public in meeting Program Objectives.

Strategy 3.4: Maintain and enhance intra-agency coordination through dissemination of Program information, development of shared databases and coordination of activities that affect other Department divisions and programs; identify activities within other programs which affect the Wildlife Diversity program, and develop mutual goals.

Objective 4. Address conflicts between non-game wildlife and people to minimize adverse economic, social, and biological impacts.

Strategy 4.1: Assist with non-game property damage and nuisance problems without compromising wildlife objectives, using education and self-help in place of landowner assistance wherever possible.

Strategy 4.2: Administer the Wildlife Rehabilitation Program.

Strategy 4.3: Administer the Scientific Taking Permits Program.

Strategy 4.4: Administer Wildlife Holding and other miscellaneous permits.

Strategy 4.5: Provide biological input to the Falconry Program for the establishment of raptor-capture regulations.

Strategy 4.6: Update the Wildlife Diversity Plan every five years.

Oregon Black Bear Management Plan (ODFW 1987)

The overriding goal of the Oregon Black Bear Management Plan is to protect and enhance black bear populations in Oregon to provide optimum recreational benefits to the public and to be compatible with habitat capability and primary land uses. To accomplish this goal, the plan relies upon the following objectives and strategies:

Objective 1. Determine black bear population characteristics.

Strategy 1.1: Implement or cooperate in research to learn more about black bear ecology in Oregon, develop accurate populations estimates and provide a measurement of population trend.

Objective 2. Determine black bear harvest levels.

Strategy 2.1: Obtain improved harvest information through use of combination report card/tooth envelope.

Strategy 2.2: Monitor black bear harvest and implement harvest restrictions if necessary.

Strategy 2.3: Develop an educational program to alert black bear hunters of the need for improved black bear population information.

Strategy 2.4: If necessary, initiate mandatory check of harvested black bear.

Objective 3. Continue current practice of allowing private and public landowners to take damage causing black bear without a permit.

Strategy 3.1: The Department will not seek any changes in current statutes.

Strategy 3.2: Continue to work with other agencies and private landowners in solving black bear depredation problems.

Strategy 3.3: Explore the possibility of using sport hunters for damage control.

Oregon's Cougar Management Plan (ODFW 1993a)

The goals of Oregon's Cougar Management Plan are to:

1. Recognize the cougar as an important part of Oregon's wildlife fauna, valued by many Oregonians.
2. Maintain healthy cougar populations within the state into the future.
3. Conduct a management program that maintains healthy populations of cougar and recognize the desires of the public and the statutory obligations of the Department.

The preceding goals will be accomplished through the following objectives and strategies:

Objective 1. Continue to gather information on which to base cougar management.

Strategy 1.1: Continue to authorize controlled cougar hunting seasons conducted in a manner that meets the statutory mandates to maintain the species and provide consumptive and non-consumptive recreational opportunities.

Strategy 1.2: Continue to study cougar population characteristics as well as the impact of hunting on cougar populations.

Strategy 1.3: Continue to update and apply population modeling to track the overall cougar population status.

Strategy 1.4: Continue mandatory check of all hunter-harvested cougar and evaluate the information collected on population characteristics for use in setting harvest seasons.
Strategy 1.5: Continue development of a tooth aging (cementum annuli) technique.

Objective 2. Continue to enforce cougar harvest regulations.
Strategy 2.1: Continue to work with OSP to monitor the level of illegal cougar hunting activity.
Strategy 2.2: Implement appropriate enforcement actions and make the necessary changes in regulations to reduce illegal cougar hunting.
Strategy 2.3: Continue to inspect taxidermist facilities and records to discourage and document the processing of cougar hides lacking Department seals.

Objective 3. Document and attempt to eliminate potential future human-cougar conflicts.
Strategy 3.1: Provide information to the public about cougar distribution, management needs, behavior, etc.
Strategy 3.2: Attempt to solve human-cougar conflicts by non-lethal methods.
Strategy 3.3: Consider additional hunting seasons or increased hunter numbers in areas where human-cougar conflicts develop.
Strategy 3.4: Manage for lower cougar population densities in areas of high human occupancy.

Objective 4. Manage cougar populations through controlled hunting seasons.
Strategy 4.1: Base regulation modifications on population trends, as annual fluctuations in the weather can greatly influence recreational cougar harvest.
Strategy 4.2: Continue to regulate cougar hunting through controlled permit seasons.

Objective 5. Continue to allow private and public landowners to take damage-causing cougar without a permit.
Strategy 5.1: No changes will be sought to existing damage control statutes.
Strategy 5.2: Continue to work with landowners to encourage reporting of potential damage before it occurs, with the goal of solving complaints by other than lethal means.
Strategy 5.3: Continue to emphasize that damage must occur before landowners or agents of the Department may remove an offending animal.
Strategy 5.4: Encourage improved livestock husbandry practices as a means of reducing cougar damage on domestic livestock.
Strategy 5.5: Continue to work with other agencies to solve cougar depredation problems.

Objective 6. Manage deer and elk populations to maintain the primary prey source for cougar.
Strategy 6.1: Work with landowners and public land managers to maintain satisfactory deer, elk and cougar habitat.
Strategy 6.2: Evaluate the effects of human activities and human disturbance on cougar.
Strategy 6.3: Take action to correct problems in areas where human access is detrimental to the welfare of cougar or their prey base.

Mule Deer Management Plan (ODFW 1990)

The goals of the Oregon Department of Fish and Wildlife Mule Deer Management Plan are:

1. Increase deer numbers in units that are below management objectives and attempt to determine what factors are contributing to long term depressed mule deer populations.
2. Maintain population levels where herds are at management objectives.
3. Reduce populations in the areas where deer numbers exceed population management objectives.

Population objectives were set by Oregon Department of Fish and Wildlife Commission action in 1982 and are to be considered maximums.

Objective 1. Set management objectives for buck ratio, population level/density and fawn:doe ratio benchmark for each hunt unit and adjust as necessary.

