# Draft

# Snake Hells Canyon Subbasin Summary

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Prepared for the Northwest Power Planning Council

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

# Snake Hells Canyon subbasin Summary

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# Snake Hells Canyon Subbasin Summary

## Introduction

The Snake Hells Canyon Subbasin Summary has been developed as part of the rolling provincial review process developed by the Northwest Power Planning Council (NWPPC) in February 2000 in response to recommendations by the Independent Scientific Review Panel (ISRP) and the Columbia Basin Fish and Wildlife Authority (CBFWA). This summary is an interim document that provides context for project proposals during the provincial reviews while a more extensive subbasin plan is developed.

The Snake Hells Canyon subbasin is on one of four subbasins within the Blue Mountain Ecoprovince, one of the eleven ecoprovinces in the Columbia basin (Figure 1). The process of developing a Subbasin Summary was initiated as part of the provincial review process, at a March 27, 2001 meeting in La Grande, Oregon.

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 needing to intensively research and integrate past data.

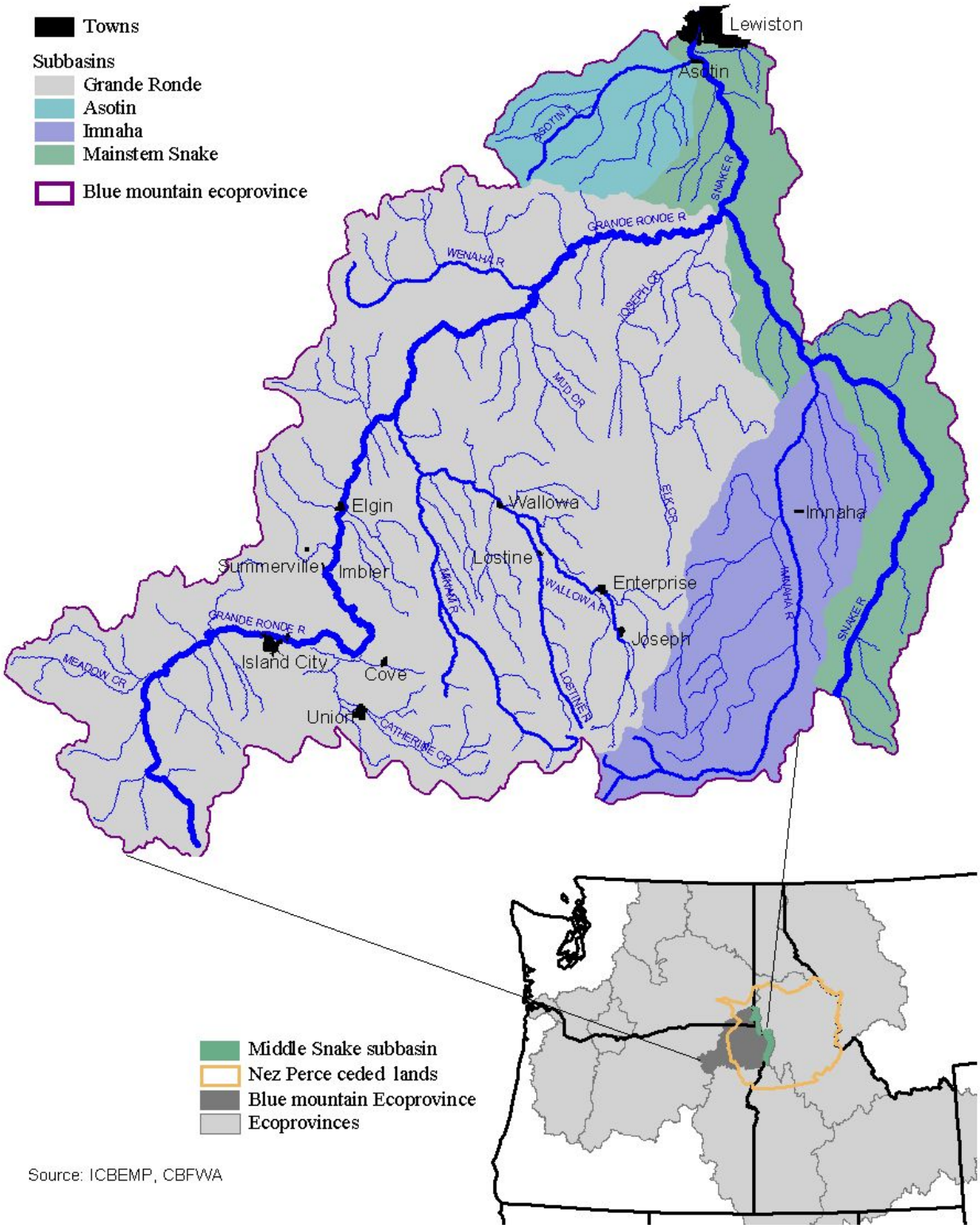


Figure 1. Location of the Snake Hells Canyon subbasin in the Blue Mountain Ecoprovince

## Subbasin Description

### General Description

#### Subbasin Location

The Snake Hells Canyon subbasin includes the mainstem of the Snake River and the small tributaries that flow into it, as the Snake flows from Hells Canyon dam to the mouth of the Clearwater River at Lewiston, a length of 109 miles (RM 247 to RM 138) (Figure 2). The Snake River forms the border between Oregon and Idaho for the upper 71 miles of the subbasin and the border between Washington and Idaho for the lower 38 miles. The subbasin contains 924 square miles, or 591,519 acres. About 58% of this area falls in Idaho, 28% is in Oregon and the remaining 14% is in Washington. The subbasin contains part of five counties: Adams, Idaho, and Nez Perce in Idaho; Asotin in Washington; and Wallowa in Oregon. The lower portion of the subbasin contains the town of Asotin and portions of Clarkston and Lewiston, the remainder of the subbasin is either rural or undeveloped. The Salmon, the Imanaha, the Grande Ronde, Asotin Creek, and the Clearwater rivers are major tributaries that join the Snake in the Snake Hells Canyon subbasin. These rivers drain a combined area of 19,280 square miles (12,339,200 acres) and dramatically influence the water quality and hydrologic conditions in the Snake River. Also included in this document are discussions of Ten Mile and Couse creeks, two Snake River tributaries occurring in Asotin County that are also discussed in the Asotin Creek subbasin summary (Johnson et al. *in preparation*).

Archeological evidence suggests that the Snake Hells Canyon subbasin has been inhabited by American Indians for the last 7,100 to 10,000 years. The subbasin's realitively mild winters, lush forage and plentiful wildlife made it a particularly attractive home. It was consistently inhabited by the Nez Perce and frequently visted by the Shoshone-Bannock, Northern Paiute and Cayuse Indians. The canyon's rock walls were an ideal canvas for ancient pictographs and the inaccessibility of the subbasin has aided in their preservation. The unique geology and inaccessibility of the subbasin have made it a place of extreme cultural significance (Wallowa-Whitman National Forest 1999). The entire subbasin is within the lands ceded by the Nez Perce tribe to the federal government under the Treaty of 1855, and the tribe maintains treaty rights to fish, roots and berries, hunting and the right to pasture horses and livestock in this area (Figure 2).

#### Climate

Climatic conditions in the Snake Hells Canyon subbasin are moderated by marine air moving up the Columbia River from the Pacific Ocean, however the 300 mile distance from the coast and the barrier provided by the Cascade mountains introduce many continental characteristics (Moseley and Bernatas 1991). Summers in the river canyon tend to be hot (mean temperatures of 80 - 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 (Cassier 1995). Precipitation comes in the form of short intense summer storms and longer milder winter storms (IDEQ and ODEQ 2001). Between 1961 and 1990 the average annual precipitation measured near Lewiston was 12.4 inches. The maximum annual precipitation recorded at this location during the same time period was 15.4 inches. Precipitation patterns do not change dramatically as you follow the river upstream: measurements taken at Weiser, a small town 225 miles upstream from Lewiston and 109 miles upstream from Hells Canyon Dam, indicate little change in precipitation patterns from those measured at Lewiston.

Between 1961 and 1990 the average annual precipitation measured at Lewiston was 11.3 inches. The maximum annual precipitation recorded at Weiser during this period was 16.3 inches (IDEQ and ODEQ 2001). Precipitation patterns do change dramatically with elevation increases in the subbasin. Data generated by the PRISM project indicates that the highest average annual precipitation of 51 inches per year occurs in the Seven Devil's mountains, the highest elevation area of the subbasin (Daly et al. 1997) (Figure 3). Above 5,000 feet, more than 70 percent of the annual precipitation is in the form of snow (IDEQ 1998).

### Topography

Elevations in the Snake Hells Canyon subbasin are highly variable, ranging from a low of 218 meters (715 feet) at its confluence with the Clearwater River (RM 139.3) to more than 2860 meters (9,384 feet) in the peaks of the Seven Devil's mountain range (Figure 4). He Devil Mountain, the tallest of the Seven Devils, towers almost 8,000' above the river below, creating the deepest gorge in the United States (Wallowa-Whitman 2001). The canyon averages 10 miles across. "The upper part of the subbasin is characterized by an elevated mountainous mass cut by the deep canyons of the Snake and Salmon rivers. To the north is a gently undulating plateau of 3,000 feet to 5000 feet in elevation" (WDFW et al. 1990).

### Geology

The formation of Hells Canyon is one of the most interesting geologic stories in North America. Major events begin in the Pennsylvanian period, about 300 million years ago (mya) when a volcanic island arc was accreted to the North American continent (Vallier 1998). The resulting formations containing volcanic, sedimentary and metamorphic rocks are part of Seven Devils Group (Orr and Orr 1996). The lithology of the Seven Devils Group includes *argillite/slate, sandstone, mud/siltstone, interlayered meta-sedimentary, mafic meta-volcanic* and *granitic gneiss*. This group of rocks forms much of the bedrock the river currently cuts through at the bottom of Hells Canyon and is an important influence on channel morphology and habitat (Hubbard 1956).

Jurassic and Cretaceous (160-120mya) *calc-alkaline intrusive* granite associated with the Idaho batholith form the high peaks of the Seven Devils Mountains and outcrops in various locations around Sheep Creek, Triangle, Cactus and Craig Mountains (Vallier and Brooks 1987). The granite tends to weather into coarse granular sediment forming grussic, non-cohesive soils that are prone to slope failure and mass wasting at higher elevations (McClelland et al 1997).

The most dominating rock-type in the Hells canyon is the *mafic volcanic flows* from the early Miocene (17.5-15 mya) Columbia River Basalt Group (Hooper and Swanson 1990). Many layers of lava form bench topography with cliff-faced rock outcrops intermixed with soils on the steep mid to upper slopes of the canyon (Figure 5). Basalt is prone to rockslides and forms many colluvium and *alluvium* deposits throughout the canyon and is therefore a major contributor of gravel and cobbles into the Snake River.

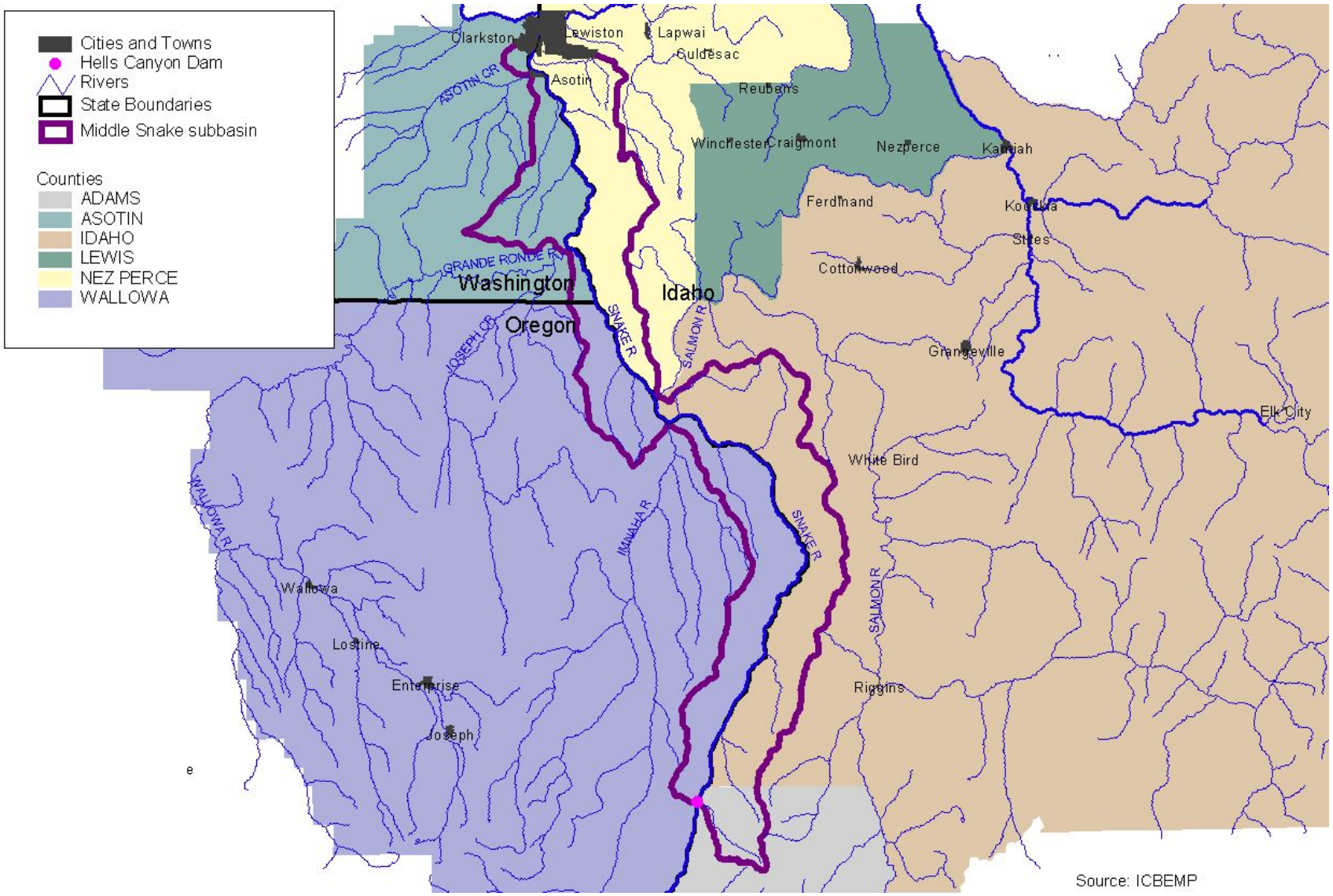


Figure 2. Location and major features of the Snake Hells Canyon subbasin

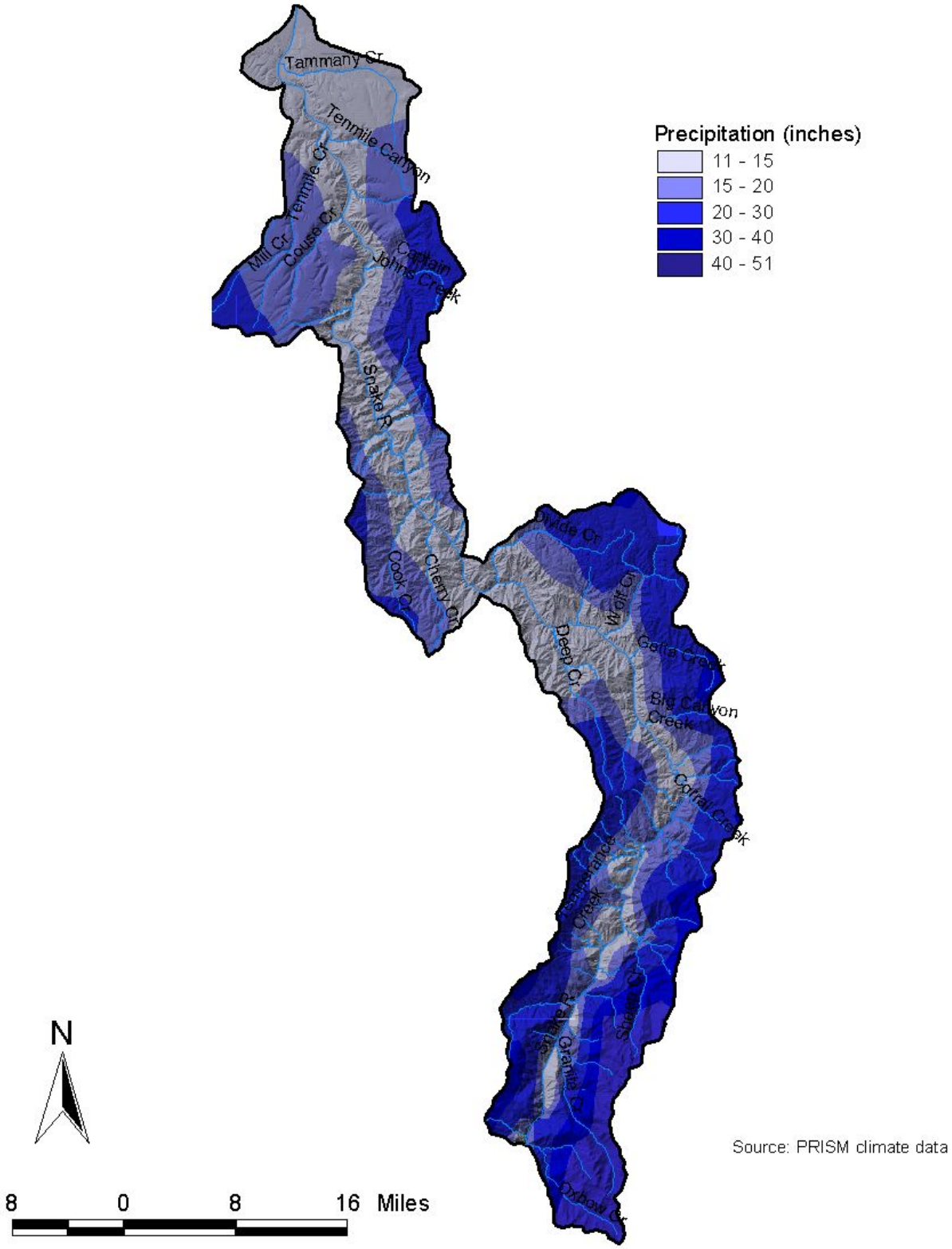


Figure 3. Precipitation patterns in the Snake Hells Canyon subbasin

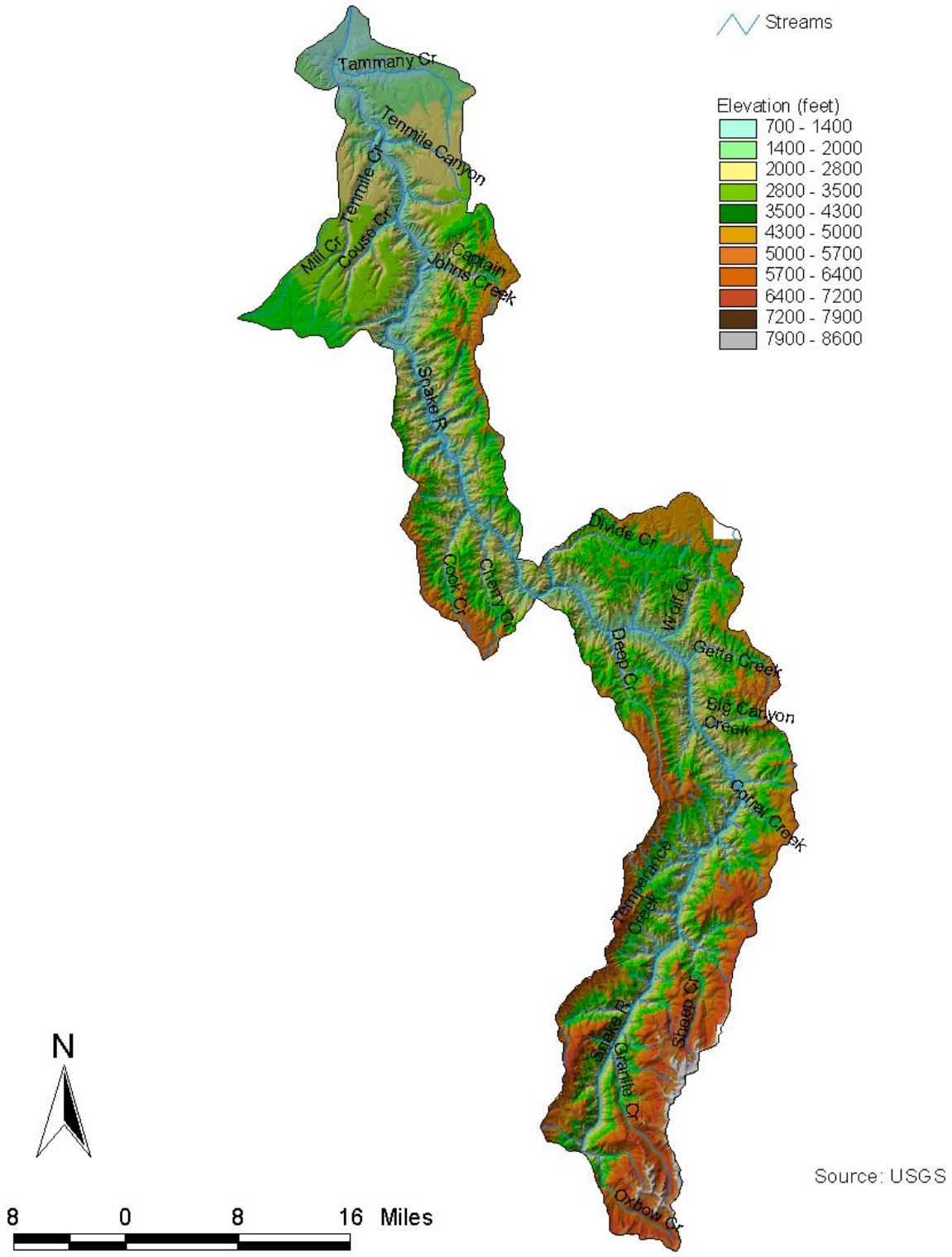


Figure 4. Topography and elevation in the Snake Hells Canyon subbasin

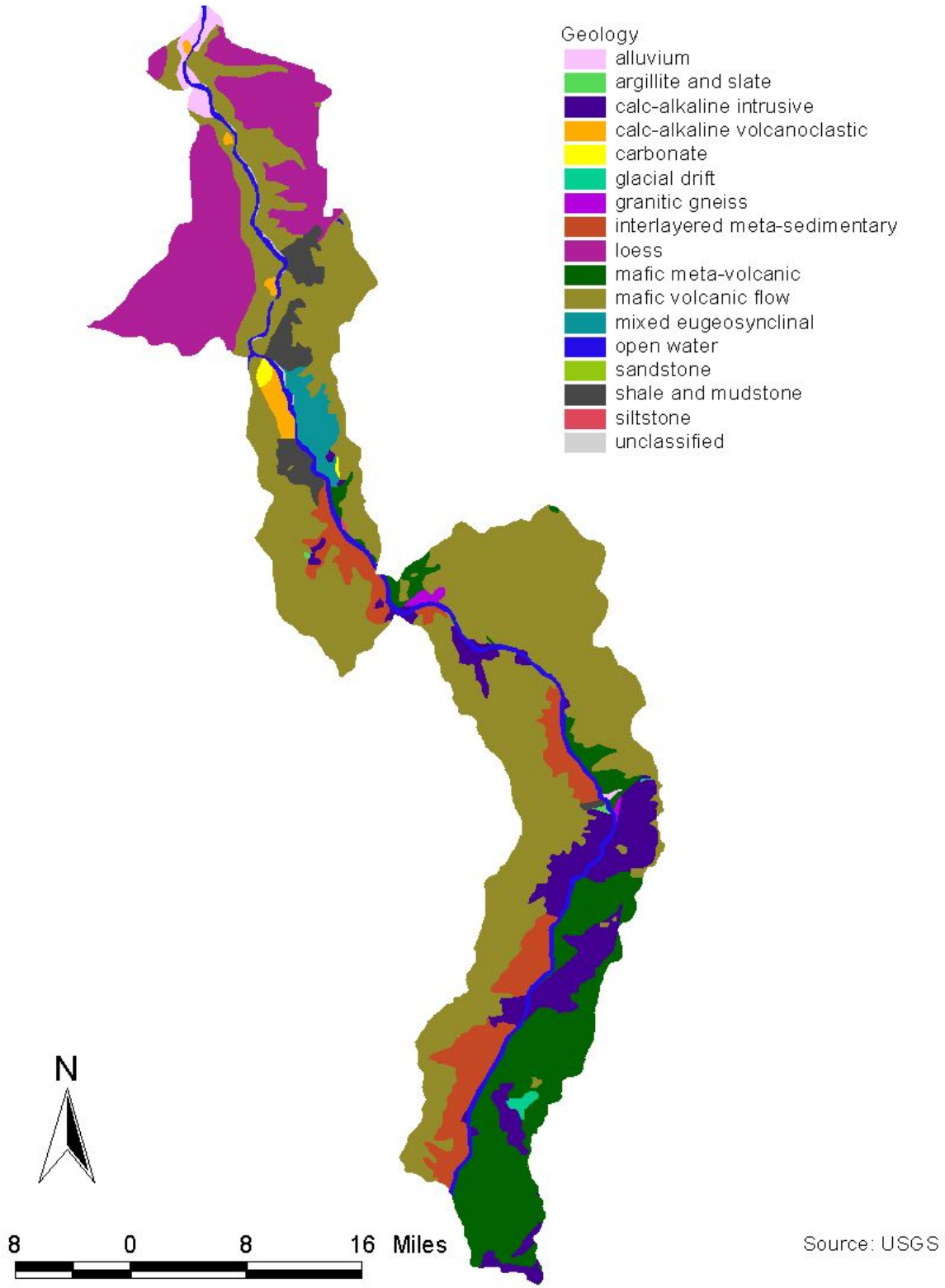


Figure 5. Geology of the Snake Hells Canyon subbasin

The most important events to shape Hells Canyon began about 13 million years ago when lava flows to the south dammed the Snake River, forming paleo-Lake Idaho, 150 miles long and 50 miles wide (Orr and Orr 1996). During this time the Snake River was a tributary to the Salmon River north of Oxbow dam. The mountain building of the Northern Rockies, which began sometime in the past 6 million years and still continues, uplifted the mountains to their current elevations causing rivers and streams to rapidly incise the landscape, forming the many canyons and gorges throughout the region (Orr and Orr 1996). Headward erosion of the Snake River in the southward direction cut through the lava dam, emptying Lake Idaho about two million years ago. The enormous amount of water spilling into the Snake River greatly increased the downcutting of the Hells Canyon, undercutting the Salmon River, making it a tributary to the Snake River at the same time (Vallier 1998).

The over-steepened side slopes of Hells Canyon caused many 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 (14.5ka) the Bonneville flood swept down through the Snake River, further steepening canyon slopes, creating terraces and depositing gravels (Vallier 1998).

### Soils

Soils within Hells Canyon influence erosion and sedimentation into the Snake River and it's 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 receiving different precipitation, 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.

Grassland soils called Mollisols are the dominant soil type in Hells Canyon (Figure 6). There are many variations of this soil, because it forms over the wide variety of conditions that exist throughout the canyon. However, the most common sub-type forms in a semi-arid environment and contains a clay-rich subsurface horizon. The grassland soils near Lewiston, Idaho at lower elevation with less precipitation are noted for having lime hardpans with some soils having natric or sodic horizons. In the higher elevations along the ridges of the Craig Mountains on the Idaho side of the canyon, clay rich grassland soils grade into Alfisols. These soils often have an organic litter layer that protects them from surface erosion when left undisturbed.

In the area of the Seven Devils Mountains above 7,000 feet elevation, cold temperatures and recently exposed bedrock have severely restricted soil development and submature, coarse-grained, grussic soils called Inceptisols formed from granite and on the glacial till found in the area (USDA Forest Service 1981b). These soils are non cohesive and prone to slope failure. Volcanic ash deposited over the whole region accumulated deep enough in the upper elevations on the Oregon side to form ashy soils called Andisols. These soils have a wide variety of properties and erodibility is difficult to assess.

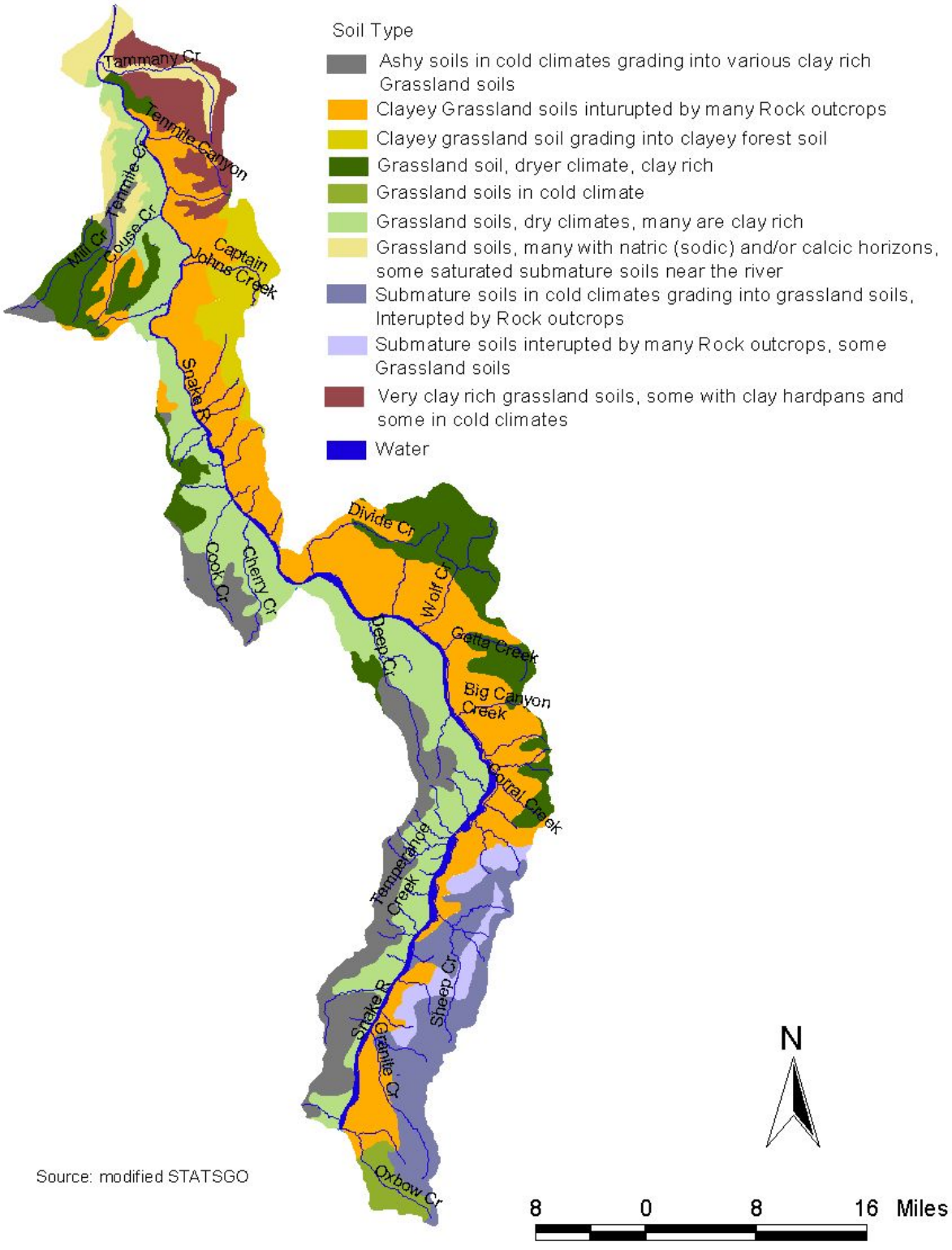


Figure 6. Soils of the Snake Hells Canyon subbasin

#### Erosion and Erosion Hazards within Hells Canyon

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 along with 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 protective cover of grassland and shrub steppe vegetation along with 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 in the bench topography, evidently some soil creep has taken place because deep current soils overly 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 many 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 anytime, and is a source for sedimentation into streams. Undercutting by stream erosion or road construction has increased instability and movement on these deposits (Vallier 1994).

Rockslides in Hells Canyon and large falling rocks 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 many thousands of years, sedimentation from fine material from more recent modern influences is still a large concern.

### Hydrology

Hydrological features of the Snake Hells Canyon subbasin may best be described by dividing the reach into two sections: the lower section, which extends below the confluence of the Salmon River to the Clearwater River and the upper section, which extends upriver from the confluence of the Salmon to Hells Canyon Dam.

The lower section flows 50 miles from the mouth of the Salmon River (river mile 188) to the mouth of the Clearwater River (river mile 138). This segment of river is regulated by Hells Canyon Dam (river mile 247.0), and large contributing tributary rivers, which include the Clearwater and Grande Ronde rivers. Lower order tributaries joining the Middle Snake in this reach include Asotin Creek, Tammany Creek, Redbird Creek, and several other streams, many of which flow only during periods of runoff. The Clearwater River contributes approximately 30% of the total flow of the Snake at that point. Water discharge records are from a U.S. Geological Service (USGS) discharge station located 1.2 mile downriver from the Grande Ronde River (period of record 1958-1997) (Figure 8). The average annual discharge is 35,900 cfs; highest daily mean is 191,000 cfs (maximum 195,000 cfs - June 18, 1974); and lowest daily mean is 6,630 cfs (minimum 6,010 - September 2, 1958). High flows average 80,000-140,000 cfs, and

mean low flows generally range from 8,000-15,000 cfs. Stream flows follow a pattern of low flows during the late summer and fall months and high flows in the spring and early summer months. The lowest portion of the subbasin includes several miles of the Lower Granite Reservoir, which extends upstream to Asotin at RM 146.8. With three major dams upstream—Brownlee, Oxbow and Hells Canyon—water levels fluctuate daily and weekly to generate power, and are seasonally impacted to moderate flooding and provide water for irrigation.

The upper section of the Middle Snake flows 58.8 miles from Hells Canyon Dam (river mile 247.0) to the mouth of the Salmon River (river mile 188.2). This segment of river is dam regulated by Hells Canyon dam (river mile 247.0). The largest tributary in this river segment is the Imnaha River (river mile 191.7). Water discharge records are from a USGS discharge station located 0.6 mile downriver from Hells Canyon Dam (period of record 1966-1997). The average annual discharge is 20,650 cfs; highest daily mean is 98,100 cfs (maximum 103,000 - January 2, 1997); and lowest daily mean is 4,360 cfs (minimum 4,360 cfs - May 8, 1977) (Figure 7).

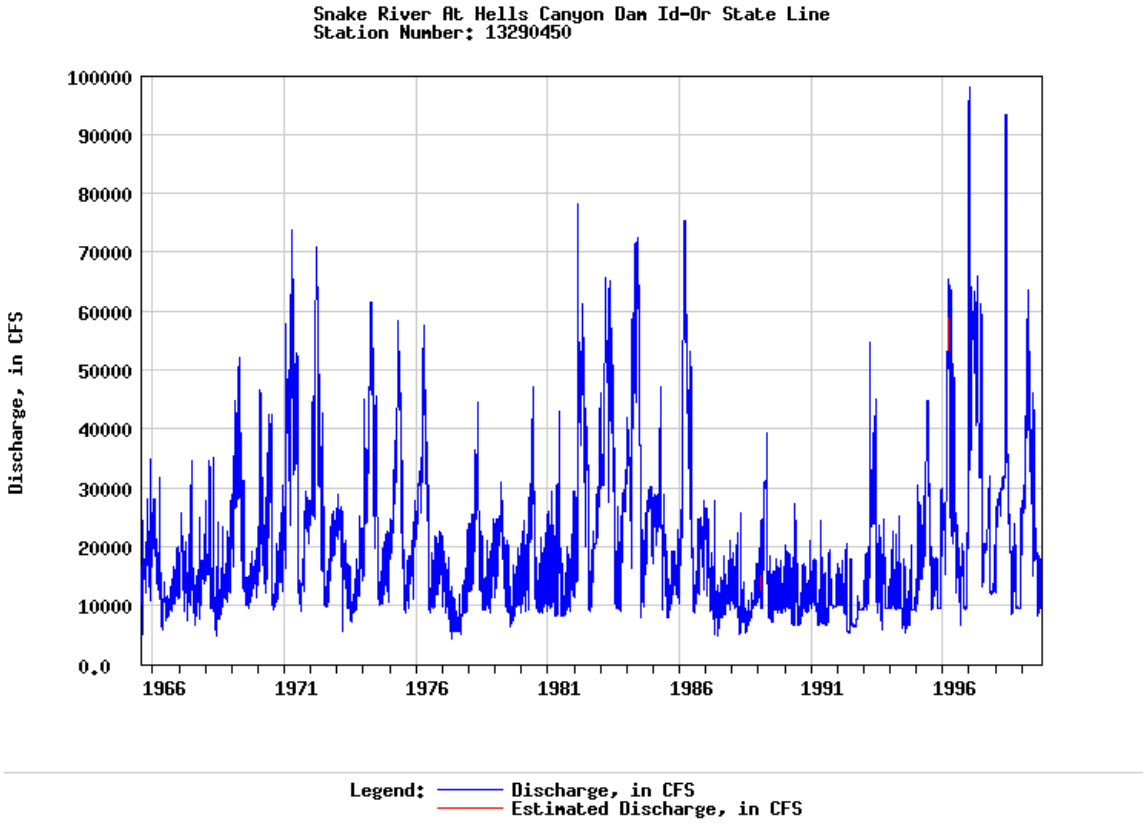


Figure 7. Average daily flows measured at Hells Canyon Dam gage #13290450 (1966-1997)

Mean high flows generally range from 60,000-80,000 cfs, and mean low flows generally range from 7,000-10,000 cfs. Currently, Hells Canyon Dam discharge is maintained at 10,000 cfs minimum discharge during fall chinook salmon spawning/incubation periods. Stream flows follow a pattern of low flows during the late summer and fall months and high flows in the spring and early summer months.

More than 95% of total inflow into the subbasin down to the Salmon River is contributed from upstream flows through Hells Canyon Dam (Figure 8) (IDEQ and ODEQ 2001). These flows are heavily influenced by upriver water uses. The Hells Canyon complex provides irrigation storage for more than 3.5 million acres of lands upstream of Brownlee Dam for a total estimated annual consumptive use of 6-8 million acre-feet (IDEQ and ODEQ 2001). Currently, high flows are not usually as high as those recorded in the early 1900s and in most areas average low flows are not generally as low. Although the volume of water that passes through the subbasin annually has not changed substantially, the timing of flows has been altered by Hells Canyon Dam complex.

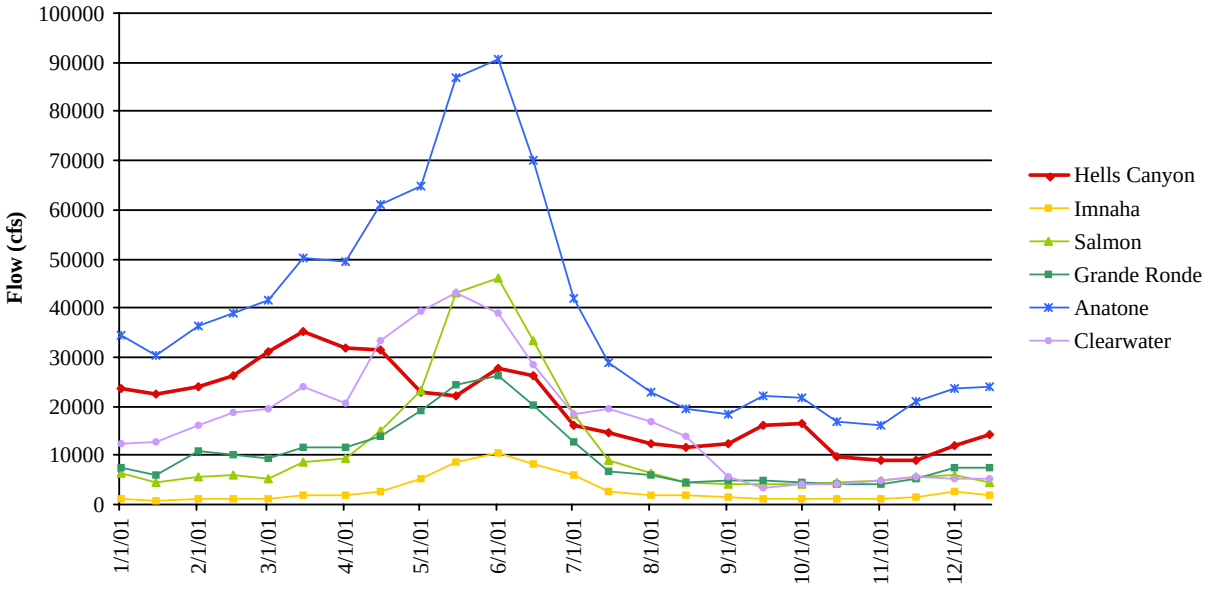


Figure 8. Flow in the Snake (Hells Canyon and Anatone gages) and contributing flow from four main tributaries

Water releases through Hells Canyon Dam cause the Snake to flucuate dramatically each day due to the effects of power peaking (Figure 9, Figure 10, Figure 11) (USGS 2001). These effects are most pronounced above the confluence with the Salmon River (Kern 1976). Above the Salmon River, these fluctuations cause severe enough disturbances to vegetation to prevent the establishment of more than early successional plants within the zone of fluctuations. The flow of the Salmon River moderates the impacts of the flow enough to allow more complex vegetative communities below the confluence (Kern 1976).

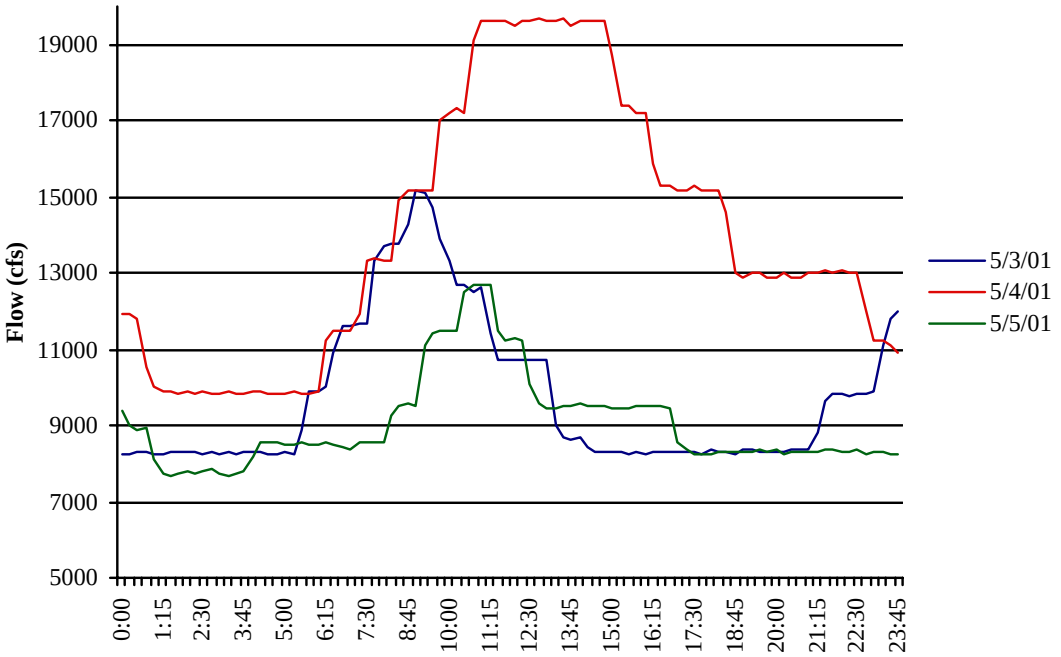


Figure 9. Daily Flow Fluctuations at Hells Canyon Dam for 3 days in March 2001

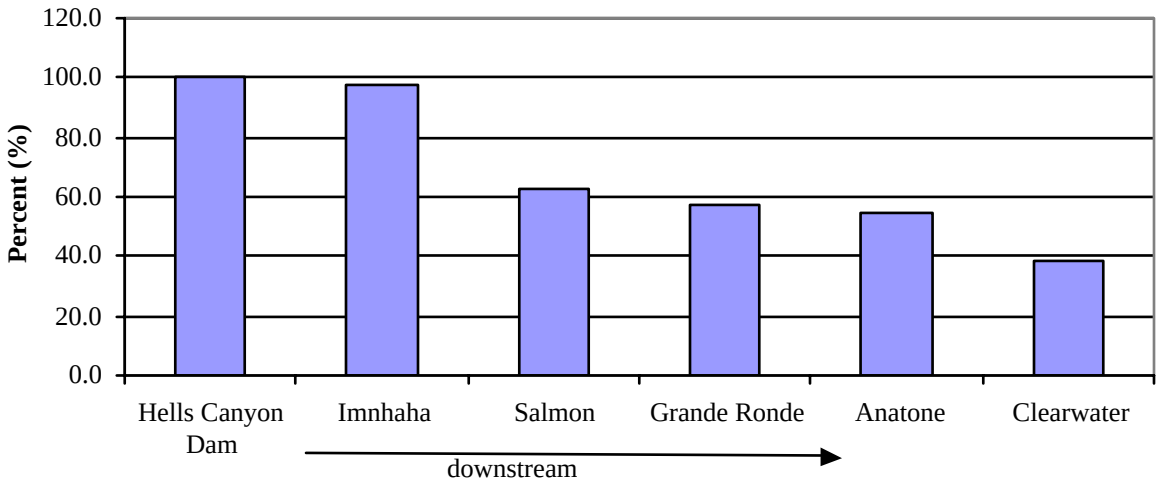


Figure 10. Percent Contribution of Flow from Hells Canyon Dam at various points in the Snake Hells Canyon subbasin

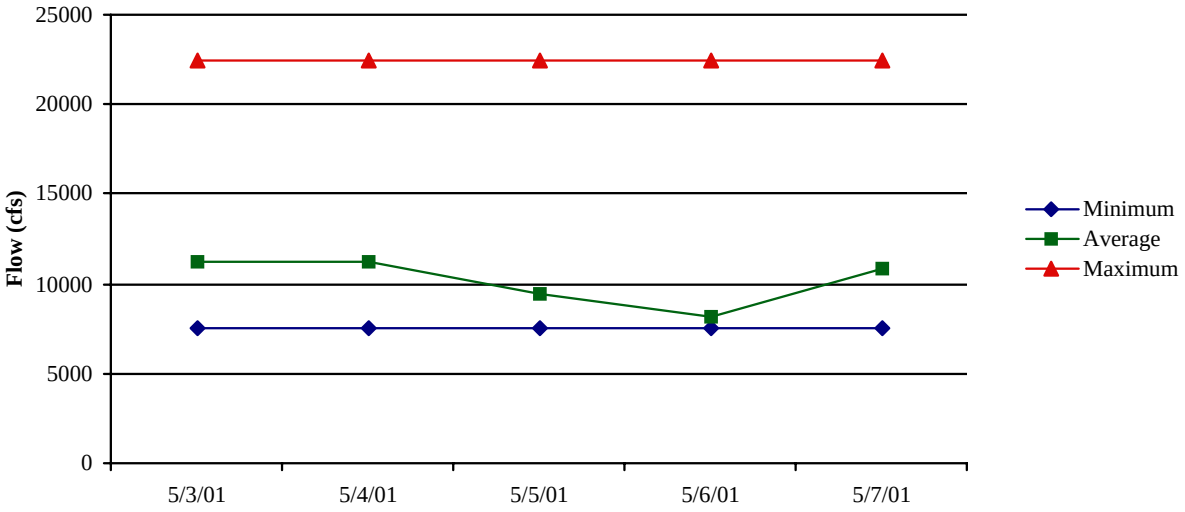


Figure 11. Minimum, mean and maximum daily flows at Hells Canyon Dam gage #13290450 for 5 days in May 2001.

The Federal Energy Regulatory Commission (FERC) relisensing for the Hells Canyon Complex is currently underway. IPCo expects to file a draft FERC liscense application in 2002. The final lisence application will be filed on or before July 3, 2003. In addition, section 401 of the Clean Water Act requires IPCo to file for certification with the states of Idaho, Oregon, and Washington. (IDEQ and ODEQ 2001).

## Water Quality

Very little water quality information exists for the Snake Hells Canyon subbasin. Water quality data, including temperatue, flow, conductivity, oxygen, oxygen saturation, pH, suspended solids, total persulfate nitrogen, ammonia nitrogen, total phosphorus, dissolved soluble phosphorus, turbidity, fecal coliform, and nitrate-nitrite is collected by the Washington Department of Ecology at the Snake River station (#35A150) just above the confluence of the Clearwater River.

In the mainstem, above and below the confluence with the Salmon River, water quality is generally excellent (IDEQ 1998). It fully supports all beneficial uses identified for the river (recreation, primary and secondary contact recreation, salmonid spawning, domestic water supply, agricultural water supply, and cold water biota). Elevated summer water temperatures are not optimum for salmonid rearing conditions and high sediment concentration occur during high flow events (IDEQ 1998; WDFW et al. 1990).

### 303(d) listed segments

Section 303(d) of the Clean W ater 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 section 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.

Water quality in the Snake Hells Canyon subbasin is subject to the different criteria of

three states (Table 1). Idaho, Washington and Oregon each 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 due to the water mixing at the state line in the middle of the river (IDEQ and ODEQ 2001).

#### Temperature

"Data collected roughly monthly from 1975 to 1991 by the USEPA in the Downstream Snake River segment at RM 247 (below Hells Canyon Dam) show temperatures ranging from 1° C in January, 1979 and 1985 (air temperature at -4.5° C and 2°C respectively) to 24 °C in July, 1975 and September, 1987 (air temperature at 35°C and 30°C respectively). When compared to the 13°C absolute maximum temperature target identified by the SR-HC TMDL for salmonid spawning in interstate waters (because these are instantaneous data, there is no way to determine an average) the data show that the target was routinely not met during September (82%) and October (47%). Targets were not met in November only 7% of the time. Roughly 22% of all available data show temperatures above 17.8°C (all occurring during late July, August or September). Roughly 1% of all available data show temperatures above 22°C (all occurring in July or September). This set contained 148 data points. These data were collected over a variety of seasonal variations, but do not represent continuous monitoring" (USEPA 1975 cited in IDEQ and ODEQ 2001).

The average winter season temperature of inflowing water from Hells Canyon Dam is approximately 6°C (43°F), and the average summer temperature for inflowing water is 20°C (68°F) (IDEQ and ODEQ 2001). Water temperatures at RM 192 (just above the confluence with the Imnaha River) are warmer in the summer and cooler in the fall than just below Hells Canyon Dam (Anderson 2000). Daily maximum and minimum temperatures have a wider range and greater variance with greater distance from Hells Canyon Dam. IDEQ and ODEQ (2001) found that water temperatures in the Snake generally decrease by an average of 3°C during the summer between Hells Canyon Dam and the Salmon River. Anderson (2000), however, found that water temperatures changed by approximately 10% of the difference between air and water temperatures between Hells Canyon Dam and the Salmon River, warming about 1°C as it flowed through the canyon during summer. Anderson also found that during the summer, the outflow from Hells Canyon Dam may be either warmer or cooler than water temperatures measured in primary Snake River tributaries. This means that the tributaries can either warm or cool the Snake River (Anderson 2000). Downstream temperatures in the Snake River, recorded just above the confluence of the Clearwater River at the Washington Department of Ecology station #35A150, regularly fail State water quality criteria during summer months (July-September) (Figure 12). Although flow datasets for 1999-00 are incomplete, it does not appear that flow and temperature are correleated ($\rho\, x_1,x_2 = -0.09$).