- Strategy 1.1: Antlerless harvest will be used to reduce populations which exceed management objectives over a two or three year period or to address damage situations.
- Strategy 1.2: Harvest tag numbers are adjusted to meet or exceed objectives within 2-3 bucks/100 does.
- Strategy 1.3: Population trends will be measured with trend counts and harvest data and may include population modeling.
- Strategy 1.4: Update Mule Deer Plan every five years.

Objective 2. Hunter opportunity will not be maintained at the expense of meeting population and buck ratio management objectives.

Oregon's Elk Management Plan (ODFW 1992)

The primary goal of Oregon's Elk Management Plan is to protect and enhance elk populations in Oregon to provide optimum recreational benefits to the public and to be compatible with habitat capability and primary land uses. This goal will be accomplished through the following objectives and strategies:

Objective 1. Maximize recruitment into elk populations and maintain bull ratios at Management Objective levels. Establish Management Objectives for population size in all herds, and maintain populations at or near those objectives.

- Strategy 1.1: Maintain bull ratios at management objectives.
- Strategy 1.2: Protect Oregon's wild elk from diseases, genetic degradation, and increased poaching which could result from transport and uncontrolled introduction of cervid species.
- Strategy 1.3: Determine causes of calf elk mortality.
- Strategy 1.4 Monitor elk populations for significant disease outbreaks, and take action when and were possible to alleviate the problem.
- Strategy 1.5: Establish population models for aiding in herd or unit management decisions.
- Strategy 1.6: Adequately inventory elk populations in all units with significant number of elk.

Objective 2. Coordinate with landowners to maintain, enhance and restore elk habitat.

Strategy 2.1: Ensure both adequate quantity and quality of forage to achieve elk population management objectives in each management unit.
Strategy 2.2: Ensure habitat conditions necessary to meet population management objectives are met on critical elk ranges.
Strategy 2.3: Minimize elk damage to private land where little or no natural winter range remains.
Strategy 2.4: Maintain public rangeland in a condition that will allow elk populations to meet and sustain management objectives in each unit.
Strategy 2.5: Reduce wildlife damage to private land.

Objective 3. Enhance consumptive and non-consumptive recreational uses of Oregon's elk resource.
Strategy 3.1: Develop a policy that outlines direction for addressing the issues of tag allocation to private landowners and public access to private lands in exchange for compensation to private landowners.
Strategy 3.2 Increase bull age structure and reduce illegal kill of bulls while maintaining recreational opportunities.
Strategy 3.3 Adjust levels of hunter recreation in all units commensurate with management objectives.
Strategy 3.4 Identify, better publicize, and increase the number of elk viewing opportunities in Oregon.

Oregon's Bighorn Sheep Management Plan (ODFW 1992)

The primary goal of Oregon's Bighorn Sheep Management Plan is to restore bighorn sheep into as much suitable unoccupied habitat as possible. The following objectives and strategies have been developed to accomplish this goal:

Objective 1. Maintain geographical separation of California and Rocky Mountain subspecies.
Strategy 1.1: California bighorn will be used in all sites in central and southeast Oregon
Strategy 1.2: Coordinate transplant activities with adjacent states.
Strategy 1.3: Continue to use in-state sources of transplant stock while seeking transplant stock from out of state.
Strategy 1.4: Historic areas of bighorn sheep range containing suitable habitat will be identified and factors restricting reintroduction will be clearly explained for public review.

Objective 2. Maintain healthy bighorn sheep populations.
Strategy 2.1: Bighorn sheep will not be introduced into locations where they may be reasonably expected to come into contact with domestic or exotic sheep.
Strategy 2.2: Work with land management agencies and private individuals to minimize contact between established bighorn sheep herds and domestic or exotic sheep.
Strategy 2.3: Work with land management agencies to locate domestic sheep grazing allotments away from identified present and proposed bighorn sheep ranges.
Strategy 2.4: Maintain sufficient herd observations to ensure timely detection of disease and parasite problems.

Strategy 2.5: Promote and support aggressive research aimed at reducing bighorn vulnerability to diseases and parasites.
Strategy 2.6: Bighorn individuals that have known contact with domestic or exotic sheep will be captured, quarantined, and tested for disease. If capture is impossible, the bighorn will be destroyed before it has a chance to return to a herd and possibly transmit disease organisms to others in the herd.
Strategy 2.7: Bighorns of questionable health status will not be released in Oregon.

Objective 3. Improve bighorn sheep habitat as needed and as funding becomes available.
Strategy 3.1: Monitor range condition and use along with population characteristics.

Objective 4. Provide recreational ram harvest opportunities when bighorn sheep population levels reach 60 to 90 animals.
Strategy 4.1: To reduce possibility of black-market activity, all hunter-harvested horns will be permanently marked by the Department.
Strategy 4.2: Do not transplant bighorns on those areas where some reasonable amount of public access is not possible.
Strategy 4.3: Consider land purchase in order to put such land into public ownership.

Objective 5. Conduct annual herd composition, lamb production, summer lamb survival, habitat use and condition, and general herd health surveys.
Strategy 5.1: Maintain sufficient herd observations so as to ensure timely detection of disease and parasite problems. This will include mid- to late-summer, early winter, and later winter herd surveys.
Strategy 5.2: Initiate needed sampling and collections when problems are reported to verify the extent of the problem. Utilize the best veterinary assistance.
Strategy 5.3: Promote and support an aggressive research program aimed at reducing bighorn vulnerability to disease and parasites.
Strategy 5.4: Continue to test bighorns for presence of diseases of importance to both bighorn sheep and livestock.
Strategy 5.5: Monitor range condition and use along with population characteristics.
Strategy 5.6: Conduct population modeling of all herds.
Strategy 5.7: Determine herd carrying capacity after consultation with the land manager.
Strategy 5.8: Investigate lamb production and survival as an indication of a population at carrying capacity.