Table 1. 303d listed stream segments Snake Hells Canyon subbasin

| Listing State | Segment | 303d listed parameters | Designated beneficial uses |
|---|---|---|---|
| **Idaho** | Snake River-Hells Canyon Dam downstream to confluence with Clearwater River | not listed | cold water biota salmonid spawning primary contact recreation domestic water supply |
| **Idaho** | Divide Creek | Sediment | |
| **Idaho** | Wolf Creek | Sediment | |
| **Idaho** | Getta Creek | Sediment | |
| **Idaho** | Cottonwood Creek | Sediment | |
| **Idaho** | Deep Creek | Metals<br>Sediment<br>pH | |
| **Idaho** | Tammany Creek | Sediment | |
| **Oregon** | Snake River-Hells Canyon Dam downstream to Washington Border | mercury, temperature | public/private domestic water supply industrial water supply irrigational water, livestock watering salmonid rearing and spawning resident fish and aquatic life watercontact recreation wildlife and hunting fishing, boating, aesthetics anadromous fish passage commertial navigation and transport |
| **Washington** | Snake River- confluence with Clearwater River to one mile upstream | temperature | water supply (domestic, industrial, agricultural) stock watering fish and shellfish wildlife habitat recreationcommerce and navigation |

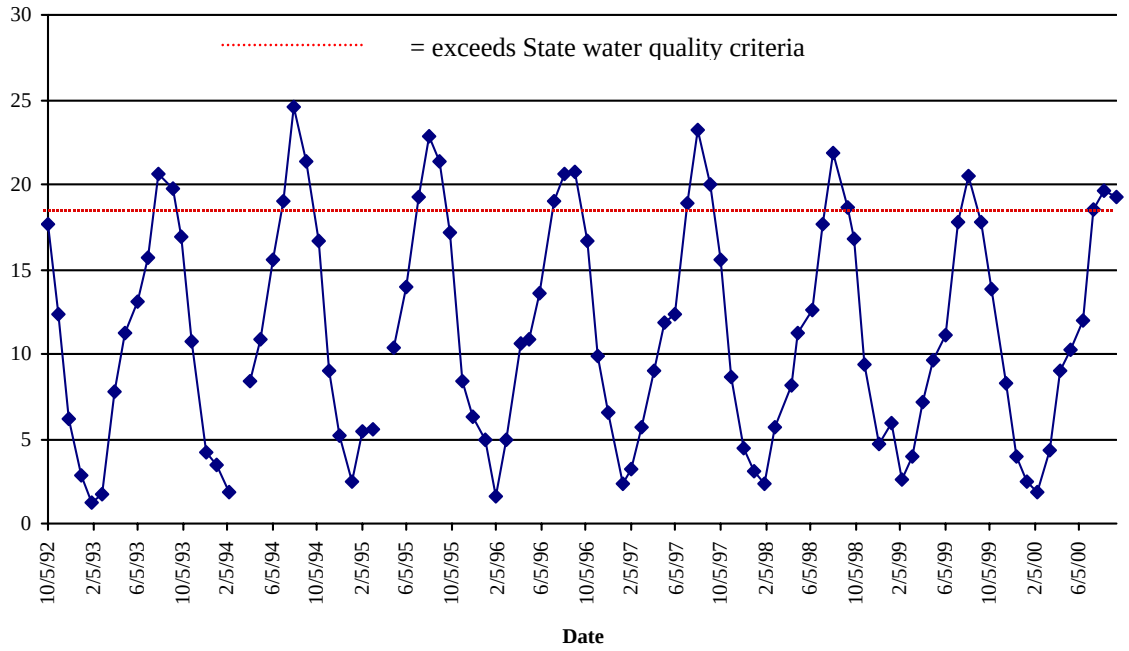


Figure 12. Stream temperatures recorded at Washington Department of Ecology site #35A150 on the mainstem Snake River above the confluence of the Clearwater River (1992-1999)

#### Sediment

The Snake River below Hells Canyon Dam is sediment-deficient due to the operation of the Hells Canyon Hydroelectric Dam Complex, and would benefit from added sediment (USDA Forest Service 1999). The three upriver dams trap suspended sediment and bedload, while fluctuating water levels increase rates of streambank erosion. The entrapment of sediments has retarded recruitment and/or development of new sand bars and silt deposits, which provide substrate for riparian growth (Kern 1976).

#### Total Disolved Gas (TDG)

The Snake River is not currently listed as limited by TDG in Oregon or Idaho, although IDEQ and ODEQ (2001) recommends listing for the 2002 303(d) list for both Oregon and Idaho. Both Oregon and Idaho have a TDG criterion of 110% TDG. Idaho Power Company has been monitoring TDG below Hells Canyon Dam and has found that at all spill levels the criterion was exceeded from below Hells Canyon Dam to at least RM 180 (IPCo, 1999b). A declining trend in TDG occurred with distance from the dam, and t a direct relationship exists between distance to compliance with the criterion and the amount of spill (IDEQ and ODEQ 2001).

#### Mercury

The State of Oregon lists the upper half of the Snake River (above the Salmon River confluence) as water quality limited due to mercury contaminants, which may pose threats to humans through fish consumption (IDEQ and ODEQ 2001). Only one sample has been collected within the reach, and that sample only included two fish tissue samples. All other samples used were from sites upstream of Hells Canyon Dam. The major source of mercury is assumed to originate from Brownlee Reservoir and upstream tributary flows (IDEQ and ODEQ 2001). The one data point

available shows mercury levels at 0.15 mg/kg dry weight fish tissue, which is below the level used by the Oregon Division of Health to establish a mercury fish tissue advisory (IDEQ and ODEQ 2001).

#### Point Sources of Water Pollution

No known point sources of water pollution exist between Hells Canyon Dam and the Salmon River (IDEQ and ODEQ 2001).

### Vegetation

The flora of the Snake Hells Canyon subbasin is exceptionally diverse (Figure 13). This reflects the complex topography, varied soil conditions, and the dispersal corridors provided by the Snake and Salmon rivers. The area is home to many rare and endemic species of plants (Mancuso and Moseley 1994). The canyon grasslands of the subbasin are particularly distinctive. Canyon grasslands are rare within the Columbia Basin and despite years of disturbance the Hells Canyon grasslands are among the most intact in terms of its native grassland species component (USDA Forest Service 1999).

The vast majority of canyon grassland communities are representative of the bluebunch wheatgrass (*Agropyron spicatum)* habitat type series (Tisdale 1986). The healthiest bluebunch wheatgrass communities in the subbasin are found in steep areas with limited livestock accessibility and water availability. In these areas, the vegetation is characterized by widely spaced clumps of bunchgrass with coverage values usually between 15 and 25 %. Areas of rock and bare ground are common, often with a coverage of more than 50%. Native grassland forbs usually make up less than 20% of the coverage in the community. Common native forbs include arrowleaf balsamroot *(Balsamorhiza sagittata)*, desert parsleys (*Lomatium* spp.), lupines *(Lupinus spp*.), Snake River phlox *(Phlox* colubrina), harsh paintbrush *(Castiileja hispida),* deerhom *(Clarkia pulchella),* tall annual willowweed *(Epilobium paniculatum),* cleavers *(Galium aparine),* prickly-pear cactus *(Opuntia polyacantha) ,* and narrow-leaved skullcap *(Scutellaria .angustifolia).* Except for scattered gray rabbitbrush *(Chrysothumnus numeosus)* plants, shrubs are very uncommon or absent. Sand dropseed and red three-awn (Aristida longiseta) have become disclimax species on some river benches, bars, and toeslope areas. Bluebunch wheatgrass communities are particularly susceptible to invasion by yellowstar thistle (*Centaurea solstitialis*) the most problematic and widespread noxious weed species in the Snake Hells Canyon subbasin. In severely infested areas, yellowstar thistle coverage has been documented at more than 50%. In these areas native vegetation was almost non-existant (Mancuso and Moseley 1994).

At slightly higher elevations or on mesic aspects, Idaho fescue (*Festuca idahoensis)* usually dominates grasslands. Idaho fescue grassland sites appear less susceptible to invasion by yellow starthistle than blue bunchgrass communites, but are commonly invaded by sulphur cinquefoil (*Potentilla recta*) and other noxious weeds. Grasslands on mesic aspects, in canyon draws and at higher elevation are often interspersed with shrubfields. Common shrub species include ninebark (*Physocarpus malvaceu*s), snowberry (*Symphoricarpus albus*), rose (*Rosa spp*.), oceanspray (*Hokniiscus discolor*)and hackberry (*Celtic reticulata)* (Mancuso and Moseley 1994).

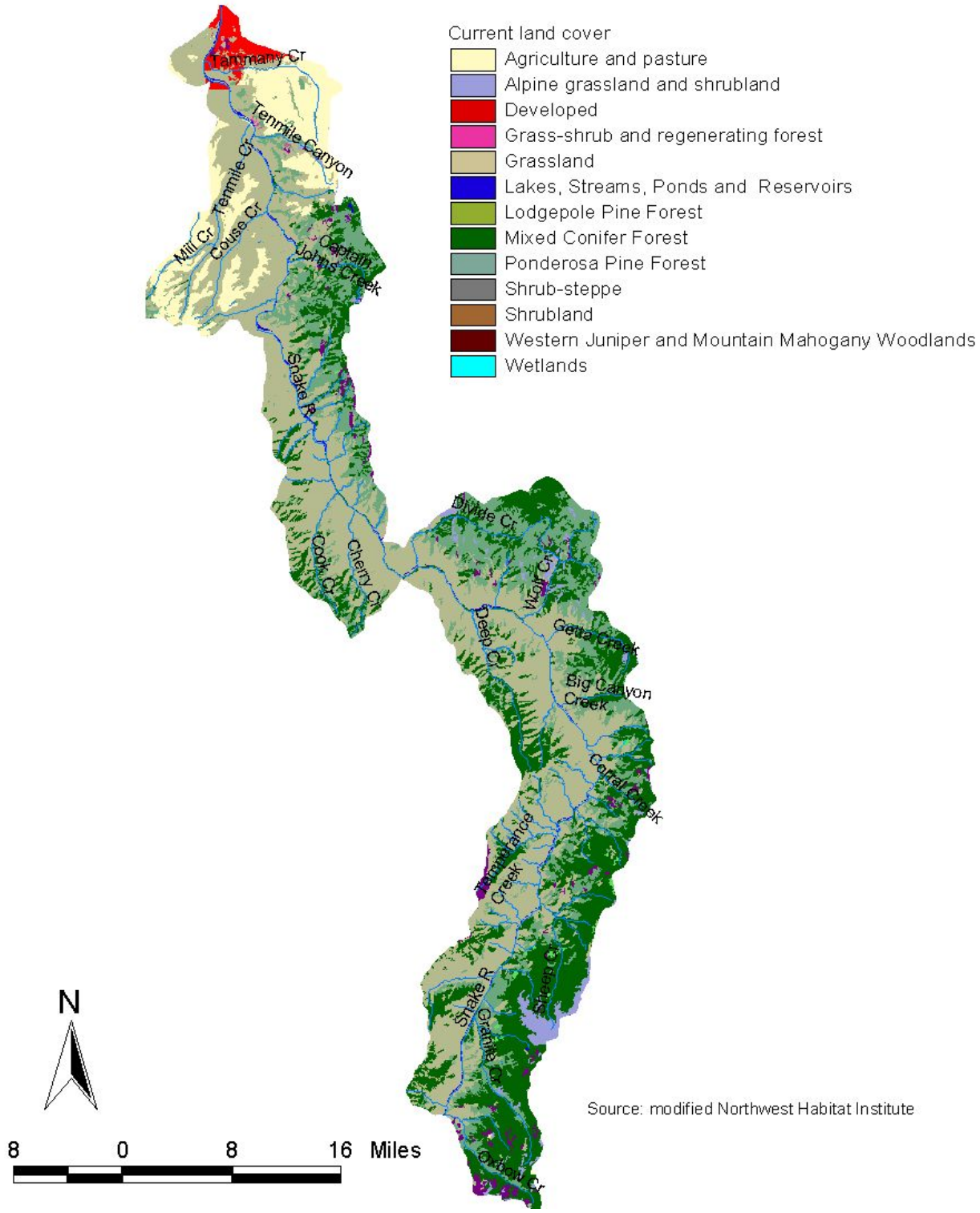


Figure 13. Current land cover patterns in the Snake Hells Canyon subbasin

Other common canyon native grasses that are sometimes community dominants in the subbasin include Sandberg's bluegrass *(Poa sandbergii),* prairie Junegrass *(Koeleria cristata),* sand dropseed *(Sporobolus cryptandrus),* and red threeawn *(Aristida longiseta).* Introduced cheatgrass (Bromus tectorum) and Kentucky bluegrass *(Poa pratensis)* are also very common, particularly on disturbed sites (Mancuso and Moseley 1994).

Between 2,000 and 4,800 feet coniferous tree species begin to occur in the subbasin; at lower elevations these trees occur on northern aspects and in draws. Ponderosa pine *(Pinus ponderosa)* is the community dominant at lower elevations. As conditions become more mesic Douglas-fir *(Pseudotsuga menziesii),* lodgepole pine (*Pinus contorta*), Englemann spruce (*Picea englemannii*) and grand fir *(Abies grandis)* increase in prominence. Sub-alpine fir *(Abies lasiocarpa)* occurs in the wettest and coldest portions on the subbasin (Mancuso and Moseley 1994). There is no true alpine timberline in the Snake Hells Canyon subbasin; subalpine-fir and white bark pine (*Pinus albicaulis*) krummholz grow on even the highest of the Seven Devils Mountains (Bingham 1987).

Riparian vegetation along the Snake River is often sparse or nonexistent and is primarily associated with the areas immediately adjacent to the mean high water zone (IDEQ 1998). Common vegetative species in this area include Hackberry *(Celtis reticula),* willow, cudweed sage, sawatch knotweed, poison ivy (*Rhus radicans*) and mockorange (*Philadelphia lewisii*). The grass community is predominantly annual bromes (*Bromus spp.*) sedges (*Carex spp.),* bluebunch wheatgrass, (*Agropyron spiciatum*) and Idaho fescue (Festuca idahoensis) (USDA Forest Service 1999). Steep gradient tributary streams often have narrow riparian zones that typically vary from 25 feet to 200 feet and are confined by steep side slopes. The lower elevation riparian areas are dominated by white alder, river alder, water birch, black cottonwood, Rocky Mountain maple, serviceberry, mockorange, elderberry, dogwood, and oceanspray. At higher elevations Douglas fir, grand fir, Engelmann spruce, subalpine fir, and willows are more common in the riparian areas. Low gradient streams with meadows commonly have rushes, sedges, willows, and alders. These meandering streams are very sensitive to overuse by livestock. Overgrazing, can convert riparian vegetation to shallow rooted species such as Kentucky bluegrass; and reduce palatable shrub species such as willow.

Larger tributaries, with year-round flow, support white alder *(Alnus rhombifolia)* cottonwood (*Populus trichocarpa*) and scattered ponderosa pine (*Pinus ponderosa*) (Mancuso and Moseley 1994). Riparian communities in the subbasin have been heavily impacted by aggressive nonnative species including bur chervil (*Anthriscus scandecina*), teasel (*Dipsacus sylvestris*), black locust (*Robinia pseudo-acacia*), box elder (*Acer negundo*) and European corn-salad. (Valerianella locusta) (USDA Forest Service 1999).

The subbasin supports a number of rare plant species. MacFarlane's four-o'clock is the only plant species listed under the Endangered Species Act known to occur in the subbasin. Spalding'Catchfly has recently been proposed for listing and has been documented to occur just outside the subbasin boundaries, as of yet undetected populations may occur within the subbasin (USDA Forest Service1999). Eight species of Palouse and/or Camas Prairie regional endemics have identified as occurring as occurring in the subbasin; green-band mariposa lily, broad-fruit mariposa lily, Idaho hawksbeard, Palouse goldenweed, spacious monkeyflower, Spalding silene, purple thick-leaved thelypody and plumed clover (USDA Forest Service 1999). Two rare species found in the subbasin are disjunct from their main population centers. Fern-leaved desert-parsley is disjunct from the eastern base of the Cascades, and Wolf's currant from the southern Rockies (Mancuso and Mosely 1994).

## Land Use

The majority of the Snake Hells Canyon subbasin is publicly owned, with nearly half under U.S. Forest Service management (Figure 14). Three National Forests manage land in the subbasin including Wallowa-Whitman, Payette and Nez Perce. Wallowa-Whitman National Forest manages the greatest acreage of any management agency in the basin having jurisdiction over 46.6% of the subbasin and 96.5% of the Forest Service lands (Table 2). Ranching and grazing, recreation, timber harvest, transportation, mining, urban development, and agriculture are primary land uses considered to potentially affect, or historically have affected, terrestrial and aquatic resources in the subbasin (Figure 15).

### Ranching and Grazing

The horses of the Nez Perce Indians were the first domestic livestock grazed within the Snake Hells Canyon subbasin; this land use is thought to have occurred as early as 1730. When the Nez Perce War ended, around 1879, Euro-American settlers began grazing large livestock herds, primarily in the valley bottoms and lower slope areas. By 1900 more than 100 families were raising livestock along the Snake River between Battle Creek and the confluence with the Imnaha River. This period is considered the peak of livestock grazing by homesteaders in the area. The remoteness of the area made obtaining supplies and getting animals to market difficult and when livestock prices declined many of the 160-acre homesteads reverted to federal ownership or were purchased and consolidated into larger livestock operations.

The preference for raising cows or sheep has changed a number of times. At first, cattle predominated, but large losses were incurred during the drought and bitter cold years of 1884-1886 and many ranchers began to try sheep. Cattle-to-sheep ratios were 80 to 20 percent in 1915. During World War I and II the grazing of sheep in the subbasin again increased due to government encouragement to increase the supply of wool for uniforms and meat for the troops. In 1940, cattle to sheep ratios on the HCRNA were 30 to 70 percent. Due to the potential for domestic sheep to spread fatal bacterial pneumonia to bighorn sheep, domestic sheep grazing was eliminated on the Oregon portion of HRCNA on August 2, 1995 (USDA Forest Service 1999). Grazing by domestic sheep continues on the Idaho portion of the HCRNA and on privately owned rangelands.

Overgrazing has negatively impacted both terrestrial and aquatic habitat in the subbasin. Livestock grazing has aided the establishment of cheatgrass and other non-native vegetation species, reduced the quanity and quality of riparian vegetation, and increased erosion and stream bank failures. Most of this damage occurred in the late 1800s and early 1900s. Sheep and cattle allotments on the Snake and Imnaha portions of the HRNCA peaked in 1920 with approximately 108,000 animal unit months (AUMs). This was reduced to 38,260 AUMS permitted on the same approximate area in 1998 (USDA Forest Service 1999). Livestock grazing continues to be one of the main land uses at Craig Mountain and throughout privately owned lands in the subbasin. Recently, strategies have been implemented to reduce negative impacts of grazing in the subbasin, including rotation of pastures, riparian fencing, and overall reduction of livestock numbers. Since the mid-1900s and especially in the past 20 years livestock grazing impacts have been significantly reduced (USDA Forest Service 1999).

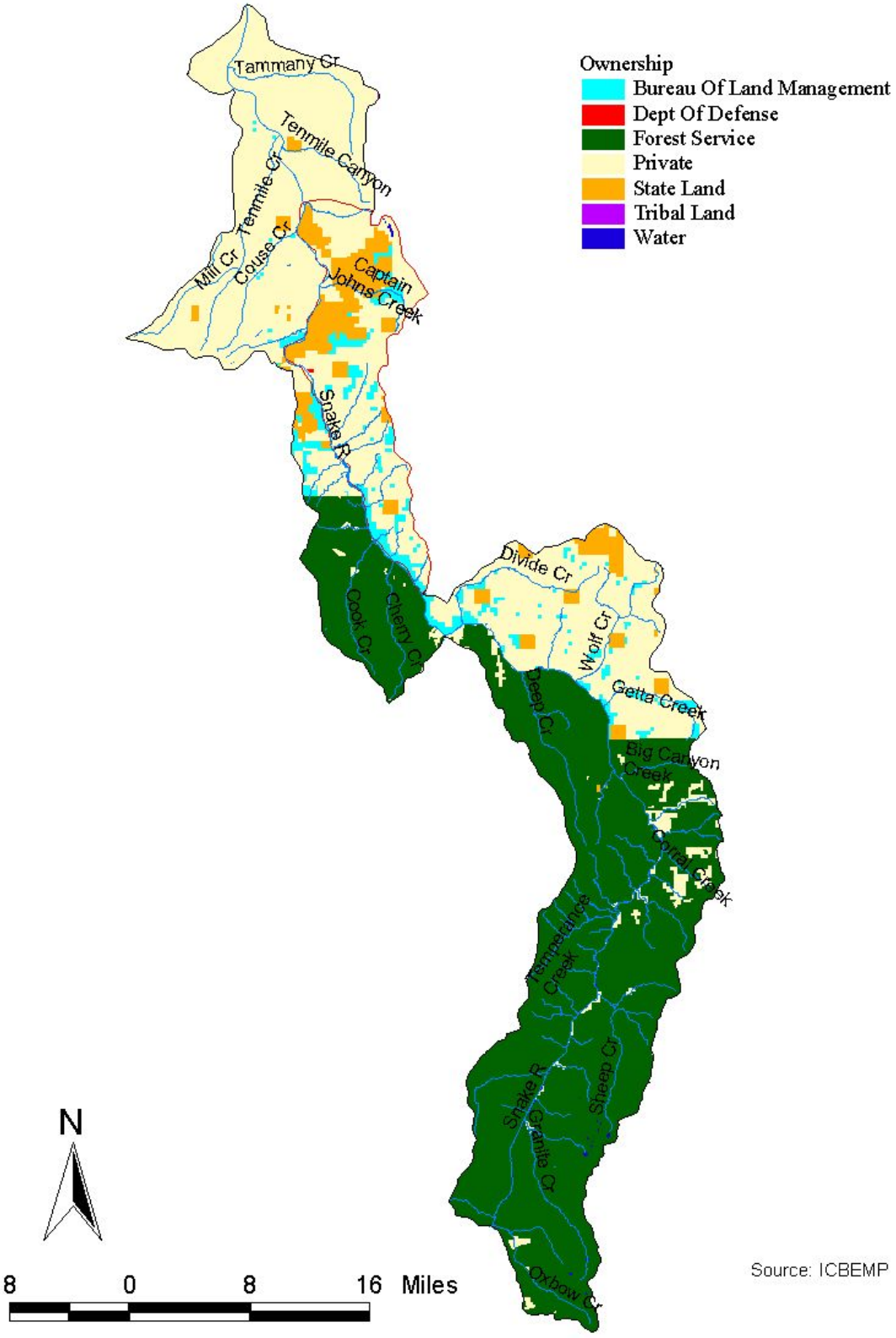


Figure 14. Land ownership in the Snake Hells Canyon subbasin

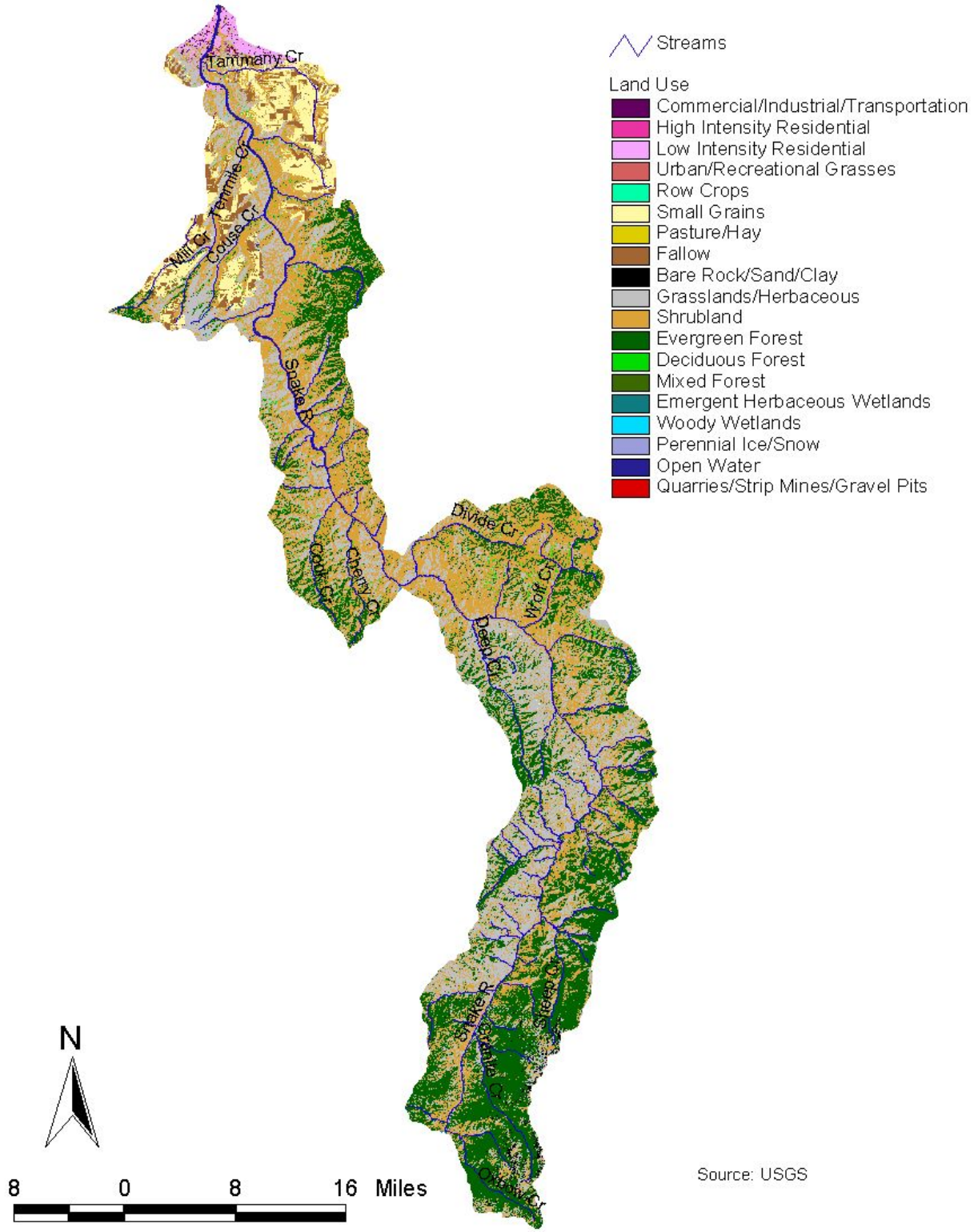


Figure 15. Land use patterns in the Snake Hells Canyon subbasin

Table 2. Land management agencies of the Snake Hells Canyon subbasin.

| Land Management Agency | | Acres | Percent of total subbasin area |
|---|---|---|---|
| Bureau Of Land Management | | 21052 | 3.56 |
| Dept Of Defense | | 64 | 0.01 |
| Forest Service | Nez Perce | 532 | 0.09 |
| | Payette | 9547 | 1.61 |
| | Wallowa Whitman | 275326 | 46.55 |
| | Total Forest Service | 285405 | 48.25 |
| Private | | 249672 | 42.21 |
| State | Idaho | 28695 | 4.85 |
| | Oregon | 111 | 0.02 |
| | Washington | 3632 | 0.61 |
| | Total State | 32439 | 5.48 |
| Tribal Land | | 35 | 0.01 |
| Water | | 2852 | 0.48 |

#### Recreation

The Hells Canyon area of the Middle-Snake subbasin is a world-renowned recreational destination in large part due to the unique whitewater rafting opportunities it presents. Other recreation opportunities provided by the subbasin include hiking, horseback riding, camping, sightseeing, mountain biking, limited all terrain vehicle riding, snowmobiling, swiming, powerboating, photography, wildlife watching, hunting and fishing (USDA Forest Service 1999). The Snake River portion of the HCRNA received an average of 32,415 visitors per year between 1995-1997. Sight seeing was the primary reason for visits to the HCRNA (30%) followed by fishing (12%) (USDA Forest Service 1999). Recreational activities peak in the summer season with heavy usage observed between Memorial Day weekend and Labor Day weekend. Recreational use of the subbasin is expected to increase, mirroring increases in nearby populations and the population of the country as a whole (USDA Forest Service 1999; IDEQ and ODEQ 2001).

Snowmobiling is a substantial use within the HCRNA. The total area on the HCRNA dedicated to motorized over-snow use is approximately 40,786 acres, which is 6.25 percent of the total land base. There are approximately 132 miles of groomed trails.

#### Timber Harvest

Timber harvest on the Forest Service managed lands in the subbasin has been relatively limited. The designation of the HCRNA in 1975 legally prevented even aged timber harvest, including clearcutting or seed tree harvests. Regulations adopted in 1994 restricted the commercial harvest of timber on the HCNRA to that which will enhance ecosystem health, wildlife habitat, or recreational and scenic uses, reduce the risk of harm posed by hazard tress, or to respond to natural events, including fire, flood, earthquake, volcanic eruption, high winds and disease or insect infestation. In addition to these restrictions forest openings created by logging must be less than 2 acres in size. No timber harvest is permitted on the wilderness portion of the HCRNA (USDA Forest Service 1999).

Timber harvest before the 1975 HCRNA designation has impacted the ecosystem to some degree. Ponderosa pine forests, western larch forests, and large trees have declined in part due to historic timber harvest. There has been a corresponding increase in mid-seral stands of

Douglas-fir and grand/white fir, however the changes in forest structure exhibited on the HCRNA are thought to be less severe than those in other parts of the subbasin and throughout the Columbia Basin (USDA Forest Service 1999).

Many of the privately owned forested lands in the subbasin have been harvested. The extent and impact of this harvest has been studied on the Craig Mountain area. Prior to its purchase by BPA in 1992, the Peter T. Johnson Wildlife Mitigation Unit was owned by the Pene Land Company and heavily logged in around 1986: "most of the valuable and larger trees were removed, leaving predominantly smaller, submerchantible, diseased, lower-value, and shade-tolerant species such as grand fir. Because of these past logging activities, poletimber stands comprised mainly of lodgepole pine can be found over much of the upland plateau within the WMU. The mid-1980's entry also affected the understory plant community, encouraging shade-tolerant grand fir regeneration along with assorted brush species, native grasses, and some noxious weeds" (Narowlski 1996). Selective harvest has resulted in the loss of the ponderosa pine-dominated, open, park-like forest that probably historically characterized Craig mountain and many of the forested lands in the subbasin (Mancuso and Mosely 1994).

Forest management activities taking place after the establishment of the Idaho Forest Practices Act (FPA) have had a lesser impact on fish habitat. The principal concerns with current and past forest management activities are increased sediment from roads, loss of riparian shade, and loss of riparian trees that provide for large woody debris recruitment to stream channels. Carefully designed, constructed and maintained roads minimize sediment input to streams. In addition, locating roads outside of riparian areas helps maintain stream shade. The FPA contains a number of rules on roads and stream shading related to the concerns above.

#### Transportation

The only state highway within the subbasin is Highway 129, located in Asotin County, connecting Clarkston, Washington and Enterprise, Oregon. Traffic volume in 1999 between Asotin and Clarkston was 5600 vehicles per day at Critchville Rd. However, this quickly drops to 640 vehicles per day at Fairgrounds Rd. on the south end of Asotin city limits (WSDOT 2000).

No rail service has ever been available in the subbasin (K. Frederickson, Washington State Department of Transportation, Rail Office, personal communication, May, 2001; T. Long, Idaho Department of Transportation, Lewiston Office, personal communication, May, 2001), although the Camas Prairie Line follows the north shore of the Snake River in Washington into Clarkston and Lewiston where it continues along the south shore of the Clearwater River. Even though the Camas Prairie Line is not located within the subbasin and is not heavily used, it does provide transportation of goods, especially dryland crops, out of the area (K. Frederickson, Washington State Department of Transportation, Rail Office, personal communication, May, 2001).

There are 735 miles of existing forest service roads on the HCNRA, of which 533 are currently open to travel. 50 percent have natural surfaces, 4 percent have improved pit run, 12 percent have a crushed rock surface, 6 percent have been surface treated and less than 1 % have an asphalt concrete surface. The highest road density areas in the HCRNA fall outside the Snake Hells Canyon subbasin.

About 88 percent of the HCNRA is accessible by trail. An extensive trail system features 925 miles of trail, with approximately 361 miles of trail occurring within the Hells Canyon wilderness. Trail use in higher elevation areas is limited to summer, while most lower elevation trails are used year round. Trails on the HCRNA evolved from Indian travel routes, big

game migration routes, and later, for access for grazing, mining and fire control. Because trails blazed by early users were not constructed for current patterns and levels of use, erosion affects some trails on steep grades.

Areas with low road density are associated with special management designation such as the Hells Canyon Wilderness Area, Hells Canyon National Recreation Area, and areas without extensive historic logging activity. Road density ranges from 0 miles to over 5 miles of road per square mile for the various subwatersheds (IDEQ 1998).

#### Mining

In the 1860s gold was discovered on the river bars of the Snake Hells Canyon subbasin, which led to European settlement of the region. Placer mining for these deposits turned out to be relatively unsuccessful, but hundreds of rock piles still dot the river corridor as evidence of the attempt (USDA Forest Service 1999). Some of these tailings still pose a sedimentation problem during peak flows (Mancuso and Moseley 1994). Later efforts focused on hard rock mining. Minerals excavated from the subbasin include gold, silver, copper, iron, and lead (Figure 16). Historic mining operations were widespread, but currently only sand, gravel and stone are excavated from the subbasin. These operations occur in the lower subbasin within 20 linear miles of Lewiston.

#### Agriculture

Cultivated land comprises 41, 639 acres, or 7%, of the subbasin with small grain crops in the lower twenty miles of the subbasin composing the vast majority of the regions agriculture (refer to Figure 15). Small grains are grown on a three-year dryland crop rotation of wheat, barley and a legume, oil, or fallow crop; therefore, each crop in the rotation comprises about one third of the acreage. Soft white, hard red spring and hard red winter are the three classes of wheat. Both feed and malt barley are grown.

The legumes and oilseed crops are evenly divided into approximately $1/6^{th}$ of the total rotation each. More variety in crops is found traveling from west to east as precipitation increases. The fallow rotation is only found on the western edge of the subbasin where a lack of adequate moisture prevents continuous cultivation. Legume crops include peas, lentils, and garbanzo beans with the latter of the two being the most common crops. Oilseed crops include mustard, flax, spring and winter rape seed, and spring and winter canola seed with the latter being the most prevalent. Traditionally, most of the legume-oilseed rotation was planted in legumes; however, poor prices for these crops has caused a shift towards more oilseed production, which is now equal to and will soon overtake legumes (S. O'Connell, Columbia Grain Growers, personal communication, May, 2001).

As the fertilizer costs increase, associated with the higher price for natural gas, farmers are applying commercial fertilizers with much more scrutiny. This has led to an increase in malt barley production, which has a lower protein content, requiring less nitrogen than feed barley. There is also a trend toward reduced tillage practices for the benefit of both soil conservation as well as savings in labor, time, and wear on equipment (L. Smith, University of Idaho Cooperative Extension, Nez Perce County, personal communication, May, 2001).

In the upper subbasin agriculture activity is associated with small hay fields in the canyons located on bars and benches to larger hay fields located in the upland prairie, meadows, or plateau areas. Large dryland farming occurs north of the Salmon River (Camas Prairie) and in the lower portion of the Snake Hells Canyon subbasin on the upland plateau areas (refer to Figure 15).

#### Urban Development

Populations in all five of the counties partially contained in the Snake Hells Canyon subbasin increased between 1990 and 2000 (Table 3). This population increase is reflected both in more residents inhabiting the lower subbasin towns of Asotin, Lewiston and Clarkston and greater recreational pressure from the residents of neighboring communities. In the upper half of the subbasin, some residential housing with septic systems exists, but the density is very low (IDEQ and ODEQ 2001).

Table 3. Changes in population in counties partially contained by the Snake Hells Canyon subbasin 1990-2000 (U.S. Census Bureau 2000).

| County | Population 1990 Census | Population 2000 Census | Change 1990-2000 | |
|---|---|---|---|---|
| | | | Number | Percent |
| Asotin | 17,605 | 20,551 | 2,946 | 16.7 |
| Idaho | 13,783 | 15,511 | 1,728 | 12.5 |
| Nez Perce | 33,754 | 37,410 | 3,656 | 10.8 |
| Adams | 3,254 | 3,476 | 222 | 6.8 |
| Wallowa | 6,911 | 7,226 | 315 | 4.6 |

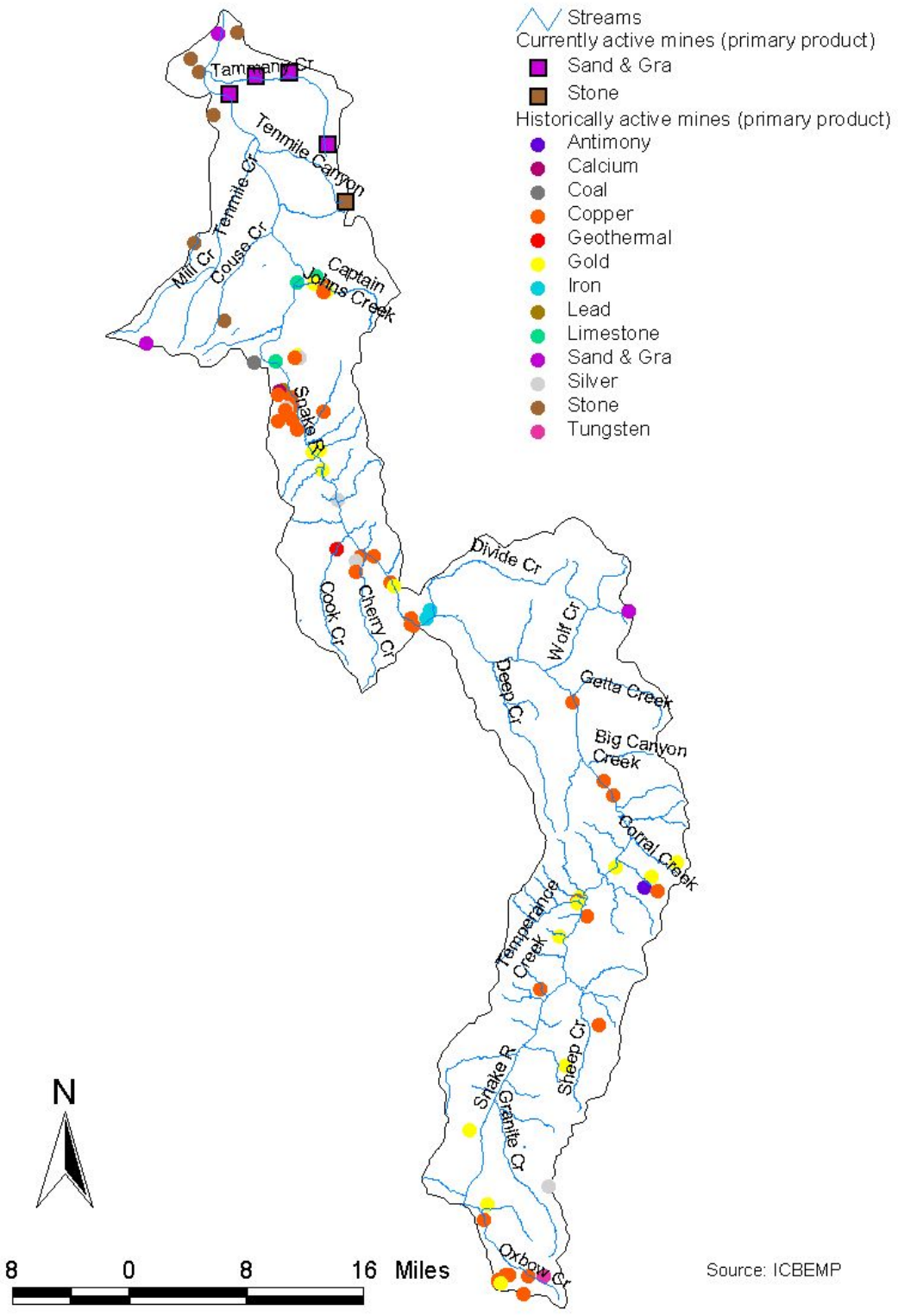


Figure 16. Historical and current mining areas in the Snake Hells Canyon subbasin

#### Diversions, Impoundments, and Irrigation Projects

Idaho Power operates the Hells Canyon Dam Complex (Hells Canyon, Oxbow, and Brownlee Dams). This complex has significant hydrologic effects downstream. There are numerous small water rights (less than .02 cfs) used for irrigation, livestock, and domestic use. The USFS and BLM are currently filing on many springs and creeks in accord with Snake River Adjudication protocols.

#### Barriers

Although the original Federal Energy Regulatory Commission license for Hells Canyon Dam included fish passage, no fish passage was ever built. Hells Canyon Dam blocks all fish passage out of the subbasin. No man-made barriers are known to occur on tributaries to the Mid-Snake River.

Natural barriers to salmonid migration, such as low flows or high gradients, have been identified on many of the small tributaries that drain into the Snake River on the Idaho side. Specifically, in the lower portion of the subbasin, natural barriers (falls) occur on Captain John Creek (RM 5.8), and the South Fork of Captain John Creek (RM 1.7) (BLM 2000b). Low flow barriers have been documented on Madden Creek, a tributary to Captain John Creek, and are suspected to occur at the mouth of Corral Creek when Snake River flows are low (BLM 2000b). In the upper portion of the subbasin (above the Salmon River confluence) natural barriers have been identified in Dry Creek, Wolf Creek (≈0.75 mi. upstream from the confluence with the Snake River), Getta Creek (during periods of low flow), and Highrange Creek (steep gradient and low flows) (BLM 2000a).

### Protected Areas

Much of the Snake Hells Canyon subbasin is protected by some kind of management designation (Figure 17; Table 4).

#### 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 (Wallowa-Whitman 1996) (Figure 17; Table 4). HRNCA is administered as part of the Wallowa-Whitman National Forest.

#### Wild and Scenic Snake River

Approximately 67.5 miles of the Snake River in Hells Canyon National Recreation Area were designated in 1975 as a component of the National Wild and Scenic Rivers System. In this reach the river is managed to preserve its free-flowing character and unique environment while providing for continued public use (USDA Forest Service 2001).

The 31.5-mile section of the river between Hells Canyon Dam and Upper Pittsburg Landing is designated wild under the Wild and Scenic Rivers Act. This act defines wild as "free of impoundments and generally accessible only by trail" representing "vestiges of primitive America." The 36-mile section of river downstream from Upper Pittsburg Landing to mile 180.2 is designated scenic, which is defined as "free of impoundments with shorelines and watershed still largely primitive, and shorelines largely undeveloped, but accessible in places by roads." An additional 4.2 miles of the river from mile 180.2 North to the HCNRA boundary at the Oregon-Washington line is recommended for scenic designation (USDA Forest Service 2001).
The Wild and Scenic Snake River corridor extends approximately one-quarter mile back from the high water mark on each shore. The river corridor itself is not wilderness and wilderness regulations do not apply (USDA Forest Service 2001).

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#### Craig Mountain

The Craig Mountain study area is approximately 125,000 acres in size. The study area itself is not legally protected but has been inventoried because of its many rare plant and animal inhabitants. The area has multiple managers including the Nez Perce tribe, the Bureau of Land Management, Idaho Department of Lands, the Nature Conservancy, and private. The Craig Mountain study area contains the 60,000-acre Craig Mountain Wildlife Mitigation Area purchased by the Bonneville Power Administration (BPA) in 1992 as partial mitigation for wildlife habitat losses resulting from the construction of Dworshak dam on the Clearwater river. The Nez Perce Tribe, Idaho Department of Fish and Game, and BPA agreed to provide for the protection and enhancement of wildlife habitat through management of the area (Cassier 1995). The pileated woodpecker, yellow warbler, black-capped chickadee, river otter, elk, and white-tailed deer, are species that have been identified as having been negatively affected by the construction of Dworshak dam in the Clearwater and these species are given special management attention on the Craig Mountain Wildlife Mitigation Area (Cassirer 1995).

#### Chief Joseph Wildlife Area

The Chief Joseph Wildlife Area is 9,735 acres in size and is located in Asotin County Washington. Elevations range from 825 feet to 4,913 feet at Mt. Wilson, the highest point in the vicinity. The area is comprised primarily of Bluebunch wheatgrass grasslands with riparian woodlands surrounding streams and springs. The area provides important elk, mule deer, bighorn sheep, game bird and non-game habitat (WDFW 2001).

#### 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 Snake Hells Canyon subbasin. 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 Forest Service 1999).

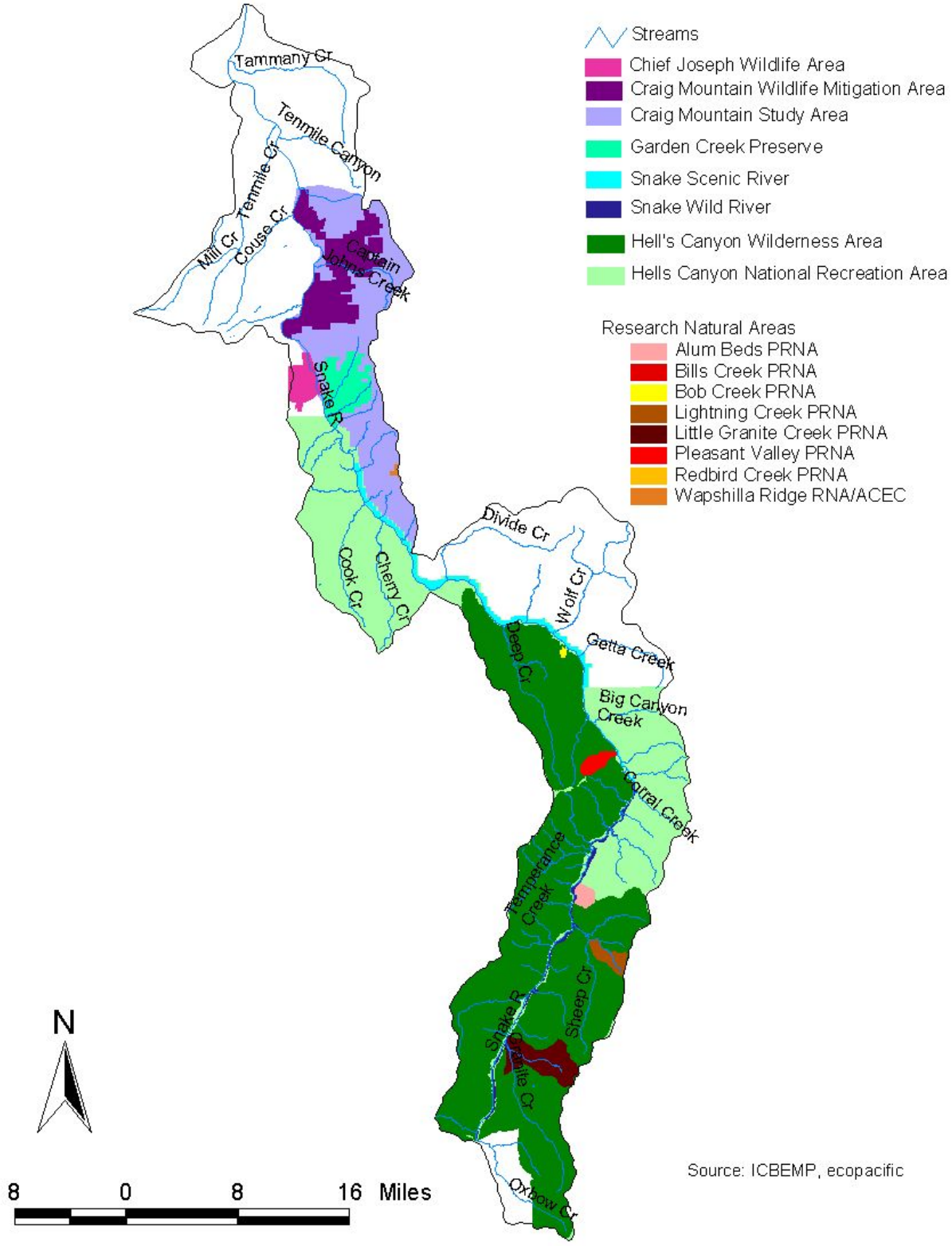


Figure 17. Areas in the Snake Hells Canyon subbasin that are managed and/or protected using a conservation-based strategy

Table 4. Areas in the Snake Hells Canyon subbasin managed and/or protected using a conservation-based strategy

| Area Type | Name | Acreage in subbasin | Agency | Type of Protection/Management |
|---|---|---|---|---|
| Wildlife Area | Craig Mountain Wildlife Mitigation Area | 18,517 | BPA, IDFG, NPT | Managed to mitigate for wildlife losses caused by construction of Dworshak dam |
| | Chief Joseph Wildlife Area | 3,770 | WDFW | Managed for benefit of wiildlife |
| Wild and Scenic Rivers | Snake Scenic River | 6,160 | | Managed and protected under the Wild and Scenic Rivers Act of 1968 |
| | Snake Wild River | 3,656 | | Managed and protected under the Wild and Scenic Rivers Act of 1968 |
| Preserve | Garden Creek | 8,030 | Nature Conservancy | |
| Proposed Research Natural Areas | Alum Beds | 1,449 | Forest Service | Managed as biologically unique areas under the direction of the Forest Plan |
| | Bills Creek | 26 | Forest Service | |
| | Bob Creek | 194 | Forest Service | |
| | Lightning Creek | 2,113 | Forest Service | |
| | Little Granite Creek | 7,004 | Forest Service | |
| | Pleasant Valley | 1,594 | Forest Service | |
| | Redbird Creek | 548 | Forest Service | |
| Research Natural Area | Wapshilla Ridge | 410 | Forest Service | |
| Wilderness | Hell's Canyon | 11,171 | Forest Service | Managed and protected under the Wilderness Act of 1964 |
| National Recreation Area | Hells Canyon National Recreation Area | 182,479 | Forest Service | |

## Fish and Wildlife Resources

### Fish and Wildlife Status

Fish

The middle Snake River is currently inhabited by at least 30 species of fish, 23 of which are endemic to the region (Table 5)

Table 5. Fish species currently inhabiting the Snake Hells Canyon subbasin

| Species | Origin[1] | Location[2] | Status[3] | Comments |
|---|---|---|---|---|
| Bull trout (*Salvelinus confluentus*) | N | R, T | ESA T | |
| Spring chinook salmon (*Oncorhynchus tshawytscha*) | N | R, T | ESA T | Spawn in Aug/early Sep |
| Summer/early fall chinook salmon (*O. tshawytscha*) | N | R, T | ESA T | Early falls only recognized by NPT |
| Fall chinook salmon (*O. tshawytscha*) | N | R | R ESA T | |
| Summer steelhead (*Oncorhynchus mykiss*) | N | R, T | ESA T | |
| Sockeye salmon (*O. nerka*) | N | R | ESA-E | Migration corridor only |
| Redband trout (*O. mykiss*) | N | R, T | C | True redbands are U; generic RBT are C |
| Westslope cutthroat trout (*O. clarki lewisii*) | N | R,T | | |
| White sturgeon (*Acipenser transmontanous*) | N | R | C | |
| Mountain whitefish (*Prosopium williamsoni*) | N | R, T | C | |
| Pacific lamprey (*Lampetra tridentata*) | N | R, T | ID - E | Considered endangered by the state of Idaho |
| Peamouth (*Mylocheilus caurinus*) | N | R, T | I | |
| Northern pikeminnow (*Ptychocheilus oregonensis*) | N | R, T | C | |
| Bridgelip sucker (*Catostomus columbianus*) | N | R, T | C | |
| Largescale sucker (*Catostomus macrocheilus*) | N | R, T | C | |
| Chiselmouth (*Acrocheilus alutaceus*) | N | R, T | C | |
| Longnose dace (*Rhinichthys cataractae*) | N | R, T | R/I | |
| Speckled dace *(Rhinichthys osculus*) | N | R, T | A | |
| Leopard dace (*Rhinichthys falcatus*) | N | R, T | I | |
| Redside shiner (*Richardsonius balteatus*) | N | R, T | C | |
| Torrent sculpin (*Cottus rhotheus*) | N | R, T | R | |
| Paiute sculpin (*Cottus beldingi*) | N | R, T | C | |
| Shorthead sculpin (*Cottus confusus*) | N | R, T | C | |
| Mottled sculpin (*Cottus bairdi*) | N | R, T | C | |
| Common carp (*Cyprinus carpio*) | E | R, T | R/I | |
| Bullhead, brown (*Ictalurus nebulosus*) | E | R, T | R/I | |
| Channel catfish (*Ictalurus natalis*) | E | R, T | R/I | |
| Smallmouth bass (*Micropterus dolomieu*) | E | R, T | U/I | |
| Largemouth bass (*Micropterus salmoides*) | E | R, T | I | |
| White crappie (*Pomoxis annularis*) | E | R, T | I | |
| American shad (*Alosa sapidissima*) | E | R, T | | |

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

[2] Location: R=mainstem rivers, T=tributaries

3 Fish species abundance based on average number of fish per 100m$^2$: 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

Four species currently under the jurisdiction of National Marine Fisheries Service (NMFS) because of listing under the Endangered Species Act (ESA) occur within the subbasin. These

species include Snake River fall chinook salmon and spring/summer chinook salmon, listed as threatened on May 22, 1992 (Federal Register, Vol. 57, 14653), Snake River sockeye salmon, listed as endangered on November 20, 1991 (Federal Register, Vol. 56, 58619), and Snake River summer steelhead, listed as threatened on October 17, 1997 (Federal Register, August 18, 1997, Vol. 62, 43937). Bull trout, under the jurisdiction of the U. S. Fish and Wildlife Service (USFWS) was also listed under the ESA on July 10, 1998 (Federal Register, June 10, 1998, Vol. 63, 31647). Sensitive species occurring in the subbasin, as defined by the Bureau of Land Management, include redband trout, white sturgeon, westslope cutthroat trout, and Pacific lamprey (BLM 2000a).