Oregon Migratory Game Bird Program Strategic Management Plan (ODFW 1993)

The primary goal of the Oregon Migratory Game Bird Program Strategic Management Plan is to protect and enhance populations and habitats of native migratory game birds and associated species at prescribed levels throughout natural geographic ranges in Oregon and the Pacific flyway to contribute to Oregon's wildlife diversity and the uses of those resources. The following objectives and strategies are designed to accomplish this goal:

Objective 1. Integrate state, federal, and local programs to coordinate biological surveys, research, and habitat development to obtain improved population information and secure habitats for the benefit of migratory game birds and other associated species.

Strategy 1.1: Establish an Oregon Migratory Game Bird Committee to provide management recommendations on all facets of the migratory game bird program.

Strategy 1.2: Use population and management objectives identified in Pacific Flyway Management Plans and Programs.

Strategy 1.3: Develop a statewide migratory game bird habitat acquisition, development, and enhancement plan based on flyway management plans, ODFW Regional recommendations, and other state, federal, and local agency programs.

Strategy 1.4: Implement a statewide migratory game bird biological monitoring program, including banding, breeding, production, migration, and wintering area surveys based on population information needs of the flyway and state.

Strategy 1.5: Develop a statewide program for the collection of harvest statistics.

Strategy 1.6: Prepare a priority plan for research needs based on flyway management programs.

Strategy 1.7: Annually prepare and review work plans for wildlife areas that are consistent with policies and strategies of this plan.

Strategy 1.8: Develop a migratory game bird disease contingency plan to address responsibilities and procedure to be taken in the case of disease outbreaks in the state. It will also address policies concerning "park ducks", captive-reared, and exotic game bird releases in Oregon.

Objective 2. Assist in the development and implementation of the migratory game bird management program through information exchange and training.

Strategy 2.1: Provide training for appropriate personnel on biological survey methodology, banding techniques, waterfowl identification, habitat development, disease problems, etc.

Objective 3. Provide recreational, aesthetic, educational, and cultural benefits from migratory game birds, other associated wildlife species, and their habitats.

Strategy 3.1: Provide migratory game bird harvest opportunity.

Strategy 3.2: Regulate harvest and other uses of migratory game birds at levels compatible with maintaining prescribed population levels.

Strategy 3.3: Eliminate impacts to endangered or threatened species.

Strategy 3.4: Reduce impacts to protected or sensitive species.

Strategy 3.5: Provide a variety of recreational opportunities and access, including viewing opportunities, throughout the state.

Strategy 3.6: Provide assistance in resolving migratory game bird damage complaints.

Strategy 3.7: Develop opportunities for private, public, tribal, and industry participation in migratory game bird programs including, but not limited to, conservation, educational, and scientific activities.

Strategy 3.8: Disseminate information to interested parties through periodic program activity reports, media releases, hunter education training, and other appropriate means.

Objective 4. Seek sufficient funds to accomplish programs consistent with the objectives outlined in the plan and allocate funds to programs based on management priorities.

Strategy 4.1: Use funds obtained through the sale of waterfowl stamps and art to fund all aspects of the waterfowl management program as allowable under ORS 497.151.

Strategy 4.2: Develop annual priorities and seek funding through the Federal Aid in Wildlife Restoration Act.

Strategy 4.3: Solicit funds from "Partners in Wildlife" as appropriate.

Strategy 4.4: Seek funds from a variety of conservation groups such as Ducks Unlimited and the Oregon Duck Hunter's Association.

Strategy 4.5: Solicit funds form the Access and Habitat Board as appropriate and based on criteria developed by the Board and the Fish and Wildlife Commission.

Strategy 4.6: Pursue funds from other new and traditional sources, such as corporate sponsors and private grants.

ODFW's Fish Goals, Objectives and Strategies
Oregon's Trout Plan

The primary goal identified in Oregon's Trout Plan is to Achieve and maintain optimum populations and production of trout to maximize benefits and to insure a wide diversity of opportunity for present and future citizens. To achieve this goal, the following objectives and strategies have been developed:

Objective 1. Maintain the genetic diversity and integrity of wild trout stocks throughout Oregon.

Strategy 1.1: Identify wild trout stocks in the state.

Strategy 1.2: Minimize the adverse effects of hatchery trout on biological characteristics, genetic fitness, and production of wild stocks .

Strategy 1.3: Establish priorities for the protection of stocks of wild trout in the state.

Strategy 1.4: Evaluate the effectiveness of trout management programs in providing the populations of wild trout necessary to meet the desires of the public.

Objective 2. Protect, restore and enhance trout habitat.

Strategy 2.1: Continue to strongly advocate habitat protection with land and water management agencies and private landowners.

Objective 3. Provide a diversity of trout angling opportunities.

Strategy 3.1: Determine the desires and needs of anglers.

Strategy 3.2: Use management alternatives for classifying wild trout waters to provide diverse fisheries.

Strategy 3.3: Conduct an inventory of public access presently available to trout waters in the state.

Objective 4. Determine the statewide management needs for hatchery trout.

Strategy 4.1: Summarize information on the current hatchery program and determine necessary changes.

Strategy 4.2: Increase the involvement of the STEP program in the enhancement of trout.

Strategy 4.3: Publicize Oregon's trout management program through the ODFW office of Information and Education.

Oregon's Warmwater Game Fish Plan

The primary goal of Oregon's Warmwater Game Fish Plan is to provide optimum recreational benefits to the people of Oregon by managing warmwater game fishes and their habitats. The following objective and strategies were developed by ODFW to achieve this goal:

Objective 1. Provide diversity of angling opportunity

Strategy 1.1: Identify the public's needs and expectation for angling opportunity.
Strategy 1.2: Choose management alternatives for individual waters of groups of waters, and incorporate the alternatives in management plans subject to periodic public review.
Strategy 1.3: Design management approaches to attain the chosen alternative.
Strategy 1.4: Constantly remind the public of the consequences of unlawful transfers of fishes in order to reduce the incidence of the introductions.
Strategy 1.5: Inform the public as to why ODFW chooses particular management strategies, in order to establish a positive perception of warmwater game fish.
Strategy 1.6: Use existing state and federal laws and regulations to deal with illegal introductions.