A variety of key fish species use the Snake Hells Canyon subbasin during various stages of their lives (Table 6 and Table 7). Not included in the table are sockeye salmon, a species that uses the mainstem Snake River (below the confluence with the Salmon River) only during downstream and upstream migration.

Table 6. General life history stages of listed key salmonid species occurring in the Snake Hells Canyon subbasin (from BLM 2000a; IDEQ and ODEQ 2001)

| Life History Stage | Fall Chinook Salmon[1] | Spring/Summer Chinook Salmon | Steelhead Trout | Bull Trout |
|---|---|---|---|---|
| Adult Migration | August-October | April-July | September-May | August-September |
| Spawning | September 15 to April 15 | August 1 to July 15 | February 1 - July 15 | September 1 - April 1 |
| Adult/Sub- Adult Rearing | N/A | N/A | N/A | Year-long |
| Adult Overwintering | N/A | N/A | November-March | Winter |
| Incubation and Emergence | October-April | August-April | March-July | September-March |
| Rearing | Young-of-Year: May-August | 1 Year: Tributary Streams | 1-3 Years | 2-3 Years |
| Smolt Emigration | June-August | April-July | April-July | N/A |

1/ Occur in mainstem Snake River only.

Table 7. Salmonid life history stages and their general occurrence in the Snake Hells Canyon subbasin (from BLM 2000a; M. Hanson, ODFW, personal communication, April 19th, 2001)

| Species | Life history | Occurrence |
|---|---|---|
| Fall chinook | Spawning/rearing | Mainstem Snake |
| Spring/summer chinook | Spawning/rearing | Accessible tributaries (i.e. Granite and Sheep Creeks) |
| Spring/summer chinook | Rearing (limited) | Mainstem Snake |
| Summer steelhead | Spawning/rearing | Accessible tributaries |
| Bull trout | Rearing (subadult and adult) | Mainstem Snake |
| Bull trout | Overwintering | Mainstem Snake |
| Bull trout | Spawning/early rearing | Accessible tributaries (i.e. Granite and Sheep creeks) |
| Westslope cutthroat trout (resident forms) | Spawning/rearing | Granite and Sheep Creeks |
| White sturgeon | Spawning/rearing | Mainstem Snake |

#### Fall Chinook Salmon

Throughout the early 1900's, Snake River fall chinook salmon remained stable at high levels of abundance (NMFS 2000a). Although historical abundance of Snake River fall chinook is speculative, adult escapement estimates suggest a decline in abundance by as many as three orders of magnitude since the 1940's, and perhaps by another order of magnitude from pristine levels (NMFS 2000a). During the period 1938-1949 wild runs of Snake River fall chinook averaged 72,000 fish. During the 1950's runs averaged 29,000 fish (Irving and Bjornn 1981). Construction of the Hells Canyon Complex (1958-1967) and the Lower Snake River Dams (1961-1975) eliminated or severely degraded 530 miles of spawning habitat. Currently, fall chinook spawn from Asotin to Hells Canyon Dam and in the tail races below the four Snake River dams, and in the lower Clearwater, Grande Ronde, Imnaha, and Tucannon Rivers.

Fall chinook populations in the Snake Hells Canyon subbasin are currently considered to be depressed (Quigley and Arbelbide 1997b) but are showing considerable improvement following restoration efforts. Returning wild fall chinook salmon counts from 1975 through 1980 averaged 600 fish per year (Waples et al. 1991). Counts of wild adult fall chinook past Lower Granite Dam from 1981 to 1999 averaged 904 fish per year (Figure 18).

Snake River fall chinook were historically distributed from the mouth of the Snake River to a natural barrier at Shoshone Falls, Idaho, River Mile 615 (Haas 1965). Swan Falls Dam was the first impoundment to inundate spawning and rearing habitat in 1901, eliminating 385 miles of habitat in the upper river (Tiffan et al. 1999). Following construction of Swan Falls Dam, most spawning occurred in the 30-mile reach from the dam to Marsing, Idaho. From the late 1950's through the mid-1970's, the development and completion of the Snake River hydrosystem reduced available fall chinook spawning and rearing areas in the free-flowing river reach to 99.4 miles (from Lower Granite Dam at RM 148 to Hells Canyon Dam at RM 247 (Figure 19) (Tiffan et al. 1999).

Snake River fall chinook salmon mostly exhibit an "ocean-type" (Healey 1991) life history, and unlike other anadromous fish in the Mid-Snake maintain a full reliance upon mainstem habitat during all freshwater stages. Fry emerge in the spring, grow rapidly and migrate out of the Snake River primarily during July and August as subyearlings (Connor et al. in press). The timing of fall chinook salmon life history events and growth are regulated by water temperature (Connor et al. In review), thus the Snake River ESU of fall chinook salmon can be divided into four tributary races based on life history timing differences fostered by water temperature. The four races, in order of fry emergence timing are the upper reach Snake River, lower reach Snake River, lower Grande Ronde River and lower Clearwater River (W.P. Connor, US Fish and Wildlife Service, personal communication, April 2001). The mainstem run up to Hells Canyon Dam consists of hatchery-reared stock, natural fish (fish born to hatchery-reared parents that spawned in the wild), and wild fish (Blankenship and Mendel 1997).

Fall chinook salmon spawning in the Snake Hells Canyon subbasin primarily occurs in mid-November, but may occur in late October and early December (Rondorf and Miller 1993; 1994; 1995). Groves and Chandler (1999) determined that redd depths for Snake River fall chinook salmon ranged between 0.2 – 6.5 m., mean water column velocity ranged from 1.3 – 6.8 feet/second, and substrate-level water velocity ranged from 0.3 – 6.6 feet/second. Substrate sizes used for spawning ranged between 1.0 – 5.9 inches (Groves and Chandler 1999). Spawning was determined to initiate when water temperatures dropped below 16.0° C, and terminated when temperatures approached 5.0°C.

Post-emergence rearing life history forms are most commonly associated with littoral habitat (BLM 2000a), which is generally characterized by sandy substrate (Tiffan et al. 1999).

Mid-Snake juveniles grow rapidly. Peak numbers of subyearling fall chinook were beach-seined during April in the Hanford Reach (Columbia River), in May in McNary Reservoir (Columbia River), and in June in the Middle Snake River (Rondorf and Miller 1995). Results show that Middle Snake River subyearling chinook salmon attained a larger size more quickly than Columbia River subyearlings (Rondorf and Miller 1995).

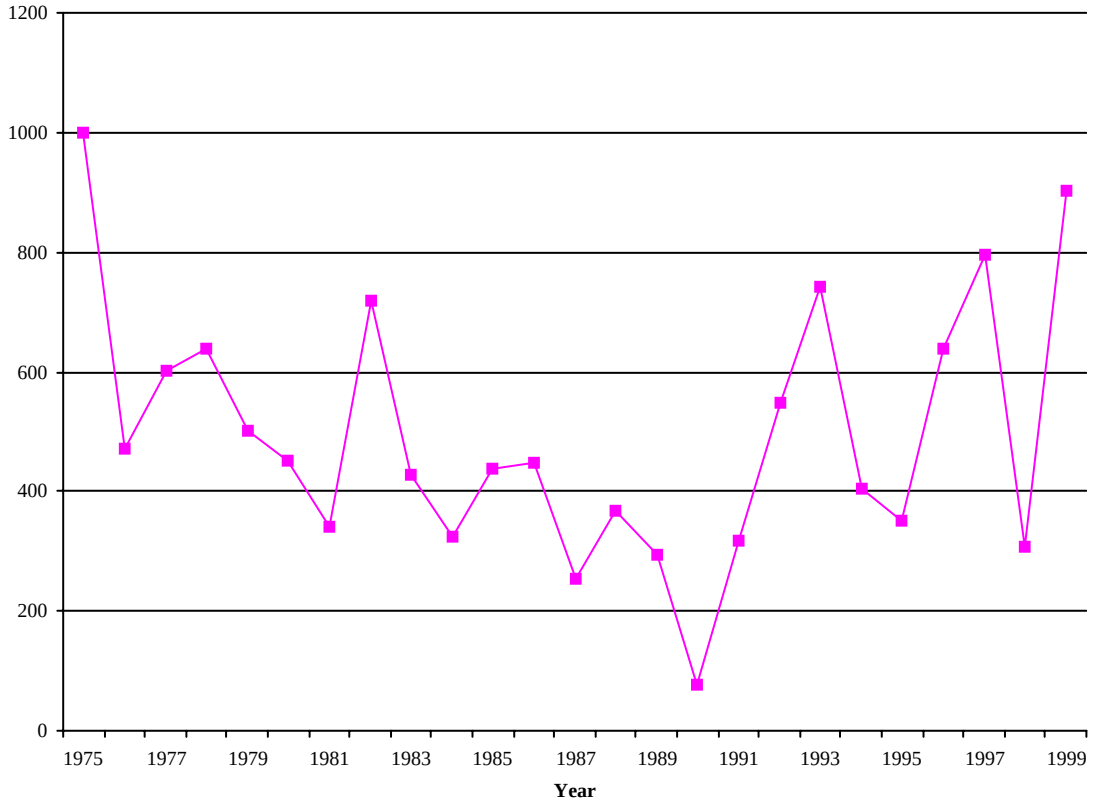


Figure 18. Adult returns of wild fall chinook salmon past Lower Granite Dam (1975-1999) (BLM 2000a).

Snake River fall chinook salmon initiate a protracted downstream migration in the late spring (June) and early summer (July) as subyearlings (2.7-3.9 inches in length) (Rondorf and Miller 1993). Late emigration of hatchery fish to Lower Granite Dam may be affected by a number of factors including fall chinook salmon size at time of release, river flow, and water temperature at time of release (Rondorf and Miller 1993; 1994; 1995). Late emigration timing is detrimental to production since smolt survival to Lower Granite Dam decreases as summer flow decreases, summer water temperature increases and passage date at the dam increases (Connor et al. 1998, Connor 1999). Studies have shown that outmigrating fall chinook juveniles are capable of moving substantial distances during the day as well as at night, swimming actively only at low water velocities and rarely drifting passively (Rondorf and Miller 1993; 1994; 1995). During their migration, subyearlings have a biological requirement for food in the juvenile migration corridor/rearing area. Prey resources in reservoirs differ from those in free-flowing reaches (e.g., terrestrial insects and zooplankton predominate in reservoirs versus aquatic insects in the free-flowing river).

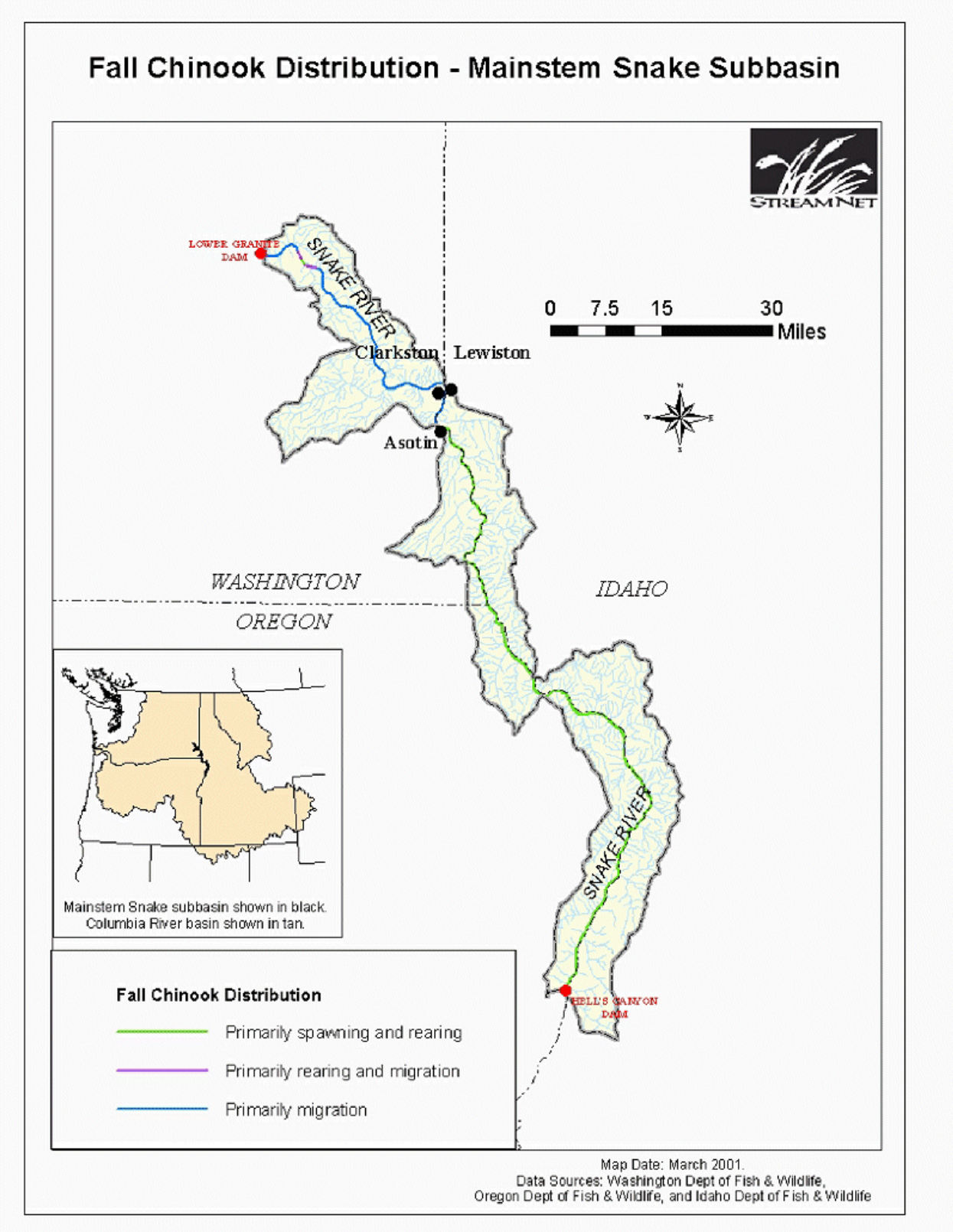


Figure 19. Fall chinook distribution in the Snake Hells Canyon subbasin

The majority of fall chinook redds constructed between 1996 and 1999 upriver of Lower Granite Dam occurred in the mainstem Snake (Garcia 2000) (Table 8). Results from 1994 and 1995 redd count surveys indicate that the majority of spawning had shifted downstream to sites above the Grand Ronde River, as compared to counts made from 1988-1993 (Rondorf and Tiffan 1997). Mainstem redds counted in 1999 accounted for 64% of the total, compared to 61% in 1998, 31% in 1997, and 55% in 1996 (Table 8). Redd counts in 1999 were the highest recorded since annual searches began in 1986 (Garcia 2000). The increase in returns between 1998-2000 may be attributable to supplemental releases of juvenile fish in previous years (G. Mendel, personal communication, May, 2001).

Table 8. Number of fall chinook redds counted upriver from Lower Granite Dam, 1986-1999. An empty cell indicates no searches were conducted in the corresponding river or method, and year (A.P. Garcia, USFWS, Ahsahka, Idaho; unpublished data. Data from the Clearwater basin and the Salmon River provided by the Nez Perce Tribe).

| *River* | **1986** | **1987** | **1988** | **1989** | **1990** | **1991** | **1992** | **1993** | **1994** | **1995** | **1996** | **1997** | **1998** | **1999** | **2000** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Snake (aerial)[1/]** | **7** | **66** | **64** | **58** | **37** | **41** | **47** | **60** | **53** | **41** | **71** | **49** | **135** | **273** | 255 |
| **Snake (camera)[2/]** | | | | | | **5** | **0** | **67** | **14** | **30** | **42** | **9** | **50** | **100** | 91 |
| Clearwater (RM 0-41) | | | 21 | 10 | 4 | 4 | 25 | 36 | 30 | 20 | 66 | 58 | 78 | 179 | 164 |
| Clearwater (RM 41-74) | | | | | | | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 7 |
| M.F. Clear. (RM 74-98) | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| NF Clearwater | | | | | | | 0 | 0 | 7 | 0 | 2 | 14 | 0 | 1 | 0 |
| SF Clearwater | | | | | | | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 |
| Grande Ronde | 0 | 7 | 1 | 0 | 1 | 0 | 5 | 49 | 15 | 18 | 20 | 55 | 24 | 13 | 1 |
| Imnaha | | 0 | 1 | 1 | 3 | 4 | 3 | 4 | 0 | 4 | 3 | 3 | 13 | 9 | 8 |
| Salmon | | | | | | | 1 | 3 | 1 | 2 | 1 | 1 | 3 | 0 | 9 |
| Selway | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 7 | 73 | 87 | 69 | 45 | 54 | 82 | 219 | 120 | 115 | 206 | 189 | 303 | 579 | 535 |

1/ The targeted search area was the entire reach from the head of Lower Granite Reservoir to Hells Canyon Dam.
2/ The targeted search areas were discrete sites composed mainly of 1-6 inch bottom substrates. The number of sites searched varied each year.

#### Spring Chinook Salmon

Historically, Snake River spring and summer chinook spawned in virtually all accessible and suitable habitat in the Snake River system (Fulton 1968). A substantial proportion of Columbia Basin spring/summer chinook were estimated to have originated in the Snake River Basin in the late 1800's, with total production probably exceeding 1.5 million in some years (NMFS 2000a). By the mid-1900's however, the abundance of adult spring/summer chinook salmon had declined considerably. Fulton (1968) estimated that an average of 125,000 adults per year entered the Snake River tributaries from 1950 through 1960. Adult counts at dams show that this value has continued to decline since the 1960's.

Currently, the number of naturally spawning spring/summer chinook salmon in the Snake Hells Canyon subbasin are at all time lows, with an overall downward trend (

Figure 20). Most chinook salmon stocks in the remaining accessible habitat are severely depressed and at risk (BLM 2000a; 2000b).

Stream-type chinook were historically widely distributed, occupying an estimated 46% of the Columbia River basin, and occurring as far up the Snake River as Shoshone Falls (RM 615) (Haas 1965). Current distribution of spawning and rearing populations of native fish has been reduced to 0.2% of the historical range and 0.8% of the historical range respectively (Figure 21) (BLM 2000b).

Below the confluence with the Salmon River, Asotin Creek is the only tributary stream used by chinook salmon for spawning, while a limited amount of rearing may occur in lower reaches of some of the larger tributaries (i.e. Captain John Creek) (BLM 2000b; WDFW et al. 1990). Above the Salmon confluence, Granite and Sheep creeks are the only tributaries used for spawning, albeit very minimally (BLM 2000a). Limited juvenile rearing may occur in lower tributaries when stream conditions are suitable.

The highly variable life histories of stream-type chinook allow the species to adapt to a wide range of environmental conditions. Adult spring chinook salmon destined for the Snake River and its tributaries enter the Columbia River in early spring, pass Bonneville Dam from March through May and reach the Snake River by late April (BLM 2000b). They arrive at staging areas from late May to early July, and spawn from August to mid-September (IDFG 1992 cited in BLM 2000b). Spawning adults are typically ages four to five (spending 2-3 years in the ocean), although may return to the subbasin as three to six year-olds. Fry emerge from February to April, rear through the summer in the natal stream, and then migrate downstream into the mainstem or larger tributary (i.e. Captain John or Asotin Creek) where they will overwinter. Spring chinook outmigrate as age 1+ juveniles, passing Lower Granite Dam from late April through June.

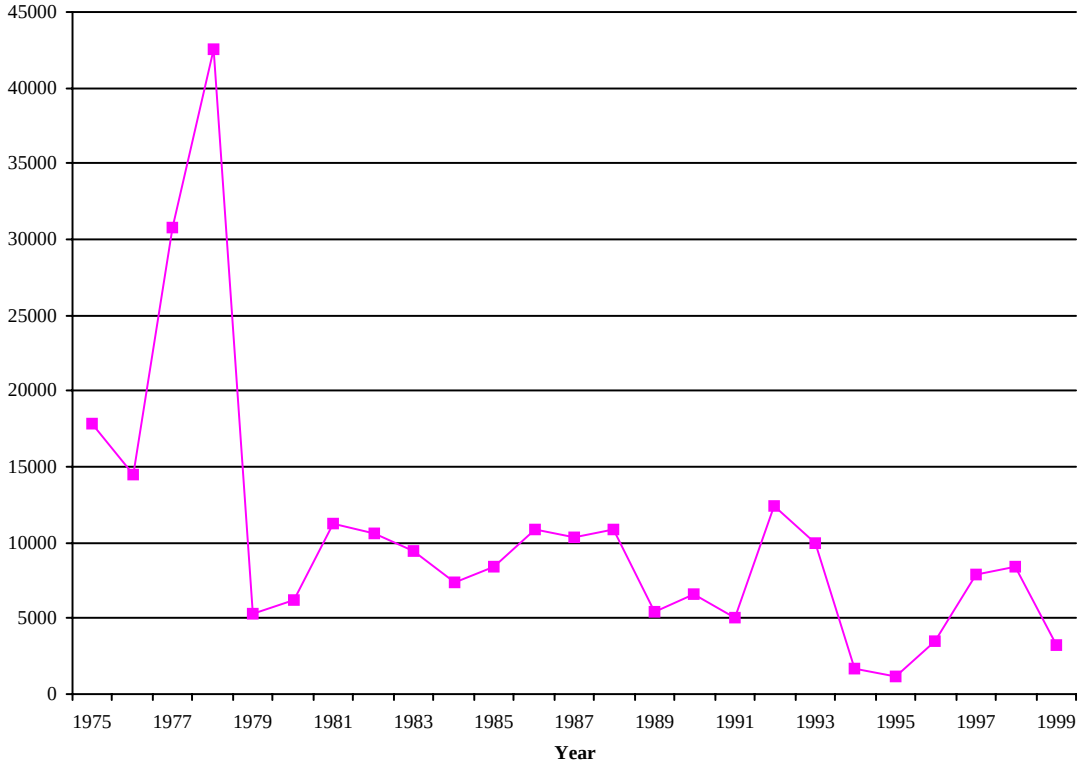


Figure 20. Adult returns of wild spring/summer chinook past Lower Granite Dam (1975-1999) (BLM 2000a; 2000b).

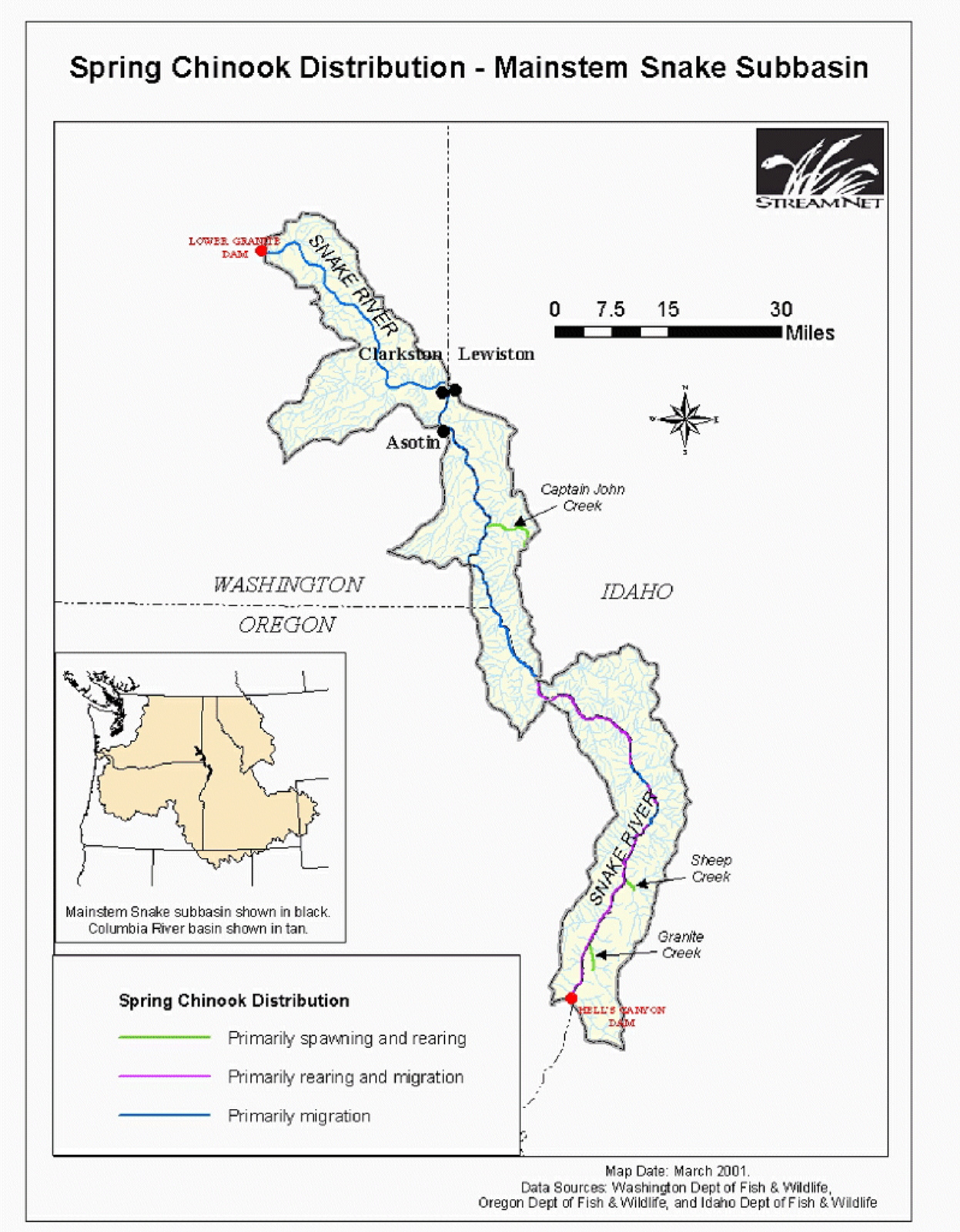


Figure 21. Spring chinook distribution in the Snake Hells Canyon subbasin

### Sockeye Salmon

Historic runs of anadromous sockeye adults at the mouth of the Columbia River may have numbered more than two million before the turn of the century. The number of Snake River sockeye adults returning to Redfish Lake in the upper Salmon subbasin has ranged from zero to eight fish since 1990 (Figure 22). An intensive, captive brood-stock program has been initiated to conserve the remaining population.