Other Goals, Objectives and Strategies

The Hells Canyon Initiative

Goal:

1. To restore self-sustaining populations of Rocky Mountain bighorn sheep to suitable habitat within the Hells Canyon ecosystem, including the Middle Snake subbasin

Management actions:

1. Eliminate potential for contact between bighorns and domestic sheep through purchase or retirement of public land grazing allotments and education of private landowners.
2. Acquire land or conservation easements on private lands providing bighorn habitat within the project area.
3. Transplant bighorns into suitable vacant habitat.
4. Control noxious weeds.

Research goals:

1. Identify factor(s) limiting bighorn population growth.
2. Evaluate the roles of habitat, density, and nutrition in contributing to disease outbreaks in bighorns.
3. Identify the organisms responsible for disease outbreaks.
4. Investigate the potential for increasing bighorn immunity to introduced diseases.

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
6. Vernal Pools: Identify and protect all high quality (A and B-ranked) occurrences of vernal pools
7. Protect and maintain California bighorn sheep populations 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

No information was found or made available regarding fish and wildlife research monitoring and evaluation activities in the Lower Middle Snake subbasin. Refer to Table 20 for a description of projects that may include a RM&E component.

Statement of Fish and Wildlife Needs

The following list(s) include specific immediate or critical needs defined within the Lower Middle Snake subbasin. Needs have been defined to address limiting factors to fish and wildlife, ensure that gaps in current data or knowledge are addressed, enable continuation of existing programs critical to successful management of fish and wildlife resources, and to guide development of new programs to facilitate or enhance fish and wildlife management.

Needs have been grouped into three broad categories. Aquatic and terrestrial needs have been identified individually. Combined aquatic and terrestrial needs which apply equally to both resource groups are also presented. The order in which needs are listed in no way implies priority. Restoration efforts directed at either aquatic or terrestrial resources are likely to impact the ecosystem as a whole and aquatic and terrestrial needs are not perceived to be mutually exclusive.

Combined Aquatic and Terrestrial Needs

1. 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).
2. Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.
3. Develop and implement BMPs on agricultural, mining, grazing, logging and development activities to protect, enhance, and/or restore fish and wildlife habitat, streambank stability, watershed hydrology, and floodplain function.
4. Synthesize historic and existing fish and wildlife resource data to determine what is known about the subbasin, and identify gaps for more efficient and meaningful assessment, monitoring and evaluation work.
5. Develop and implement comprehensive and consistent subbasin databases related to both aquatic and terrestrial resources and establish a centralized data repository. This will promote more effective resource management.
6. Coordinate M&E efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
7. Continue ongoing, and establish new, monitoring and evaluation programs for population supplementation, habitat restoration and improvement, and understanding population and habitat baseline condition. Efforts should be consistent and repeatable between entities and coordinated at a subbasin scale so as to maximize effectiveness and minimize redundancy. 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.
8. Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
9. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.

10. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal and local entities as required by law.

Fisheries / Aquatic Needs

1. Replace or remove passage problems
2. Evaluate Boylan Bypass fish bypass system for applicability to Hells Canyon Dam Complex,
3. Continue coordinated collection of water temperature data throughout the Middle Snake River Province.
4. Appropriate target areas and actions should include those which will
   - Restore, protect, and create riparian, wetland and floodplain areas within the subbasin
   - Restore in-stream habitat to conditions that provide suitable holding, spawning, and rearing areas for anadromous and resident fish
   - Reduce stream temperature, sediment and embeddedness levels to levels meeting appropriate state standards
   - Restore and augment streamflows at critical times using (but not limited to) water right leases, transfers, or purchases, and improved irrigation efficiency
   - Reduce stream temperatures where appropriate and feasible
   - Reduce impacts from agricultural practices and irrigation return flows
   - Reduce the impacts of confined animals with regard to waste and sediment production
   - Reduce stormwater, road, and urban/suburban sewage impacts to aquatic resources
   - Address streambank instability issues
   - Investigate connectivity between populations and the role of natural and artificial barriers in population isolation.

Hatchery-Wild Interactions

1. Mark all hatchery fish to aid in investigations of interactions between hatchery and wild salmonids and to provide for future selective harvest opportunities.

Resident Fish

1. Assess the status of native species. In particular, bull trout and white sturgeon appear to be well below historic population levels. Collect life history, distribution, abundance by life stage, genetic and homing behavior attributes. Determine current status and major factors limiting their distribution and abundance
2. Develop and implement plans and strategies for recovery where populations of native fish are at risk of extirpation.
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 *Oncorhynchus* 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 the possible future genetic risks native *Oncorhynchus* populations face with regards to hybridization and introgression.
4. Monitor impacts of illegal, incidental, sport and tribal harvest on resident native populations. Determine distribution of introduced non-native species and their effects on native fish, including predation and competition. Control numbers and distribution of exotic species where feasible.

Bull Trout

1. Collect life history, distribution, and homing behavior information of bull trout within the subbasin, and relevant core areas.
2. Evaluate habitat connectivity and the degree of interchange between populations throughout the subbasin.
3. Monitor core populations to establish trends and measure population response to restoration.
4. Continue presence/absence surveys to locate bull trout populations.

White Sturgeon

1. Due to lack of natural reproduction and the absence of sturgeon harvest opportunities, evaluate the potential for hatchery-based sturgeon fisheries in Hells Canyon and Oxbow Reservoirs.

Redband Trout

1. Investigate the existence, life history, and genetics of redband trout in the subbasin.
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 with regards to introgressive hybridization and genetic population structure is needed to identify remaining pure populations, preserve existing genetic variability, and identify population segments for the development of management plans and the designation of conservation units/management units.