The Snake Hells Canyon subbasin provides a migratory corridor for adult and juvenile sockeye salmon during July-August and April-June, respectively (Figure 23). This portion of the subbasin is designated critical habitat for fish en route to the upper Salmon subbasin (refer to Huntington et al. *in press*).

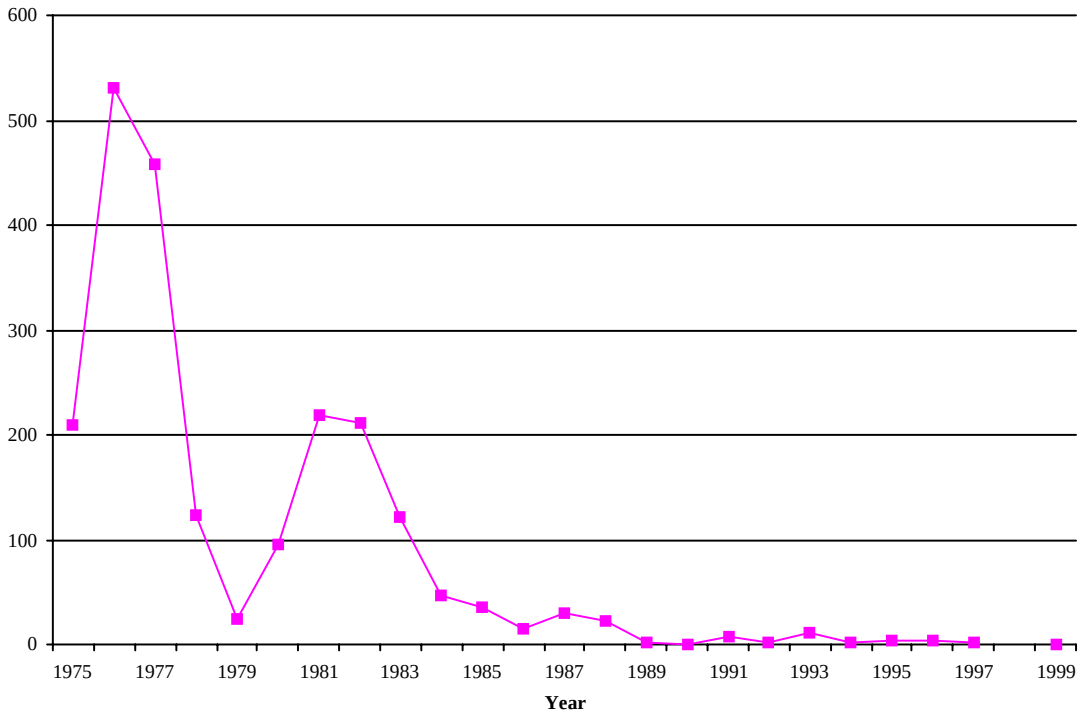


Figure 22. Numbers of Snake River sockeye passing Lower Granite Dam (1975-1999)

### Steelhead Trout

Steelhead occurring in the Snake Hells Canyon subbasin are typical A-run steelhead from the mid-Columbia and Snake basins. Most adults (60%) return from the ocean after one year of marine rearing (ODFW 2001). Two-salt and occasionally three-salt fish comprise the remainder of returns to the Snake. Females generally predominate with a 60/40 sex ratio on average (ODFW 2001). Returning adults range in size from 45 to 91 cm in length, and average 1.4 to 6.8 kg.

Adults generally enter the Columbia river from May through August, and enter their natal streams from September through April (ODFW 2001). Adults utilize accessible and suitable habitat throughout the subbasin for spawning. Spawning is initiated in March in lower elevation habitat and continues through early June in higher elevation, snowmelt-dominated habitat.

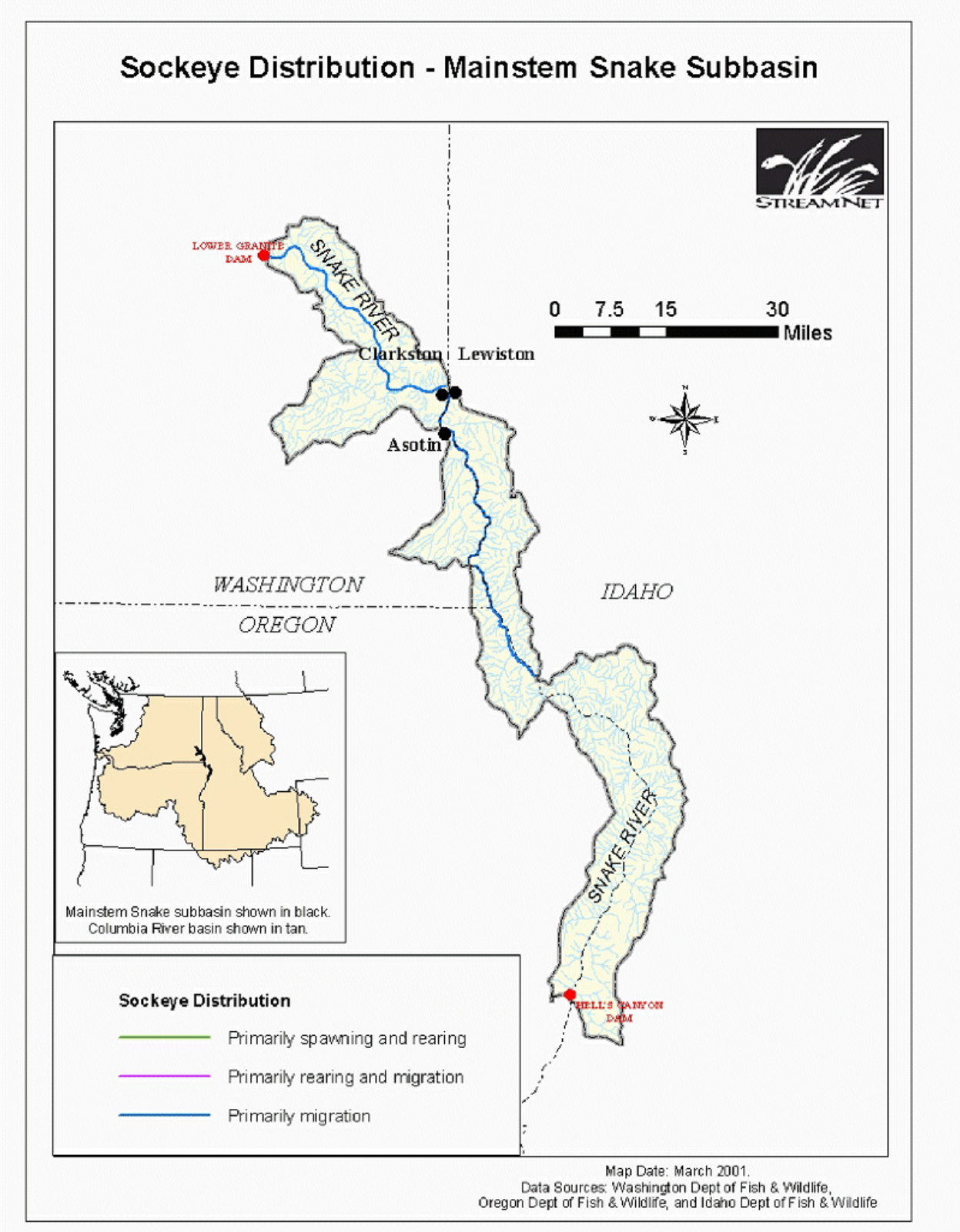


Figure 23. Sockeye salmon distribution in the Snake Hells Canyon subbasin

Most naturally produced smolts migrate after rearing for two years (ODFW 2001). A much lower percentage migrates after one or three years. Smolt out-migration from the basins extends from late winter until late spring. Peak smolt movement is associated with increases in flow, generally occurring between mid-April and mid-May.

Juveniles utilize a wide array of habitats throughout the Middle Snake, and are generally ubiquitous where other salmonids occur including areas adjacent to hatchery smolt release locations (ODFW 2001). Areas below the Salmon River confluence (excluding the Clearwater River, Grande Ronde River, and Imnaha River) containing spawning and rearing steelhead include Asotin Creek, Ten Mile Creek, Couse Creek, Captain John Creek, Jim Creek, and Cook Creek (Figure 24) (BLM 2000b). Asotin Creek, Captain John Creek, Ten Mile Creek and Couse Creek are considered to have the highest potential production by the Cottonwood Bureau of Land Management (BLM 2000b). Other tributaries (below the Salmon confluence) with limited use (often rearing only) include Tammany Creek, Tenmile Creek, Corral Creek, Cache Creek, Cottonwood Creek, and Cherry Creek (BLM 2000b).

In Idaho, some of the larger tributaries above the Salmon River confluence with known spawning and rearing populations of summer steelhead include Divide Creek, Wolf Creek, Getta Creek, Kirkwood Creek, Sheep Creek, and Granite Creek (refer to Figure 2) (BLM 2000a). Granite Creek and Sheep Creek are considered to be priority watersheds by the Cottonwood Bureau of Land Management (BLM 2000b). Larger tributaries utilized for spawning and rearing in Oregon include Somers Creek, Temperence Creek and Saddle Creek. Other Idaho and Oregon tributaries used by steelhead include (Idaho) Dry Creek, Highrange Creek, Big Canyon Creek, West Creek, Kurry Creek, Klopton Creek, Corral Creek, Kirby Creek, Kirkwood Creek, Sheep Creek, Bernard Creek, Three Creek, Granite Creek, Deep Creek, (Oregon) Deep Creek, Cougar Creek, Salt Creek, Sand Creek, Rush Creek, Sluice Creek, Battle Creek, Stud Creek, and Hells Canyon Creek.

Steelhead harvest in the Snake Hells Canyon subbasin has been restricted to hatchery fish only since 1979 (ODFW 2001). It is not anticipated that consumptive fisheries for wild steelhead will be reinstated in the foreseeable future (ODFW 2001). Adult hatchery steelhead returns of fish produced from the LSRCP and IPC hatchery programs have allowed harvest opportunities beginning in 1986. Oregon punch card estimates of hatchery fish harvest ranged from 1,116 to 2,444 fish for the 1991-92 through 1993-94 fishing seasons. Angler effort has tended to follow the availability of hatchery fish with effort being high in high return years and low in low return years (ODFW 2001).

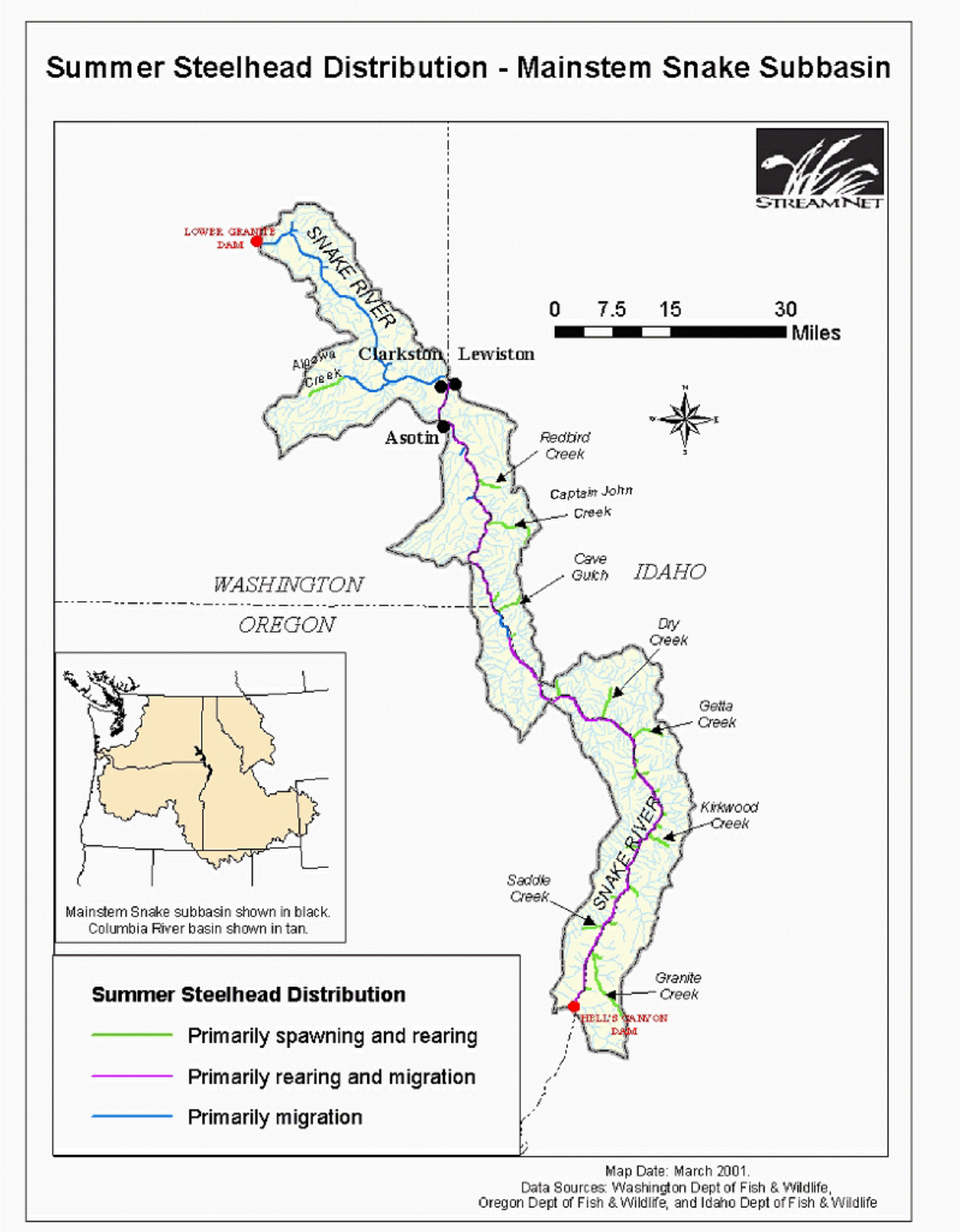


Figure 24. Steelhead distribution within the Snake Hells Canyon subbasin

#### 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 (*Acipenser transmontanus*) and their principal food resources in the Lower Snake River between Hells Canyon and Lower Granite 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 FS 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. The U.S. Fish and Wildlife Service lists the Kootenai River (Idaho, Montana and British Columbia) white sturgeon population as endangered.

Population status information has been collected in various segments of the Snake River between Lower Granite and Hell's Canyon dams since 1970 (Table 9). Currently, white sturgeon populations in the Mid-Snake are considered viable (Wallowa-Whitman National Forest 1999; Johnson 2000). Population estimates are 10,000 fish in 1977 (Coon 1977), 4,000 fish in 1985 (Lukens 1985), and 3,800 fish in 2000 (Tuell and Everett 2001).

Table 9. Population abundance estimates reported for white sturgeon between Lower Granite Dam (Rkm 108) and Hells Canyon Dam (Rkm 398).

| Location | Abundance (estimator) | Sample Year(s) | Author |
|---|---|---|---|
| Lower Granite Dam site to Hells Canyon Dam (Rkm 174-207) | 8,000-12,000 (Schnabel) | 1972-75 | Coon et al. 1977 |
| Clearwater River to Hells Canyon Dam (Rkm 224-398) | 3,955 (Schnabel) | 1982-84 | Lukens 1985 |
| Lower Granite Reservoir (Rkm 174-240) | 1,372 (Jolly-Seber)<br>1,524 (Schnabel) | 1990-91 | Lepla 1994 |
| Lower Granite Reservoir (Rkm 174-240) | 1,804 (Schnabel) | 1992 | Bennett el al. 1993 |
| Salmon River to below Hells Canyon Dam (Rkm 303-383) | 1,312 (Schnabel)<br>1,600 (Jolly-Seber) | 1997-2000 | Lepla et al. 2001 |
| Lower Granite Dam to Salmon River (Rkm 174-303) | 2,544 (Schnabel)<br>1,823 (Jolly-Seber) | 1997-1999 | Heofs 1997<br>Heofs 1998<br>Tuell and Everett 2000<br>Tuell and Everett 2001 |

In 1972-75, 86 percent and in 1982-84, 80 percent of the population was comprised of white sturgeon less than 92 cm. In addition, the proportion of white sturgeon between 92 and 183 cm, which were heavily harvested until 1970, comprised 4 and 18 percent of the populations sampled in the 1970's and 1980's, respectively (Figure 25; Coon Et. al 1977; Lukens 1985). In contrast, of the white sturgeon collected during 1997-99, only 57 percent were less than 92 cm, while 30 percent ranged between 92 and 183 cm. (Tuell and Everett 2001).

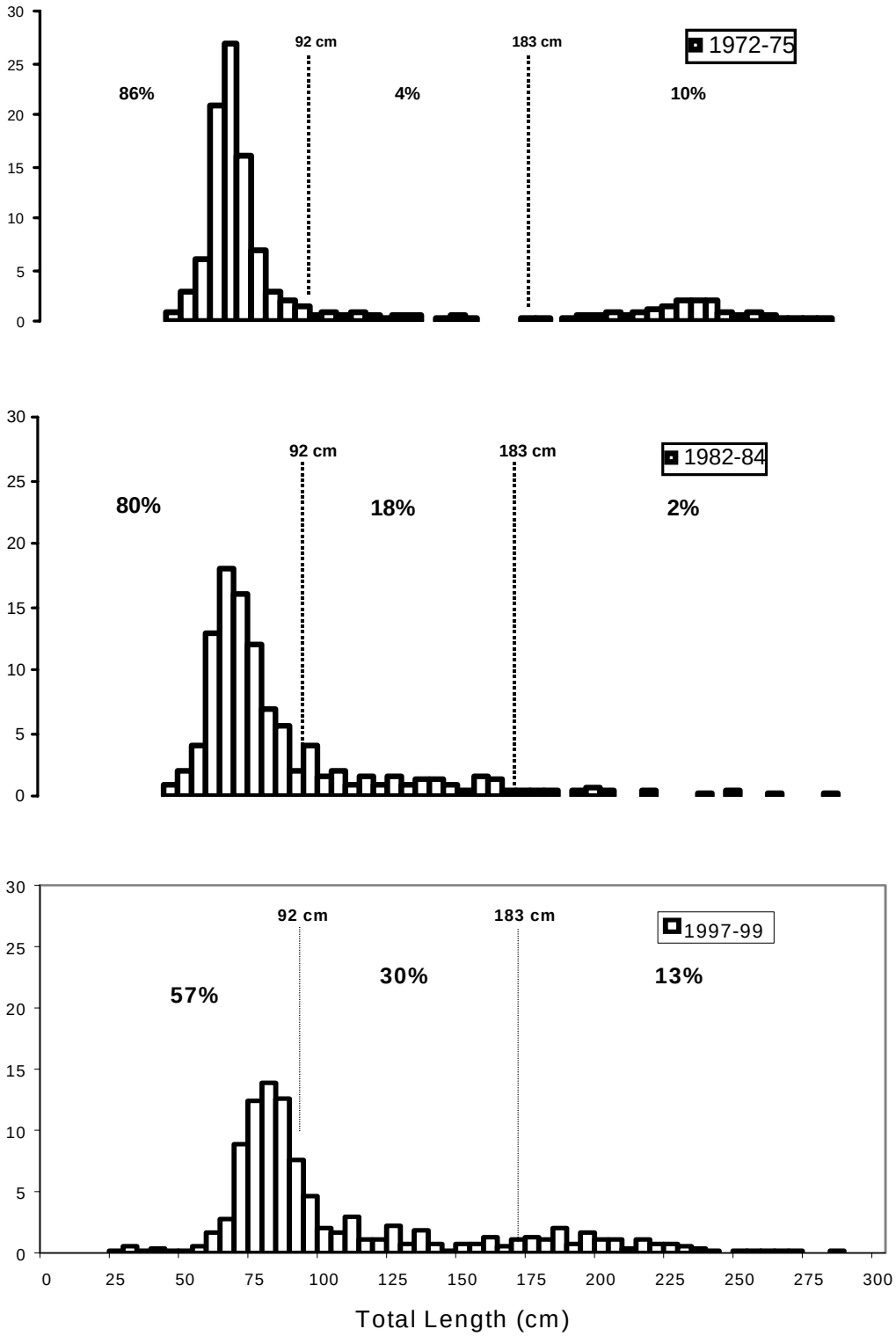


Figure 25. The length (total length) frequency distributions of sturgeon sampled from the Hells Canyon reaches of the Snake River, 1997-99 (Tuell and Everett 2001) 1982-84 (Lukens 1985), and 1972-75 (Coon et al. 1977) and the percent of the populations < 92 cm, between 92 and 183 cm, and >183 cm

The following information is summarized from the ICRB Aquatic Component Report (Quigley and Arbelbide 1997). The white sturgeon becomes sexually mature at 10 to 15 years and spawning intervals may be 4 to 11 years. The fish spawns during May and June in rocky bottoms near rapids and lays up to two million eggs. A fish at one year is 9 inches in length; 5 years is 20 inches in length; 15 years is 40 inches in length (15 to 20 pounds); and 25 to 60 years is 6 to 9 feet in length. Females grow faster than males, particularly in weight after 14 years. 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 white sturgeon is a bottom 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 poor light. "Sturgeon holes" may often range from 30 to 100 feet in depth. Because of poor light conditions the sturgeon utilizes four barbels on the snout for touching and smelling.

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 f lows compared with years of low flow (Hanson et al. 1992). Adults and juveniles prefer deep-pool habitat with a fine bottom substrate. Adults tend to move downstream in the summer and fall months and upstream in the winter and spring months. Fish tend to stay in shallower water during the spring and summer and move to deeper waters during the winter.

White sturgeon are only found in the mainstem Snake River. The Hells Canyon reach along the Oregon-Idaho border contains the highest densities of Snake River white sturgeon (BLM 2000b). Key habitats are generally associated with the deep holes occurring between Hells Canyon and Lower Granite Dams. Relative distribution of fish from Lower Granite to mouth of Salmon River is shown in Figure 26 (Tuell and Everett 2001).

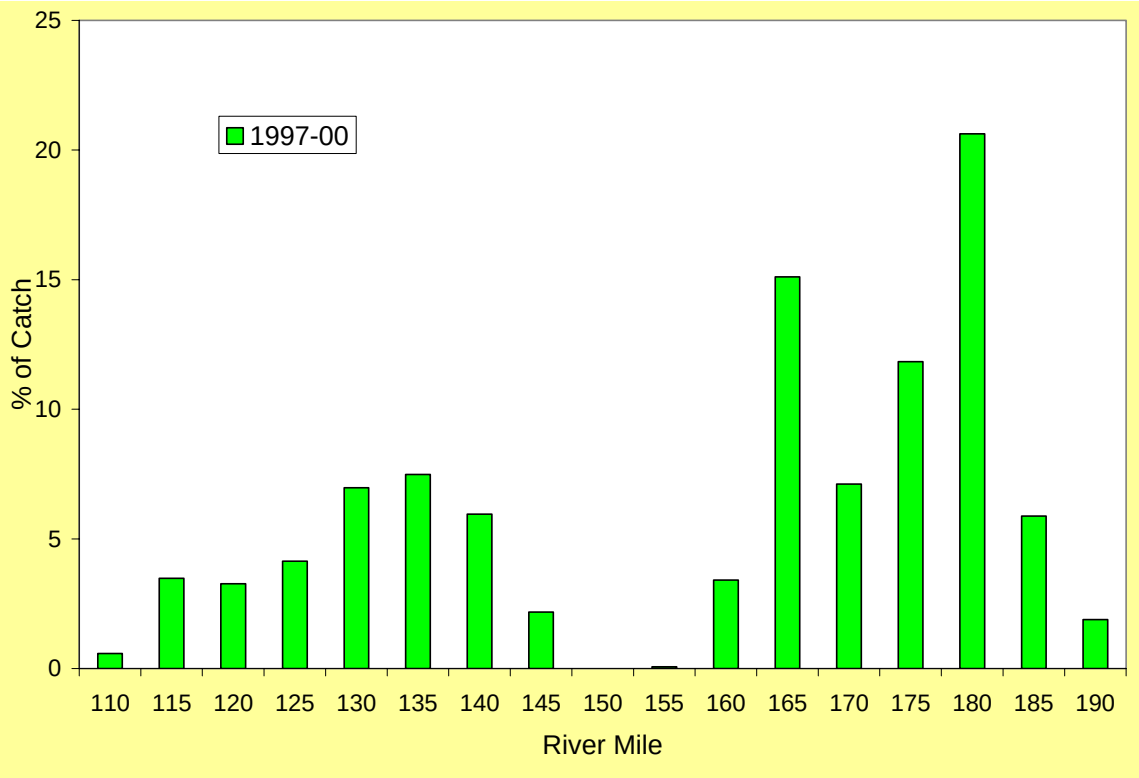


Figure 26. Relative distribution of white sturgeon between Lower Granite Dam and the confluence of the Salmon River (1997-2000) (J. Hesse, NPT, personal communication, May, 2001).

#### Bull Trout

Several subpopulations of bull trout occur upstream of the reservoir influence of Lower Granite Dam, and migrants from these groups have the capability of freely moving to and from Lower Granite Reservoir. These groups include fish from Asotin Creek, Grande Ronde, Imnaha and Salmon rivers. The USFWS has found little evidence to suggest these populations use habitat associated with the FCRPS in the Lower Snake River.

The Snake Hells Canyon subbasin occurs within the historic native range of bull trout. However, historic abundance and trend data are scarce because bull trout were considered a nuisance fish (IDEQ 1998). Bull trout are also difficult to detect during surveys because they hide and tend to be nocturnal. Therefore, they are often missed or underestimated during electrofishing and daytime snorkel surveys (IDEQ 1998). Survey and abundance measures are further limited by the fact that fluvial bull trout may occupy a portion of a stream for only a limited amount of time.

The lack of information regarding migratory phases of bull trout has led to the misidentification of fluvial fish as resident fish (Hemmingsen et al. 2001a). Management implications resulting from this confusion may underestimate the importance of maintaining migratory habitat crucial for the connectivity between various populations. Recent efforts, in an attempt to address these management issues, are currently underway. The Oregon Department of Fish and Wildlife has initiated studies to determine the distribution of juvenile and adult bull trout and their respective habitats, and is also studying fluvial and resident life history patterns.

While results are still preliminary, ODFW has documented radio-tagged Grande Ronde fish in the Middle Snake as far down as RM 146, just upstream from Asotin, WA (e.g. Hemmingsen et al. 2001a; Hemmingsen et al. 2001b; USFWS 2000), although documenting the extent and duration of their residence in the mainstem currently represents a research need (M. Hanson, ODFW, personal communication, April 19, 2001). In the lower reaches of the Imnaha River, large migrant sized bull trout are incidentally caught by steelhead anglers each year, and ODFW believes these fish are migrants that use the Snake River seasonally (B. Knox, ODFW, personal communication, 2000). Fluvial bull trout are occasionally captured at the Idaho Fish and Game smolt trap near Lewiston (Basham, in litt. 2000), but the catch rates have been no more than 1 bull trout annually. Bull trout are also often caught in the steelhead fishery during the winter from the mouth of the Grande Ronde to Asotin (G. Mendel, WDFW, personal Communication, May, 2001).

Below the Salmon River confluence, the only known tributary providing spawning and early rearing is the Grande Ronde River and Asotin Creek in Washington (Figure 27) (BLM 2000b; IDEQ 1998) (refer to Johnson et al. and Nowak et al. *in press*). Captain John Creek in Idaho, and Asotin Creek are considered to be medium priority watersheds since they producers of forage fish for bull trout (i.e. rainbow trout/steelhead). Other Snake River tributaries are also producers of forage fish; however, production is often limited because of small size, low flows, steep gradient, and fish passage barriers (IDEQ 1998).

Above the Salmon River confluence, the only known tributaries containing spawning and rearing bull trout are Sheep Creek and Granite Creek (BLM 2000a; Buchanan et al. 1997; Clearwater Basin Technical Advisory Team 1998). Data is lacking for population size, movement, and/or life histories of bull trout utilizing this portion of the subbasin. Medium priority watersheds (those which are producers of forage fish for bull trout) in the subbasin include Divide Creek, Getta Creek, and Kirkwood Creek (IDEQ 1998). Medium priority watersheds occurring in Oregon include Saddle Creek and Temperance Creek (IDEQ 1998). Other Snake River tributaries are also producers of forage fish; however, anadromous production is limited because of small size, low flows, steep gradient, and fish passage barriers.

#### Redband Trout

Little information exists on redband trout due to the difficulty in morphologically distinguishing juveniles from anadromous juvenile rainbow trout (steelhead). Non-anadromous rainbow trout occurring within the Snake Hells Canyon subbasin may be divided into two groups; one group which evolved in sympatry with steelhead and the other allopatric, or those which evolved outside the historical range of steelhead (BLM 2000b). The sympatric form, or non-anadromous steelhead, are considered to be historically derived or associated with steelhead (BLM 2000b). The Cherry, Cook and Deep creeks all provide several miles of rainbow habitat above natural migratory fish barriers. Cherry, Cook and McGraw creeks are believed to contain pure strains of redband trout (USDA Forest Service 1999).

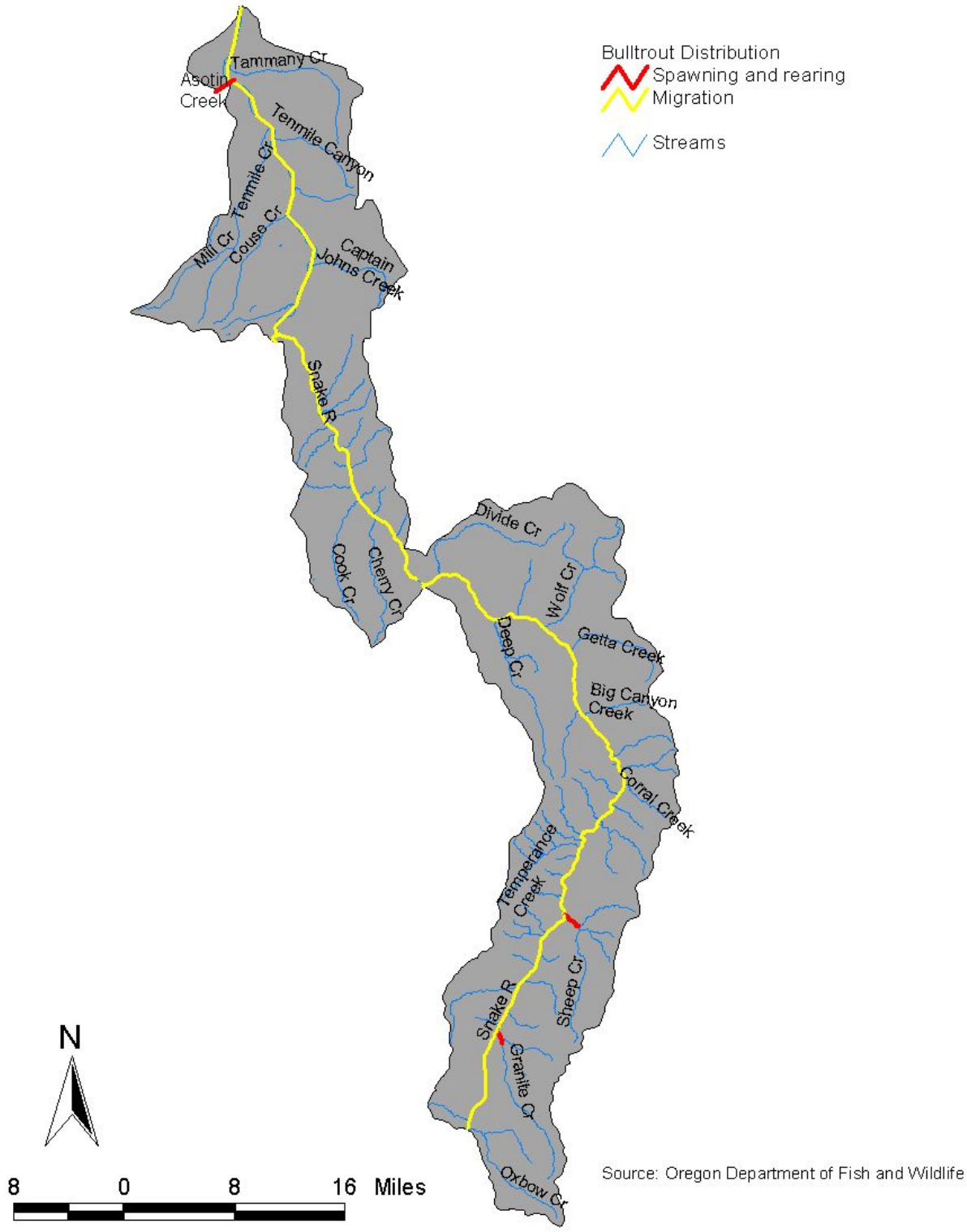


Figure 27. Bull trout distribution in the Mid-Snake subbasin.

## Wildlife

The complex topography, varied soil conditions, and diverse vegetative communities of the Snake Hells Canyon subbasin make it an ideal home for a large number of wildlife species. A list of vertebrate species, excluding fish, that potentially occur in the area, was developed as part of the 1995 Wildlife Inventory of Craig Mountain (Cassirer 1995). The list was compiled using wildlife data from the BLM, The Nature Conservancy, Washington Department of Wildlife, Oregon Department of Fish and Wildlife, U. S. Forest Service (USFS) Hells Canyon National Recreation Area, regional publications, searches of the Idaho Conservation Data Center database, Oregon Natural Heritage Program database, and University museums (Cassirer 1995). During the subbasin summary process the Craig Mountain species list was reviewed and updated by regional biologists, additions and deletions were made to account for the fact that the Craig mountain study area does not include the entire Snake Hells Canyon subbasin and also contains areas outside of the subbasin. A total of 269 vertebrate species other than fish were thought to occur within the Snake Hells Canyon subbasin during all or part of the year including 179 bird, 66 mammal, 10 amphibian, and 14 reptile species (Appendix A).

Most of the wildlife species of the Snake Hells Canyon subbasin are thought to have healthy and stable populations but there are many exceptions. Of the 269 non-fish vertebrate species in the subbasin, 43 are special status species, in Idaho, Oregon, or Washington; or are listed by the U. S. Fish and Wildlife Service, USFS and/or BLM (Table 10).

The composition of the wildlife community has been altered since the historic period. Some native species, including marten, sharptailed grouse, and white-tailed jackrabbits have been, or may have been extirpated from the subbasin. Wild turkey, chukar, gray partridge, european starlings, and bull frogs have been introduced to the subbasin either intentionally or unintentionally and have become well-established (Cassirer 1995).

The large number of wildlife species that occur in the Snake Hells Canyon subbasin makes management on a species by species basis impractical. Wildlife management in the subbasin is conducted in an ecosystem-based framework with the goal of providing a variety of wildlife habitat conditions in all vegetative communities. Representatives from the three broad terrestrial habitat types present in the subbasin were selected as target species because of their ability to serve as indicators of ecosystem health and representatives of larger wildlife guilds. Species of special concern, managed species, and groups of species with many members experiencing population declines were also considered. The management focal species selected in this document reflects those considered in the Hells Canyon National Recreation Area (HCRNA) Comprehensive Management Plan, and the Craig Mountain Wildlife Inventory (USDA Forest Service 1999, Cassirer 1995).

Table 10. Listed wildlife species of the Snake Hells Canyon subbasin (WDFW ODFW .

| Species | | Idaho State | Oregon State | Washington State | US Forest Service | BLM | Federal |
|---|---|---|---|---|---|---|---|
| *Accipiter gentilis* | Northern Goshawk | SOC[1]-Undetermined | Sensitive-Critical | Canidate | Sensitive | Sensitive | SOC |
| *Aegolius funereus* | Boreal Owl | SOC-Priority | Sensitive-Undetermined | N/A | N/A | Sensitive | N/A |
| *Ascaphus truei* | Tailed Frog | N/A[2] | Sensitive-Vulnerable | N/A | N/A | N/A | N/A |
| *Bucephala albeola* | Bufflehead | N/A | Sensitive-Undetermined | N/A | N/A | N/A | N/A |
| *Bufo boreas* | Western Toad | SOC-Undetermined | Sensitive-Vulnerable | N/A | Sensitive | Sensitive | SOC |
| *Bufo regalis* | Ferruginous Hawk | N/A | Sensitive-Critical | Threatened | N/A | N/A | SOC |
| *Bufo swainsoni* | Swainson's Hawk | N/A | Sensitive-Vulnerable | N/A | N/A | N/A | N/A |
| *Chaetura vauxi* | Vaux's swift | N/A | N/A | Canidate | N/A | N/A | N/A |
| *Chrysemys picta* | Painted Turtle | N/A | Sensitive-Critical | N/A | N/A | N/A | N/A |
| *Contopus borealis* | Olive-sided Flycatcher | N/A | Sensitive-Vulnerable | N/A | N/A | N/A | SOC |
| *Dolichonyx oryzivorus* | Bobolink | N/A | Sensitive-Vulnerable | N/A | N/A | N/A | N/A |
| *Diadophis punctatus* | Ringneck Snake | SOC-Undetermined | N/A | N/A | N/A | Sensitive | N/A |
| *Drycopus pileatus* | Pileated Woodpecker | N/A | Sensitive-Vulnerable | Canidate | N/A | N/A | N/A |
| *Empidonax trailii* | Willow flycatcher | N/A | N/A | N/A | N/A | N/A | SOC |
| *Euderma maculatum* | Spotted Bat | SOC-Undetermined | N/A | N/A | N/A | Sensitive | N/A |
| *Falco peregrinus anatum* | American Peregrine Falcon | Endangered | Endangered | Endangered | N/A | N/A | SOC |
| *Glaucidium gnoma* | Northern Pygmy-owl | SOC-Undetermined | Sensitive-Critical | N/A | N/A | N/A | N/A |
| *Gulo gulo* | Wolverine | SOC-Priority | Threatened | Canidate | Sensitive | Sensitive | N/A |
| *Haliaeetus leucocephalus* | Bald Eagle | Endangered | Threatened | Threatened | N/A | N/A | Threatened |
| *Lanius ludovicianus* | Loggerhead Shrike | SOC-Priority | N/A | Canidate | N/A | Sensitive | SOC |
| *Lasionycteris noctivagans* | Silver-haired Bat | N/A | Sensitive-Undetermined | N/A | N/A | N/A | N/A |
| *Lepus townsendii* | White-tailed Jackrabbit | N/A | Sensitive-Undetermined | N/A | N/A | N/A | N/A |
| *Lynx canadensis* | Lynx | SOC-Undetermined | N/A | Threatened | N/A | Sensitive | Threatened |
| *Martes americana* | American Marten | N/A | Sensitive-Vulnerable | N/A | N/A | N/A | N/A |
| *Melanerpes lewis* | Lewis' woodpecker | N/A | N/A | Canidate | N/A | N/A | N/A |
| *Myotis ciliolabrum* | Western Small-footed Myotis | N/A | Sensitive-Undetermined | N/A | N/A | Sensitive | N/A |
| *Myotis evotis* | Long-eared Myotis | N/A | Sensitive-Undetermined | N/A | N/A | Sensitive | N/A |

| Species | Idaho State | Oregon State | Washington State | US Forest Service | BLM | Federal | Species |
|---|---|---|---|---|---|---|---|
| *Myotis thysanodes* | Fringed Myotis | SOC-Undetermined | Sensitive-Vulnerable | N/A | N/A | Sensitive | N/A |
| *Myotis volans* | Long-legged Myotis | N/A | Sensitive-Undetermined | N/A | N/A | Sensitive | N/A |
| *Myotis yumanensis* | Yuma Myotis | N/A | N/A | N/A | N/A | Sensitive | N/A |
| *Oreortyx pictus* | Mountain Quail | SOC-Priority | N/A | N/A | Sensitive | Sensitive | SOC |
| *Oreoscoptes montanus* | Sage thrasher | N/A | N/A | Canidate | N/A | N/A | N/A |
| *Otus flammeolus* | Flammulated Owl | SOC-Undetermined | Sensitive-Critical | Canidate | Sensitive | Sensitive | N/A |
| *Ovis canadensis* | Bighorn sheep | N/A | | N/A | | N/A | SOC |
| *Picoides albolarvatus* | White-headed Woodpecker | SOC_Peripheral | Sensitive-Critical | N/A | Sensitive | Sensitive | N/A |
| *Picoides arcticus* | Black-backed Woodpecker | SOC-Undetermined | Sensitive-Critical | Canidate | Sensitive | Sensitive | N/A |
| *Rana pretiosa* | Spotted Frog | SOC-Undetermined | N/A | Endangered | N/A | Sensitive | Candidate |
| *Rana pipiens* | Northern Leopard Frog | SOC-Priority | N/A | Endangered | Sensitive | Sensitive | SOC |
| *Sceloporus graciosus* | Sagebrush lizard | N/A | N/A | N/A | N/A | N/A | SOC |
| *Riparia riparia* | Bank Swallow | N/A | Sensitive-Undetermined | N/A | N/A | N/A | N/A |
| *Sitta pygmaea* | Pygmy Nuthatch | SOC-Undetermined | Sensitive-Critical | N/A | N/A | Sensitive | N/A |
| *Strix nebulosa* | Great Gray Owl | SOC-Undetermined | Sensitive-Vulnerable | N/A | N/A | Sensitive | N/A |
| *Sorex merriami* | Merriam's shrew | N/A | N/A | Canidate | N/A | N/A | N/A |

[1]SOC-Species of Concern

[2]N/A: Not listed as threatened, endangered, sensitive, species of concern, or candidate species

**Forest associated species**

Bats

The Middle-Snake subbasin provides extremely important habitat for many species of bats, some of which are listed species. Townsend's big-eared bats are year round residents of the Snake Hells Canyon subbasin which contains nursery, foraging and hibernating habitat. Populations of Townsend's big-eared bats are thought to be decreasing in the subbasin and across the western United States; they are listed as a USFWS species of concern, and as sensitive or canidate in Oregon, Washington and Idaho. One of six significant maternity colonies of Townsend's big-eared bats documented to occur in Oregon lies entirely within the HCNRA (USDA Forest Service, 1999). Recent wildlife surveys on the HCRNA and in the Craig mountain area both detected the species along the Snake River corridor. Townsend's big-eared bats feed primarily on moths, most commonly at the edge of mesic forests. However, they have been documented to use wide range of habitats including desert areas and prairies. The species is dependent on relatively cool mines, caves, or abandon buildings for raising young and hibernation (Cassirer 1995). Few Townsend's big-eared bats maternity colony sites, hibernacula and day roosts have been located or identified (USDA Forest Service, 1999).

Maternity colonies of Yuma myotis and little brown myotis have been identified in caves and abandoned mines along the Snake River corridor (USDA Forest Service 1999). Big brown bats, silver-haired bats and fringed myotis and have been located in the timber sections of the subbasin (USDA Forest Service1999; Cassirer 1995). Hoary and silver-haired bats are known to be migratory species that probably don't winter in the subbasin (USDA Forest Service1999).

Late and Old-Growth Species

The northern goshawk is 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 goshawk nests are monitored on the HCRNA, some for more than 20 years. Nest occur predominantly in mature mixed conifer stands, activity at the nests varies from year to year (USDA Forest Service 1999). Northern goshawks are occasionally observed in the upland forest on Craig Mountain during the breeding season, and likely nest in the area (Cassirer 1995). A goshawk nest and adult goshawk were observed in 1992 in the deer creek drainage (IDCDC, 2001). Goshawks also use the river corridors during migration. Forest habitat with suitable nesting and foraging qualities may be a primary factor affecting goshawk populations at Craig Mountain (Cassirer 1995). In addition to northern goshawks, there are at least 20 animal species that occur within the subbasin, express a definite preference for late and old growth habitat (USDA Forest Service 1999).

Primary Cavity Excavators

The pileated woodpecker, the largest woodpecker in North America is one of the most sensitive primary cavity nesters because of its large size (USDA Forest Service 1999). They excavate large cavity nests usually in dead ponderosa pine or larch trees greater than 22 in diameter at an average height of 45 feet (Cassirer 1995). They forage primarily on ants and beetle larvae in logs, standing dead trees, and live trees. They forage primarily in mature grand fir forests and maintain year-round territories. The HCNRA provides large amounts of unharvested forest

much of it with high densities of snags and down wood habitat. In these areas populations of primary excavators are thought to be near natural population levels (USDA Forest Service 1999).

Pileated woodpeckers are widespread throughout the upland forest at Craig Mountain, at varying densities. The abundance of pileated woodpeckers on Craig Mountain may be related to the presence of dead, diseased, and dying standing and down trees as well as to the presence of mature forest habitats. Management of upland forest habitats, particularly distribution and abundance of snags, mature trees, replacement snags, and woody debris will be important in affecting pileated woodpecker and other primary excavator species population densities. Viable populations of primary excavators are essential for maintaining populations of secondary cavity users (Cassirer 1995).

#### Secondary Cavity Nesters

Flammulated owls are associated mainly with ponderosa pine forests. It spends summers in the subbasin and winters in Mexico. A secondary cavity nester it nests in cavities created by northern flickers and pileated woodpeckers. Snag densities and abundance of mature or old growth Douglas-fir and ponderosa pine forest are important components of flammulated owl habitat (Cassirer 1995). Flammulated owl habitat has declined across most of the subbasin since 1900, as it has for much of the Columbia Basin (Wisdom *et al* 2000).

### Grassland Associated Species

#### Ferruginous Hawk

Breeding habitat for the ferruginous hawk *(Buteo regalis*) occurs within the subbasin, although it is at the edge of their range. Ferruginous hawks are dependent on native prairie ecosystems and prey population densities. 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 subbasins native prairie ecosystems to agriculture, has reduced their ability to support ferruginous hawks and their prey. Source habitats for breeding ferruginous hawks has declined by between 20 and 60% for most watersheds in the subbasin, similar declines in habitat availability have occurred over much of the Columbia Basin (Wisdom *et al*. 2000).

No recent documentation of Ferruginous hawks nesting in the subbasin was located, this seems consistent with the region wide trend. Many of the 200 ferruginous hawk nesting territories that have been identified in eastern Washington have been vacant for years (Watson and Pierce 2000). Ferruginous hawks are susceptible to human disturbance and have been documented to abandon nest sights in response (Csuti 1997).

### Wetland Dependent Species

Many of the wetland dependent species in the subbasin have experienced population declines; this mirrors a worldwide trend. Of the 10 amphibian species thought to occur in the subbasin, the tailed frog, the western toad, the northern leopard frog and spotted frog are species of special concern. Intensive amphibian surveys have only been conducted for small portions of the subbasin. Survey's were conducted on Craig mountains wetland areas and riverine habitats associated with Captain John's Creek during the summer of 1994 and 1995. Breeding populations of long-toed salamanders were identified in upper elevation ponds and in the oxbows and slow moving areas of Captain Johns creek. Tailed frogs were identified in a pristine area of the south fork of Captain Johns creek. Pacific tree frog eggs and tadpoles were found in many of

the upper elevation wet meadows and adults were heard vocalizing along the Snake. Two ponds containing spotted frog tadpoles were located along the Snake in the area of Limekiln rapids. Western toads also were found breeding in wetland areas along the mainstem snake. Adult Spotted frogs were found in lower Deer and Captain Johns creek but these areas probably do not contain suitable breeding habitat (Llewellyn and Peterson 1998).

The American bullfrog, native to eastern North America from Canada to the Gulf of Mexico, has been introduced to many areas west of the Rocky Mountains. Numerous studies have shown that the bullfrog out-competes native amphibians due to its aggressive behavior and rapid growth rate (Corkran and Thomas 1996). Bullfrog predation is considered a major factor in the decline of many native amphibian species (Csuti et al. 1997). Bullfrogs were found in low densities in the lower Salmon river subbasin but were not found during surveys of the Craig Mountain portion of the Snake Hells Canyon subbasin (Llewellyn and Peterson 1998). Bullfrogs are thought to occur in the Washington portion of the subbasin (Washington Department of Fish and Wildlife 1999b).

#### Threatened, Endangered and Sensitive Species

##### Bald eagle

Bald eagles are listed as a threatened species by the USFWS and the states of Oregon and Washington; they are listed as endangered in 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 eagle monitoring has been conducted on the HCRNA since 1979. Recent winter counts along the Snake River and Hells Canyon Reservoir portion on the HCRNA have ranged from three in 1989 to 18 in 1998, with a generally increasing trend. These surveys indicate that Eagles concentrate below Hells Canyon Dam to feed on fish that have passed through the turbines, no nests were found (USDA Forest Service 1999). Nearly all bald eagles observed in the Craig mountain area were perched in mature ponderosa pine trees along the Salmon and Snake rivers. One historical bald eagle nest was reported in the subbasin near the mouth of Captain John Creek (Cassirer 1995).

##### Canada Lynx

The current population status and distribution of the Canada lynx in the Snake Hells Canyon 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 and the Oregon Natural Heritage database have no records of lynx sightings in the subbasin (IDCDC 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). The Idaho Conservation Data Center database documents three wolverine sightings just outside the subbasin. In 1987 a Wolverine carcass was found near Rapid River, tracks were

observed from a helicopter in the same area in 1998. In 1993 a wolverine was observed on private land near the Slate Creek Ranger district in the Salmon River drainage. 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).

#### 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).

#### Peregrine Falcon

Peregrine falcon populations in the US dramatically declined primarily due to DDT induced reproductive failure. Protection as an endangered species under ESA and captive breeding programs resulted in the recovery of peregrine falcon populations and the delisting of the species in 1999. Peregrines nests almost exclusively on cliffs often on a ledge overhang or small cave, the subbasin contains many ideal sites. Captive raised peregrines have been released in the subbasin a number of times including a release on the Chief Joseph Wildlife Area and multiple releases in Hells Canyon (WDFW 2001; IDCDC 2001). A natural peregrine falcon nest has recently been observed in Hells Canyon (USDA Forest Service 1999).

### Game Species

The subbasin is also home to many valuable game species. Game species harvested in the Snake Hells Canyon subbasin in 1999 included mule and white-tailed deer, Rocky Mountain elk, black bear, cougar, turkey, pheasant, California quail, chukar partridge, Hungarian partridge, forest grouse, snipe, and mourning dove. Trapped furbearers include beaver, coyote, mink, muskrat, otter, skunk, raccoon, and weasel (Washington Department of Fish and Wildlife 1999c; Oregon Department of Fish and Wildlife 2000b).