Monitoring, Evaluation and Assessment

1. Refine aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts.
2. Periodically conduct longitudinal temperature profiles (such as FLIR) to better monitor temperature changes, while conducting long-term annual monitoring at point sites.
3. Upgrade existing gaging stations or construct new stations to improve access to real-time streamflow and water temperature data and monitor improvement in flows and temperatures as habitat projects are completed

Enforcement / Education

1. Better educate the public on issues and policies important to natural resource restoration, protection, and enhancement to encourage meaningful public participation.
2. Continue and improve enforcement of laws and codes related to protection of fish, wildlife and their habitats, through coordinated conservation enforcement activities, including increased efforts for in and out-of-season poaching and in road closure areas.
3. Continue compliance and effectiveness monitoring on federal and private land use activities (i.e. mining, grazing, logging). Continue or implement enforcement of controls to ensure the protection of aquatic and terrestrial resources.

Wildlife / Terrestrial Needs

General

1. Conduct comprehensive survey of herpetiles in the subbasin
2. Conduct comprehensive survey of avian species across the subbasin
3. Construct a detailed GIS-based wildlife habitat map by watershed for the entire subbasin. This would include providing personnel and equipment to search available databases for

existing coverages, digitizing existing wildlife information currently not available in GIS format, and identifying key areas.
4. Continue to research methods for effectively controlling, the spread of noxious weeds, exotic annuals and juniper expansion
5. Research broad ecological relationships and identify limiting factors for sensitive and other wildlife species within the subbasin.
6. 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 to assess distribution, abundance, or trends of most plant and animal species in the subbasin, making it difficult to protect species or to evaluate progress toward goals stated in this summary.
7. Address and mitigate hydropower impacts on loss of wildlife and wildlife habitat within the basin, based on species-specific habitat units.
8. Continue long-term landbird monitoring.
9. Assess predator impacts on big game and gain insight into predator/prey dynamics.
10. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity and for mitigation of lost wildlife habitat (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
11. Implement and (where applicable) continue noxious weed control programs.
12. Assist landowners with land holdings and easements for restoration and enhancement of wildlife habitat.
13. Mitigate hydropower impacts on loss of wildlife and wildlife habitats.
14. Participate in threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
15. Monitor use of existing reference areas to assure consistency with the maintenance of ecologic values.
16. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.
17. Establish and maintain permanent baseline monitoring systems for priority ecosystems and species.

Bighorn Sheep

1. Identify factors limiting the bighorn population and implement management measures to increase population size.
2. Conduct research into survival and productivity relative to environmental and physiological factors.
3. Protect bighorn sheep from acquiring diseases from domestic sheep and goats and maintain habitat connectivity (purchase or retirement of domestic sheep allotments on public lands, land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).

Noxious weeds

1. Monitor the spread of and evaluate the effectiveness of noxious weed control programs.
2. Continue control programs for noxious weeds to restore natural habitat conditions and communities for wildlife species.
3. Develop an information and education stewardship program for noxious weeds.

Roads

1. Reduce road densities through closures, obliteration, and reduced construction.
2. Support planned road closures on public land and encourage closure of other roads.
3. Improve enforcement of road closures.

Loss of Nutrients

1. Implement programs to reintroduce anadromous fish carcasses to the ecosystem.
2. Support cooperative efforts that benefit both anadromous fish and wildlife populations.

Lower Middle Snake Subbasin Recommendations
Projects and Budgets

The following subbasin proposals were reviewed by the Middle Snake Provincial Budget Work 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, and strategies, and other activities in the subbasin.

Continuation of Ongoing Projects

Project: – 199800200 – Snake River Native Salmonid Assessment

Sponsor: Idaho Department of Fish and Game (IDFG)
Short Description:

Investigate population status and trends, life histories, habitat needs, limiting factors, and threats to persistence of native salmonids in the Snake River and tributaries upstream of Hells Canyon Dam in Idaho, and implement recovery/protection plans.

Abbreviated Abstract

Native resident salmonid populations are in decline throughout much of their range. Bull trout have recently been listed as threatened under the Endangered Species Act (ESA), and redband trout and Yellowstone cutthroat trout have been petitioned to be listed. This project is a multi-phased project with the goal of protecting and restoring populations of native salmonids (redband trout, cutthroat trout, bull trout, whitefish) in the Snake River Basin above Hell's Canyon Dam in Idaho to self-sustaining, harvestable levels. The objectives are to: 1) Assess stock status, population trends, and fish habitat; 2) Identify life history and habitat needs, and limiting factors; and 3) Develop, implement, and monitor the effectiveness of recovery and protection plans for populations at risk. The first phase of inventorying fish populations and their habitats should be completed by the end of FY2004.

..The objective of the first phase of the project is to assess the current distribution and abundance of existing populations of native salmonids throughout the Upper Snake River Basin, and to assess the factors that influence this status. Our study design focuses on several scales, including reach- and stream-level, watershed-level, and entire species' ranges (i.e., several subbasins taken together). Relating fish abundance and distribution to stream and adjacent habitat conditions leads directly to limiting factor analysis (Phase II). This second phase will be to identify life history and habitat needs, causes for population declines (limiting factors, threats to persistence), and opportunities for restoration. Once limiting factors have been identified, the third phase will be to use this information to develop recovery and protection plans for populations at risk. Expected outcomes are activities and resource management plans that result in the recovery, protection, and long-term persistence of native salmonids.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
	BOR Boise River bull trout population monitoring.	Provided screw trap for collecting data; helped select trap location and with installation.
	BPA proposal by IDFG for genetic testing of native salmonids.	Would be used to analyze genetic samples collected on our project to determine genetic purity and variability of native salmonids in Upper Snake River Basin.
	BPA proposal by IDFG for fish restoration on the Gold Fork River in the NF Payette River subbasin.	Would attempt to bull trout populations throughout the drainage and reconnect river corridor blocked by irrigation diversions, both of which would directly relate to the goals of our project.
	BPA proposals (three) by NRCS to improve riparian and upland habitat conditions in several watersheds in southern Idaho.	All proposals propose to restore habitat for native salmonids, and thus would compliment our efforts.
	IDFG redband trout studies in southwest Idaho	They are following same inventorying sampling protocol, and with additional studies being planned, results will be used to begin assessing limiting factors for these populations.

Relationship to Existing Goals, Objectives and Strategies

The overall goals of the project is to protect and restore native resident salmonid populations in the Snake River basin upstream of Hell's Canyon Dam in Idaho to self-sustaining, harvestable levels. This goal closely mirrors the Northwest Power Planning Council's Fish and Wildlife Program and subbasin summaries, IDFG's Fish Management Plan, and Idaho's Bull Trout Conservation Plan.

..... The 2000 Fish and Wildlife Program (FWP) makes an appeal to:

- "Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored."
- "Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health, and diversity of all species, including game fish species, non-game fish species, and other organisms."
- "Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species."

All three statements apply directly to the goals, objectives, and tasks of this project through our efforts to assess current status of native salmonids throughout the Middle and Upper Snake

Provinces (including in and around hydrosystems), and, where necessary, to develop and implement strategies designed to restore native resident fish species to self-sustaining levels.

A recurring theme throughout the subbasin summaries in the Middle and Upper Snake River Provinces is the lack of and need for information on current status of native salmonids, knowledge of specific limiting factors causing declines in population strength, and restoration plans and strategies for populations at risk of extinction or where there is a need to enhance the distribution and self-sustaining viability of existing populations.

IDFG's Fish Management Plan states that wild, native, self-sustaining fish populations are a management priority, as is the protection and restoration of habitats and water quality for these species. One of the goals of the plan is to maintain and restore wild, native fish populations.

The project also relates to the State of Idaho's Bull Trout Conservation Plan. The mission of the plan is to "maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho." The goals of the plan are to "maintain the conditions of those areas presently supporting critical bull trout habitat" and "institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout."
..The goals of this project are analogous to those of the above plans, namely to promote the long-term viability of native resident salmonids. We recognize that the key to maintaining and restoring wild, native salmonids over the long term will be to protect and restore the natural functions of the watersheds and ecosystems. Without this, habitat or population restoration activities will probably fail. Consequently, a coordinated approach involving expertise in other fields such as hydrology, geology, soil science, range and forest science will be necessary throughout the project to understand proper watershed function, identify threats to the watersheds and the fish populations in particular, and implement restoration and recovery plans. The recovery strategies implemented will follow Frissell (1993), who stated that restoration goals should: "(1) maintain options for future recovery by ensuring a secure, well-distributed, and diverse constellation of natural habitats and co-adapted populations, and local examples of natural ecosystem processes, remaining in place over the long-term; (2) Secure existing populations of aquatic species, including fishes, and maintain the critical areas supporting healthy ecosystem function; (3) Institute recovery measures that stand the greatest chance of producing measurable improvements in the status and abundance of wild fish populations, and improvements of ecosystem function, in the near term."

This project will partially mitigate for fish losses due to the construction and operation of the federal hydropower system in the Middle Snake Province, namely Anderson Ranch, Boise Diversion, and Black Canyon Dams. It will include on-site and off-site mitigation.

Review Comments

None

Budget

FY2003	FY2004	FY2005
$346,375 Category: High Priority Comments:	$360,000 Category: High Priority	$375,000 Category: High Priority

New Projects

Project: – 32003 – White sturgeon put, grow, and take fishery feasibility assessment, Oxbow/Hells Canyon Reservoirs

Sponsor: Nez Perce Tribe
Short Description:

The goal of this proposed project is to determine the feasibility of a put, grow, and take white sturgeon fishery in Oxbow and Hells Canyon Reservoirs.

Abbreviated Abstract

Subsistence fishing for white sturgeon *Acipenser transmontanus* is of great cultural significance to the Nez Perce Tribe. However, subsistence fishing by the Tribe has been severely restricted in recent years with the decline of sturgeon abundance due to hydropower development in the Columbia and Snake River basins resulting in losses of spawning habitat, reductions in anadromous prey base, and expansion of exotic game and non-game fish species. In response, the Nez Perce Tribe envisions developing a "put and take" white sturgeon fishery in Oxbow and Hells Canyon reservoirs using cultured and/or wild fish, to provide additional subsistence fishing opportunities to the Nez Perce Tribe as well as providing for the first non-tribal harvest of white sturgeon in the Mid-Snake River since 1970. The developed fishery would be an 'in kind, out of place' mitigation project, designed to mitigate for loses of white sturgeon subsistence fishing opportunities in the Columbia and lower Snake River. These reservoirs reside inside the 1855 treaty boundary within which the Nez Perce Tribe retains hunting and fishing rights. The goal of this proposed project is to determine the feasibility of a put, grow, and take white sturgeon fishery in Oxbow and Hells Canyon reservoirs.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
199902200	Assessing Genetic Variation Among Columbia Basin White Sturgeon Populations	Need genetic data to determine appropriate source of sturgeon for stocking into Oxbow and Hells Canyon reservoirs.

Relationship to Existing Goals, Objectives and Strategies

The proposed project is covered in the Council's Fish and Wildlife Program 1995 amendments to Section 10, Resident Fish. Measure 10.4A.5 calls for Bonneville Power Administration to "…fund an evaluation of a put-and-take consumptive sturgeon fishery in Hells Canyon and Oxbow Reservoirs."

In section 6.6.6.1.A of the Columbia River Fish and Wildlife Authority's Resident Fish Multi-Year Implementation Plan, regional managers identify an objective for Oxbow and Hells Canyon Reservoirs to "provide fishery opportunities for white sturgeon to the maximum extent allowable by existing habitat capacity of mainstem reservoirs given reductions caused by hydropower development and operations."

The proposed project fills existing goals, objectives and strategies identified in the draft Lower Middle Snake Subbasin Summary. The proposed project would help fulfill one of the

goals set forth by the Nez Perce Tribe which is to "conserve, restore and recover native resident fish populations including sturgeon, westslope cutthroat trout, and bull trout." The proposed project would help fulfill objectives to: (1) increase anadromous and resident fish populations through tribal, federal, and state coordinated supplementation, management, and habitat restoration; (2) restore and recover historically present fish species; (3) rebuild resident fish populations in order to restore and sustain traditional subsistence fisheries for native resident fish species; (4) develop intensive resident fishery opportunities in support of traditional Nez Perce resident fishing rights; (5) integrate the use of artificial production with other fisheries management tools in achieving the program vision; (6) protect and enhance treaty fishing rights and fishing opportunities. In addition, the proposed project is called for under the resident fish section of fish and wildlife needs section: "due to lack of natural reproduction and the absence of sturgeon harvest opportunities, evaluate the potential for hatchery-based sturgeon fisheries in Hells Canyon and Oxbow Reservoirs."

Review Comments

Although CBFWA found the proposal to be technically sound, the proposal would benefit from the inclusion of additional information. For example, CBFWA suggests that the proposal needs further documentation of the sample sizes needed and analytical methods needed to determine survival and diet. To estimate survival, CBFWA suggests the release of a larger number of fish. In addition, although the number of radio tags to be implanted seems reasonable, CBFWA is unclear as to how the sample size was determined. CBFWA suggests that estimation of abundance is key to describing the survival of these fish and recommend that investigators describe what precision they are targeting, how many fish they will need to capture and how many fish they will need to examine for marks.

CBFWA suggests that diet objectives need to either be modified to allow lethal sampling of the fish using an unbiased gear (gill nets not set lines) or eliminated from the proposal. CBFWA suggests that modified methods should include a description of sample size required and the methods that will be used to characterize the stomach contents (e.g., volume, weight, count, taxonomic order, preservation techniques, etc.). CBFWA applauds the proposed coordination with ODFW and IDFG.

Budget

FY2003	FY2004	FY2005
$356,800 Category: High Priority Comments:	$246,000 Category: High Priority	$246,000 Category: High Priority

Project: – 32010 – Lookout Mountain Road Decommissioning

Sponsor: Vale District Bureau of Land Management (BLM)
Short Description:

Decommission a portion of the Sisley Creek and Fox Creek roads totaling approximately two and a half miles, resulting in a reduction of sedimentation, enhancement of riparian vegetation, and reducing the number of stream and spring crossings in the area.

Abbreviated Abstract

This project will decommission approximately 2.5 miles of road. There are three different segments of road. One segment adjacent to Sisley Creek, which is in the Burnt subbasin, and the other segments are adjacent to Fox and Hibbard creeks, which are in the Lower Middle Snake Subbasin. Although this project is within two different Subbasins, the roads are very close together, and should be treated as one project to reduce equipment and personnel costs.

This project will reduce sedimentation by decommissioning stream bottom roads, removing culverts, and restoring native riparian vegetation adjacent to the stream channels. Decommissioning will involve subsoiling the road surface with a winged subsoiler, blocking the road to prevent vehicle and ATV traffic, and removing any culverts and/or fill from the stream crossings. All stream crossings will be re-contoured to the natural streambank and stream gradient. Where needed, rock vanes will be installed at the stream crossings to prevent head-cutting of the stream channel. The roadbed will be seeded with native grass seed and planted with native hardwoods, conifers, and shrubs.

The Sisley Creek road is approximately 1.2 miles long and crosses one perennial stream, two intermittent stream channels, and three springs. Approximately 0.25 miles of this road is within the floodplain of the creek and will be re-contoured to the natural floodplain.

One segment of the Fox Creek road is approximately 0.9 miles long. This road has one intermittent and two perennial stream crossings. This road also crosses at least two springs. The second segment of road to be decommissioned is approximately 0.4 miles long between Fox Creek and Hibbard Creek. This road has one perennial stream crossing and also crosses numerous hillside springs.

Relationship to Other Projects

Project #	Title/Description	Nature of Relationship
	No direct relation to any other BPA funded projects. There are currently no projects in the Burnt Subbasin	
	BLM ongoing restoration in Lookout Mountain area.	The BLM is currently preparing an Environmental Impact Statement for management of the Lookout Mountain area. Some restoration, such as planting riparian areas, has been occurring with the help of volunteers and Challenge Cost Share programs.

Relationship to Existing Goals, Objectives and Strategies

This project is related to numerous objectives listed in the draft Burnt Subbasin Summary and the draft Lower Middle Snake Subbasin Summary. Existing goals, objectives, and strategies are included under multiple subbasin cooperator headings. Examples of objectives and strategies outlined in the subbasin summaries that are related to this project include: (1) restore riparian habitat by revegetating streambanks with native vegetation; (2) restore water quality; (3) restore stream channel integrity, channel processes, and sediment regimes under which riparian and aquatic ecosystems developed; and (4) reducing stream sedimentation by identifying and fixing road-related sources of sediment.

Specific fisheries/aquatic needs identified as critical or needing immediate attention include: restore, protect and create riparian, wetland and floodplain areas within the subbasin; reduce stream temperature, sediment and embeddedness levels to levels meeting appropriate state standards; reduce road impacts to aquatic resources; and address streambank instability issues.

In addition to aquatic impacts, Table 18 in the Lower Middle Snake Subbasin Summary points out thirteen associated factors to wildlife due to roads, including snag reduction, down log reduction, and habitat loss and fragmentation.

This project can help alleviate some of the limiting factors identified in the subbasin summaries. Loss of quality habitat and habitat degradation are overriding limiting factors to fish and wildlife in the Burnt and Lower Middle Snake Subbasins. In the Snake River tributaries (where Fox and Hibbard creeks are found), the limiting factor to tributary habitat is also degraded riparian habitat. Road related activities are identified as some of the ongoing impacts causing negative effects to resident fish habitat

Review Comments

The sponsor indicates that the project proposal can help alleviate some of the limiting factors identified in the subbasin summaries. Loss of quality habitat and habitat degradation are among the overriding factors limiting fish and wildlife populations in the Burnt and Lower Middle Snake subbasins. In the Snake River tributaries, the limiting factor to tributary habitat is also degraded riparian habitat. Road related activities are contributory to on-going negative impacts to resident fish and their habitats. CBFWA suggest that decommissioning of roads along riparian areas with reclamation seems like a reasonable approach to improve habitat conditions for native resident fishes; however, CBFWA questions prioritizing BPA funding for this type of work sponsored by the US BLM on BLM administered land to correct previous BLM sponsored actions. Potential actions to address native fish habitat needs are virtually endless. Where does the BPA responsibility to mitigation for hydrosystem impacts end and the responsibilities of others begin?

Budget

FY2003	FY2004	FY2005
$49,150 Category: Recommended Action Comments:	$6,500 Category: Recommended Action	$6,500 Category: Recommended Action

Research, Monitoring and Evaluation Activities

BPA-funded research, monitoring and evaluation activities:

- Idaho Department of Fish and Game's (IDFG) 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.

Other research, monitoring and evaluation activities:

- Idaho Power is currently conducting and/or completing a suite of studies pertinent to the FERC Hells Canyon Complex Relicensing process. Below is a listing of a portion of those studies. Many of these study reports are available in draft form from the company's website; final documents will be available to the public when Idaho Power submits its relicensing application later this year.
- Feasibility of Reintroduction of Anadromous Fish Above or Within the Hells Canyon Complex
- Hells Canyon Complex Resident Fish Study
- Conceptual Design for White Sturgeon Passage Facilities at the Hells Canyon Complex
- Differentiation of *O. mykiss* Associated with the Hells Canyon Complex Using Allozyme Electrophoresis
- Benthic Macroinvertebrates of Hells Canyon
- An Investigation of Avian Communities and Avian-Habitat Relationships in the Hells Canyon Study Area
- Migrant Shorebird Use of Mudflats along Brownlee Reservoir
- Spring Distribution and Relative Abundance of Upland Game Birds in Hells Canyon
- Improvements, Habitat Use and Population Characteristics of Mountain Quail in West-Central Idaho; Big Canyon Creek
- A Landscape-level Habitat Assessment for Mountain Quail in Hells Canyon
- Ecology of Chukars and Gray Partridge in the Reservoir's Reach of the Hells Canyon Complex
- Peregrine Falcon Surveys in Hells Canyon
- An Evaluation of Avian Electrocution at Transmission Lines Associated with the Hells Canyon Hydroelectric Complex
- Contaminant Evaluation for the Brownlee Reservoir, Snake River Basin, Idaho
- A Description of the Small Mammal Community (orders *Rodentia* and *Insectivora*) in the Hells Canyon Study Area
- Small and Medium-Sized Mammals of the Hells Canyon Area of the Snake River in Idaho/Oregon
- Medium-sized Mammal Resources in the Hells Canyon Study Area
- A Habitat Survey for the Idaho Ground Squirrel
- A Description of Bat Community in Hells Canyon

- Description and Relative Abundance of Mammalian Carnivores in Hells Canyon
- Mule Deer Population Survey in Hells Canyon
- Delineation and Assessment of Big Game Winter Range Associated with the Hells Canyon Hydroelectric Complex: Mule Deer, Elk, Mountain Goats, and Rocky Mountain Big Horn Sheep
- Distribution and Abundance of Mountain Goats in Hells Canyon
- Reptile and Amphibian Occurrence, Distribution, and Relative Abundance in the Hells Canyon Study Area
- Distribution of Sage and Sharp-tailed Grouse in Hells Canyon
- An Assessment of Sage Grouse and Sharp-tailed Grouse Habitat in Transmission Line Corridors Associated With the Hells Canyon Hydroelectric Complex
- Summer Surveys of Waterfowl Broods in Hells Canyon
- Wintering Waterfowl in the Hells Canyon Study Area
- A Survey of Nesting Colonial Waterbirds in the Hells Canyon Study Area
- A Description of the Raptor Nesting Community in the Hells Canyon Area
- Distribution and Abundance of Wintering Bald Eagles in Hells Canyon
- Habitats of Bald Eagles Wintering in Northeastern Oregon and Adjacent Areas of Idaho and Washington
- Effects of Water Level Fluctuations on Riparian Habitat Fragmentation
- Shoreline Erosion in Hells Canyon
- Influence of Roads in the Hells Canyon Complex Area on Wildlife and Botanical Species of Concern
- Effects of Constructing and Operating the Hells Canyon Complex on Wildlife Habitat
- Inventory of Rare Plants and Noxious Weeds Along the Snake River Corridor in Hells Canyon -- Weiser, Idaho to the Salmon River.

Other monitoring activities:

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

Needed Future Actions

Fish Passage – Conduct studies to assess the feasibility of reintroducing anadromous fish to the area above the Hells Canyon Complex.

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.

Table 21. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	**199800200**	**32003**	**32010**
Provincial Team Funding Recommendation	**High Priority**	**High Priority**	**Recommended Action**
Maintain and restore wild, native fish populations.	+		
Maintain the conditions of those areas presently supporting critical bull trout habitat	+		
Develop and implement plans and strategies for recovery where populations of native fish are at risk of extirpation	+		
Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout	+		
Due to lack of natural reproduction and the absence of sturgeon harvest opportunities, evaluate the potential for hatchery-based sturgeon fisheries in Hells Canyon and Oxbow Reservoirs		+	
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	+		
Increase anadromous and resident fish populations through tribal, federal, and state coordinated supplementation, management, and habitat restoration		+	
Restore and recover historically present fish species	+	+	
Rebuild resident fish populations in order to restore and sustain traditional		+	

Project Proposal ID	199800200	32003	32010
subsistence fisheries for native resident fish species			
Develop intensive resident fishery opportunities in support of traditional Nez Perce resident fishing rights		+	
Integrate the use of artificial production with other fisheries management tools in achieving the program vision		+	
Protect and enhance treaty fishing rights and fishing opportunities		+	
Restore riparian habitat by revegetating streambanks with native vegetation			+
Restore stream channel integrity, channel processes, and sediment regimes under which riparian and aquatic ecosystems developed			+
Reduce stream sedimentation by identifying and fixing road-related sources of sediment			+
199800200 – Native Salmonid Assessment Project			
32003 - White sturgeon put, grow, and take fishery feasibility assessment, Oxbow/Hells Canyon Reservoirs			
32010 - Lookout Mountain Road Decommissioning			

Note: + = potential or anticipated effect on subbasin objectives.

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