#### Elk

Though historically abundant, elk in the Hells Canyon area declined dramatically around the time of Euro-American settlement. They are thought to have been extirpated or at very low numbers by 1910. Transplants from the Yellowstone area in 1912, and hunting regulations led to the recovery of elk in northeast Oregon (USDA Forest Service 1999). Elk re-colonized the HCRNA in the late 1940s. Elk populations in the area increased to exceed the Oregon Department of Fish and Wildlife Management Objective of 5,000 wintering elk for the Snake River unit in 1987. Elk populations in the unit have declined somewhat since that time and were estimated at 3,100 in 2001(ODFW unpublished data). Increased predation is considered the primary reason for this decline (USDA Forest Service 1999). The Hells Canyon Wilderness supports the majority of the elk in the subbasin. In 1993 less than 3% of the elk counted were on private land and no damage reports have been received in recent years (ODFW unpublished data). Elk are considered a barometer for healthy habitats for themselves and other big game species such as mule deer, white-tailed deer, bear and cougar (USDA Forest Service 1999).

#### Bighorn Sheep

Rocky Mountain bighorn sheep are native to Hells Canyon and were historically very abundant (Bailey 1936). Bighorn sheep were the most frequently recovered ungulate bones in archaelogical investigation of Native American campsites in Hells Canyon (Randolph and

Dahlstrom 1977) corroborating anecdotal information that bighorns were historically more common than deer (*Odocoileus hemionus*) along the Snake River above Pittsburg landing. By the mid 1940's bighorns were extirpated from Hells Canyon by a combination of overhunting, competition with livestock for forage, and diseases contracted from domestic sheep (Smith 1954, Johnson 1980; ODFW 1992; IDFG et al 1997).

Big horn sheep habitat consists of steep rocky open terrain with abundant bunchgrasses. Lambing occurs on steep cliffs, which helps the young avoid predation (USDA Forest Service 1999).

Bighorn reintroductions to the Mid-Snake subbasin began in 1971 and are ongoing (USDA Forest Service 1999). Between 1971 and 2001, 250 bighorns were released into the subbasin; these animals originated from 9 different bighorn sheep populations, and formed the Black Butte, Redbird, Upper Hells, Canyon, Lower Hells Canyon and Lower Imnaha herds (IDFG et al 1997). As of March 2001, the bighorn metapopulation is estimated at about 280 sheep in 7 herds (ewe groups): 3 in Idaho, 3 in Oregon, and one in Washington (Hells Canyon Bighorn Sheep Restoration Committee, unpubl. data). Bighorn hunting permits are in high demand but their issue is carefully controlled by the wildlife management agencies of the subbasin. Between 1971 and 1996, 94 bighorn sheep permits were issued for the five herds that range into the subbasin through auction and lottery. These permits resulted in the harvest of resulting in the harvest of 87 bighorns (IDFG et al 1997).

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 haemolytic and multicida bacteria have been identified as the primary causes of pneumonia in bighorns. Bighorn sheep population die offs in the subbasin occurred in 1977-1972, 1983-1984, 1991 and 1995-1996 (IDFG et al 1997). The Pasturella caused die off during the winter of 1995-96 reduced the Black Butte herd from approximately 220 bighorn sheep to 52 (WDFW 1999a). All domestic sheep grazing in the Middle Snake portion of the HCRNA was stopped in 1995 to improve conditions for bighorn sheep (USDA Forest Service 1999). Domestic sheep continue to be grazed in some areas of the subbasin and may influence bighorn sheep populations on both private and public lands. For example, members of a herd of 150 domestic sheep sometimes trespass on to the adjacent Chief Joseph Wildlife Area. A barrier fence was constructed in the spring of 1999 in an effort to limit contact between domestic sheep and bighorns (WDFW 1999a).

In 1997 a cooperative interagency project "The Hells Canyon Initiative" was initiated to accelerate the restoration of bighorns to the mid-Snake, Imnaha, lower Salmon, and Grande Ronde subbasins. Continuous bighorn habitat across these subbasins suggests that historically bighorn sheep moved between herds throughout this area. The goal of the Hells Canyon Initiative is to restore self-sustaining populations of bighorns to suitable habitat. Impetus for establishing the Initiative included the tremendous potential of the area to support bighorn sheep and the recent elimination of most public land domestic sheep grazing allotments. (Hells Canyon Bighorn Sheep Restoration Committee 1997). Specifically the initiative seeks to increase the number of bighorns from the current 800 to 2000 within these four subbasins by 2007. Signators to a 1997 Memorandum of Agreement establishing the Hells Canyon Initiative are the state wildlife agencies of Idaho, Oregon, and Washington, the U.S. Forest Service, the Bureau of Land Management, and the Foundation for North American Wild Sheep.

#### Forest Grouse

Ruffed grouse, and blue grouse are native galliformes that inhabit forested areas in the subbasin (Appendix D). Ruffed grouse are closely associated with riparian areas throughout the entire year. Blue grouse breed in open foothills and are closely associated with streams, springs, and meadows. Much of the food they require comes from the succulent vegetation or insects in these areas. During spring and summer, blue grouse use stream bottoms and areas with gentle slopes. In the fall they migrate to higher elevations where they spend the winter feeding on fir needles. Large fir trees are a food source for wintering blue grouse and are required for roost sites. Blue grouse exhibit strong site fidelity to their wintering areas in true fir (*Abies spp*.) and Douglas fir (*Pseudotsuga menziesii*) forests (Larsen and Nordstrom 1999).

#### Mountain Quail

Mountain quail were historically abundant in northwestern shrub and riparian communities. The species has experienced dramatic population declines throughout its range primarily due to loss of habitat. Remnant populations remain in the riparian stringers and shrubby uplands of the Snake River corridor. In the spring these populations migrate to higher elevation open forests to breed. Mountain quail were reported in the South Fork of Captain John in October, 1992 (Cassirer 1995). Because of their secretive nature and reliance on brushy habitats that are usually associated with riparian zones, they are not capable of extensive movements away from suitable patches of habitat. Once these habitats are degraded or removed, mountain quail become isolated from other habitat that may be available (Larsen and Nordstrom 1999). Craig Mountain could be considered as a potential release site for reintroduction/augmentation in the Idaho State conservation strategy currently being developed for mountain quail.

#### Introduced Galliformes

Wild turkey, ring-necked pheasant, California quail, chukar partridge, and Hungarian partridge are species that have been introduced to the region to provide recreational activities. These species are popular game species that have effectively naturalized in the Snake Hells Canyon subbasin, and wildlife managers in the basin work to maintain their populations. The industrialization of agricultural practices and the reduction in cheatgrass prominence due to yellow star thistle invasion has reduced the subbasin's suitability for these species and their populations over the last two decades (Washington Department of Fish and Wildlife 2000c).

..... The ringneck pheasant is the primary upland game bird species in southeast Washington. The annual pheasant harvest peaked in the subbasin during 1980s at nearly 36,000 birds. By 1999, the pheasant harvest had declined 82% to 6,554 (Washington Department of Fish and Wildlife 2000c). Factors impacting pheasant harvest include pheasant population abundance, hunter participation, and weather during the hunting season. Dramatic decline in the pheasant harvest is a direct reflection of pheasant abundance. Hunter effort increases and hunter numbers decline as pheasant populations decline. The loss of both riparian and shrubsteppe/grassland habitat has resulted in a decline in the pheasant population within the subbasin (Washington Department of Fish and Wildlife 2000c).

### Habitat Areas and Quality

#### Fish

Critical habitat was designated for Snake River spring/summer chinook salmon and Snake River fall chinook salmon on December 28, 1993 (Federal Register, Vol. 58, 68543), effective on

January 27, 1994. The Snake Hells Canyon subbasin provides designated critical habitat for both fall chinook and spring/summer chinook salmon. Critical habitat was designated for Snake River summer steelhead trout on February 16, 2000 (Federal Register, Vol. 65, No. 32, 7764), effective on March 17, 2000. Critical habitat for bull trout has not yet been designated, but the Snake Hells Canyon subbasin is included in proposed critical habitat.

Currently the mainstem Middle Snake River provides upstream and downstream passage (migration corridor) for all anadromous and many resident salmonids. It is used by fall chinook and white sturgeon to support all of their life history stages of (BLM 2000a; WDFW et al. 1990). Subadult bull trout also use the mainstem for rearing and overwintering, whereas juvenile spring chinook utilization is less common.

Tributary habitat within the subbasin is limited in both quantity and quality. The Forest Service, BLM, IDFG, WDFW and ODFW have surveyed tributary creeks within the Snake Hells Canyon subbasin. Steep gradient, poor pool-riffle structure, limited spawning gravel, limited summer stream flows, and natural anadromous/resident fish barriers are believed to limit productivity in most of these creeks. A total of 409.4 miles of fish-bearing streams were identified in the USFS Hells Canyon National Recreational Area (Wallowa-Whitman National Forest 1999). Nearly all fish-bearing tributaries had high water quality, with good streamside cover and little stream bank instability (USDA Forest Service 1999).

#### Fall Chinook

Prior to impoundment, the mainstem snake and the lower reaches of several tributaries provided key spawning and rearing habitat for fall chinook (Rondorf and Tiffan 1997). The upper reaches of the mainstem Snake River, particularly near the town of Marsing, Idaho (river mile 390; approximately 144 miles upstream of Hells Canyon Dam) (Haas 1965), were the primary areas used by fall chinook salmon, with only limited spawning activity reported downstream from river mile 272 (NMFS 2000a). Access to spawning areas upstream of Hells Canyon Dam was blocked starting in 1955 by a three-dam complex. After construction of the dams, the areas available for spawning included 104 miles of free-flowing Snake River downstream of Hells Canyon Dam, and associated tributaries including the Imnaha, Salmon, Grande Ronde and Clearwater (Rondorf and Tiffan 1997). An estimated 80 percent of the Snake River drainage formerly used by fall chinook salmon for spawning and rearing has been eliminated due to habitat changes or lack of access (USDA Forest Service 1999).

Based on a total effective area model, in 1993 the predicted suitable (that which successfully met slope, depth, velocity, substrate and scour criteria) spawning habitat in the Middle Snake was determined to be 9% of shallow-water transitional, 0% of shallow-water-lateral, and 6% of deep-water transitional (Rondorf and Tiffan 1995). The estimates, when compared to fall chinook production, suggest that known spawning sites are probably underseeded (Rondorf and Tiffan 1995).

Fall chinook spawning substrate quality, measured at index reaches throughout the Snake Hells Canyon subbasin, is generally high, although some studies have documented gravel too large for spawning (Rondorf and Tiffan 1996). Percent fines in the substrate, fines by depth and surface fines vary by year and site, but overall are not considered to inhibit cobble utilization or incubation success (BLM 2000a; Rondorf and Tiffan 1995; 1996).

#### Spring Chinook

Spring/summer chinook habitat in the Snake Hells Canyon subbasin has been severely degraded over the past century. Even before mainstem dams were built, habitat was lost or severely

damaged in the high-elevation streams used for chinook spawning and rearing (Fulton 1968). Construction and operation of irrigation dams and diversions, inundation of spawning areas by impoundments, and siltation and pollution from sewage, farming, logging, and mining all contributed to reductions in habitat quantity and quality (Fulton 1968). Habitat loss following completion of the Columbia/Snake hydropower/water storage system further contributed to habitat losses, as many primary spawning and rearing areas were no longer accessible (NMFS 2000a).

Chinook habitat in the Snake Hells Canyon subbasin consists of the mainstem Snake, which is used primarily for migration, and its associated tributaries. In addition to a migration route, the mainstem snake provides rearing and staging habitat for spring chinook produced in the other subbasins. The amount of rearing is unknown (WDFW et al. 1990).

Excluding the four primary tributaries (Clearwater River, Grande Ronde River, Imnaha River, and Salmon River), the only tributaries known to contain habitat that supports spawning and rearing life history phases of spring/summer chinook are Granite Creek, and Sheep Creek (BLM 2000b; BLM 2000a; IDEQ 1998). Accessible tributary streams may be used by juvenile spring/summer chinook for rearing when conditions are suitable, or when conditions in the mainstem become unsuitable (BLM 2000b; BLM 2000a).

#### Steelhead

Below the confluence of the Salmon River, the quality of steelhead habitat in the Snake Hells Canyon subbasin is highest in Asotin Creek, Ten Mile Creek, and Couse Creek (refer also to Johnson et al. *in press*). Above the confluence with the Salmon, steelhead habitat quality is highest in Granite Creek, and Sheep Creek. These areas are generally larger tributaries, and provide access to suitable spawning and rearing habitat during respective life history stages.

Habitat in the mainstem snake is primarily used for upstream and downstream migration, but may also facilitate rearing life history forms of steelhead. Adult steelhead also winter in the mainstem Snake River (BLM 2000b).

Although steelhead are considered to occupy the widest array of habitat types of any anadromous salmonid in the Interior Columbia River basin, an estimated 7,737 river miles of historically occupied habitat has been eliminated or is no longer accessible (NPPC 1986). Within the Snake Hells Canyon subbasin, habitat is restricted to that occurring between Hells Canyon Dam and Clarkston, Washington, much of which has been modified to some degree by various land use activities. Coarse scale assessments conducted for the Northwest Power Planning Council (1990) identified low flow levels (dewatering), high temperatures, lack of high quality pools, passage impediments, and streambank degradation as negatively affecting steelhead habitat in various tributaries to the Snake Hells Canyon.

#### Bull Trout

The quality of available bull trout habitat in the Snake Hells Canyon subbasin is variable. Bull trout use mainstem Snake habitat for migration and subadult foraging and rearing life history phases (year-long). The water quality of the mainstem Lower Snake River (below the Salmon River confluence) is generally excellent (IDEQ 1998). It fully supports all beneficial uses identified for the river (recreation, primary and secondary contact recreation, salmonid spawning, domestic water supply, agricultural water supply, and cold water biota) (IDEQ 1998). Elevated summer water temperatures are not optimum for salmonid rearing conditions and high sediment concentration occur during high flow events (IDEQ 1998). The potential exists for fluvial bull trout populations from the Grande Ronde, Imnaha, and Salmon Rivers to use the mainstem

Snake River. Data is lacking for population size, movement, and/or life histories of bull trout utilizing the Snake River.

The water quality of the main stem Snake River above the confluence with the Salmon River is generally excellent (IDEQ 1998). It fully supports all beneficial uses identified for the river (recreation, primary and secondary contact recreation, salmonid spawning, domestic water supply, agricultural water supply, and cold water biota) (IDEQ 1998). The potential exists for fluvial bull trout populations from the Grande Ronde, Imnaha, and Salmon Rivers to use the mainstem Snake River. Data is lacking for population size, movement, and/or life histories of bull trout utilizing the Snake River.

Habitat quality for bull trout in secondary tributaries feeding the Snake River below the Salmon River confluence is considered marginal (BLM 2000b). Low flows, elevated levels of deposited sediment, high summer water temperatures, poor instream cover, and low numbers of high quality pools limit potentially usable bull trout habitat (BLM 2000b). The only tributary containing habitat that supports bull trout spawning and early rearing in the lower Middle Snake is Asotin Creek (refer to Johnson et al. *in preparation*).

Granite and Sheep creeks are the only tributary streams occurring above the Salmon River that provide spawning and early rearing habitat for bull trout in that portion of the Snake Hells Canyon subbasin (BLM 2000a). Both are fourth order drainages that occur within the Hells Canyon Wilderness, and thus have a proportionate amount of undisturbed habitat. Granite Creek flows into the Snake River at river mile 239.7, while Sheep Creek enters the Snake at river mile 229.4. Granite Creek contains approximately seven miles of stream which are used by fluvial bull trout, while Sheep Creek contains around six miles (IDEQ 1998). No documentation of any resident bull trout population exists for either creek. Habitat in the two streams supports spring/summer chinook salmon, rainbow/steelhead trout, cutthroat trout, and bull trout. No brook trout occur in either drainage. Past monitoring efforts by IDFG have documented relatively low bull trout numbers within the monitored stream segments. During 1998 no bull trout were observed at the trend monitoring stations (IDEQ 1998).

#### White Sturgeon

The upstream and downstream dams have considerable influence over the nature of sturgeon habitat. The upstream reservoirs have shifted the timing, natural flow patterns and temperature regimes of the Middle Snake reach (Coon 1978). Flows have been increased through the fall, winter and early spring to meet power demands, effectively emptying the reservoirs prior to spring runoff. Spring peaks have been reduced and spread out over a longer duration. These changes may decrease quality spawning and incubation habitat (BLM 2000b). Bedload, suspended solids and nutrients are trapped behind upstream impoundments, creating a deficit to downstream reaches. Overall however, sturgeon spawning and rearing habitat is considered to be good.

### Wildlife

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 moved some habitat conditions in the Snake Hells Canyon subbasin outside the natural range of variability (USDA Forest Service 1999). Habitats for wildlife have become increasingly fragmented, simplified in structure, and infringed on or dominated by exotic plants (Quigley and Arbelbide 1997b).

#### Grasslands

Outstanding representations of several Pacific Northwest bunchgrass communities occur within the subbasin. The remnants of relatively undisturbed grassland communities have been documented at Craig Mountain and on the HCRNA (Mancuso and Mosely 1994; USDA Forest Service 1999). These communities serve as important ecological benchmarks as most remaining native grassland communities in the Columbia Basin have been significantly altered. Grasslands of relatively undisturbed condition tend to be found in places where rugged topography, distance from water, and general inaccessibility combined to limit livestock use (Mancuso and Mosely 1994). In heavily grazed areas weeds, including yellow-star thistle have become well established (Mancuso and Mosely 1994). Vegetation data collected during 1994, in disturbed grassland sites on Craig mountain, often found yellow-star thistle cover values of 50% or greater, with only trace amounts of native plant species (Mancuso and Mosely 1994).

#### Forest

The most substantial alterations to forest communities in the subbasin have been in the reduction of seral and fire resistant species including ponderosa pine, western larch, western white pine and whitebark pine. The current dominance of the region by midseral stands of Douglas-fir and grand fir are a result of a management history that discriminated against early seral stands (Mancuso and Mosely 1994). White pine once occurred at Craig Mountain, but it apparently has been extirpated from the area (Cassirer 1995). Western white pine was only ever a small component on forests in the HCRNA, but the extent of its occurrence has been reduced due to blister rust infestations and fire suppression (USDA Forest Service 1999). Selective logging and fire suppression has reduced the extent of ponderosa pine forests in the subbasin (USDA Forest Service 1999; Mancuso and Mosely 1994). Forests in the subbasin that have been logged tend to have smaller patches with more abrupt edges between seral types than would have occurred under natural disturbance regimes. This has aided the expansion of edge dependent species including the brood parasitic brown-headed cowbird (Mancuso and Mosely 1994).

#### Riparian

Riparian areas contain the most biologically diverse habitats in the subbasin because of their variety of structural features and close proximity to water (Knutson and Naef 1997). This combination of habitat features provides a wide array of habitats for numerous terrestrial species and riparian zones are used by more species than any other habitat (Quigley and Arbelbide 1997b). Riparian areas are listed as a Priority Habitat by the Washington Department of Fish and Wildlife (WDFW 2001). Riparian areas in the forested regions of the subbasin are in relatively healthy condition, although in some areas they have been impacted by logging or road construction. Overgrazing has, impacted many of the narrow shrubby riparian zones that surround the steep gradient Snake tributaries (Cassirer 1995; USDA Forest Service 1999). Hackberry is an important food source for many wildlife species in the subbasin, reduced recruitment has been observed in grazed hackberry communities along the Snake River (USDA Forest Service). Reductions in sediment input to the subbasin as a result of the operation of Hells Canyon dam have reduced the prevalence of bars and beaches that support riparian communities along the Snake River (USDA Forest Service 1999). Non-native plant species were found to comprise 42% of the plant species in white alder, and 45% tall shrub riparian habitats sampled at Craig Mountain. These percentages are the highest of any habitats sampled. Riparian conditions in many areas of the subbasin have improved since the listing of salmon as a

threatened species in 1992. These improvements are primarily the result of efforts to restrict and monitor cattle grazing, establishment of stream buffer zones and improvements in harvest, burning and road construction techniques (USDA Forest Service 1999).

#### Wetland Areas

Springs, seeps and other wetland areas occur throughout the subbasin. These areas provide important habitat for many species in the subbasin. Fifty-four ponds and other wet areas were identified in a recent survey of the Craig Mountain area. Wetlands were most common in the mid-elevation areas with 80% of the wetlands identified occurring between 4100 to 5100 feet. Of the 54 wetlands identified 29 had been altered through human disturbance, 7 were man made, and 18 were in a natural state (Llewellyn and Peterson 1998). Wetland areas are very attractive to wildlife, livestock, and recreationists, which sometimes results in damage to these sensitive areas. Some wetland areas in the region have been damaged by road construction, and to a lesser degree by timber management (USDA Forest Service 1999). Wetland areas in the agricultural section of the subbasin have been reduced through draining and filling (Black et al. 1997). Wetlands are listed as a Priority Habitat by the Washington Department of Fish and Wildlife (WDFW 2001b).

#### Agricultural 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. Asotin county has increased the acreage enrolled in the CRP program dramatically in recent years to27,994 acres in 1999 (Washington Department of Fish and Wildlife 1999c). Nez Perce County contains 9,042 acres of CRP lands (U.S. Department of Agriculture 2000). Planting native vegetation and has increasingly become a priority of the program. Recent increases in southeastern Washington's deer populations have been attributed to the increase in CRP lands (Washington Department of Fish and Wildlife 2000).

#### Special Habitat Areas

##### 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 (1999). Caves are listed as a Priority Habitat by the Washington Department of Fish and Wildlife (WDFW 1999b).

##### Aspen

Aspen stands are a small but disproportionately important habitat component. Aspen is generally associated with wet or moist sites, including seeps, meadows, and streams. The Washington Department of Fish and Wildlife has listed Aspen habitats greater than 2 acres as priority habitats (WDFW 1999b). Aspen habitat in the subbasin is found in small scattered patches, generally

associated with meadows or moist conifer forests (USDA Forest Service 1999). Overgrazing and fire suppression have contributed to the decline of this habitat across the region and likely in the Snake Hells Canyon subbasin (Quigely and Arbelbide 1997b).

#### Late and Old growth Habitat

Recent large stand replacing fires have reduced late and old growth forest habitats in the subbasin. Twenty five percent of the late and old growth habitats on the HCRNA have burned since 1970. A continued high incedence of stand replacing fires can be expected unless the high fuel loads present in dense stands of mid-seral species can be reduced. Despite these losses late and old structure forests are estimated to comprise about 30% of the HCRNA and in most parts of the HCRNA are considered above the natural range of variability (USDA Forest Service 1997). On many of the privately owned lands in the subbasin timber harvest combined with the altered fire regime has reduced the extent of late and old structural forests below that present historically (Quigley and Arbelbide 1997). Late and old growth habitat in the subbasin is most commonly found along cool, moist stream bottoms or on north-facing slopes where infrequent or low intensity fires have allowed late and old-growth characteristics to develop.

#### Snags

Standing dead tree snags and down woody debris provide impotant habitat for many wildlife species. In the HCRNA 62, bird and mammal species use snags for nesting and shelter and 179 species make some use of dead and down material. Snags and woody debris were found to be abundant in many forest areas of the Craig Mountain area and on the HCRNA (USDA Forest Service 1999; Cassirer 1995). The construction of Lower Granite Dam in the Lower Snake Subbasin resulted in the inundation of many mature trees and snags in the riparian zones of the lower Snake Hells Canyon subbasin (USACE 2001).

### Watershed Assessment

Four primary types of documents are addressed in this section: watershed assessments, biological assessments, TMDLs, and broad scale plans for resource management within the Snake Hells Canyon subbasin. Watershed assessments provide information for planning and implementation. Biological assessments most often address potential impacts of proposed land use activities on sensitive species. TMDLs are required water bodies listed as impaired on the §303(d) list. The TMDL process includes a watershed assessment, and potentially a load allocation and implementation plan.

Bureau of Land Management (BLM) (2000a). *Snake River Subbasin: Biological Assessment of Ongoing and Proposed Bureau of Land Management Activities on Sockeye Salmon, Fall Chinook Salmon, Spring/Summer Chinook Salmon, Steelhead Trout, Bull Trout, and BLM Sensitive Species*.

....A biological assessment, at the 4$^{th}$ code HUC scale, for the Snake River subbasin (from the confluence of the Salmon River, up to Hells Canyon Dam). The BLM is required by the ESA to identify and evaluate ongoing and proposed BLM activities and programs within the subbasin. The programs are assessed in relation to the flora and fauna they may potentially disturb.

Bureau of Land Management (BLM) (2000b). *Lower Snake River Subbasin: Biological Assessment of Ongoing and Proposed Bureau of Land Management Activities on Sockeye Salmon, Fall Chinook Salmon, Spring/Summer Chinook Salmon, Steelhead Trout, Bull Trout, and BLM Sensitive Species*
A biological assessment, at the 4th code HUC scale, for the lower Snake River subbasin. The BLM is required by the ESA to identify and evaluate ongoing and proposed BLM activities and programs within the subbasin. The document provides a comprehensive examination of the current and historic status of various fish species in the HUC. The programs are assessed in relation to the listed fish species they may potentially disturb.

Columbia River Inter-Tribal Fish Commission (1996a). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. I.* Emphasizes cultural, legal, biological, and institutional contexts for fish restoration in the Columbia Basin and provides recommendations.

Columbia River Inter-Tribal Fish Commission (1996b). *Wy-Kan-Ush-Mi Wa-Kish-Wit: Spirit of the Salmon. Vol. II: Subbasin Plans.* Specific subbasin breakdown for fish population status/goals, problems impacting fish, ongoing actions, and recommended actions including law enforcement, instream flow and passage, watershed management for water quality, riparian restoration, range management, forest management, mining impact reduction, and artificial production

Interior Columbia Basin Ecosystem Management Project (ICBEMP) – Initiated by the Forest Service and Bureau of Land Management to respond to several critical issues in the interior Columbia Basin, including forest and rangeland health, anadromous fish concerns, and terrestrial species concerns, provides a comprehensive assessment for USFS and BLM-administered lands in Oregon (USDA and USDI 2000). Several assessments derived from this project and conducted by the Project's Science Integration Team include *Source Habitats for Terrestrial Vertebrates of Focus in the Interior Columbia Basin: Broad-scale Trends and Management Implications* (Wisdom, et al 1998), *An Assessment of Ecosystem Components in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley and Arbelbide 1997), and *An Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin and Portions of the Klamath and Great Basins* (Quigley et al. 1996). These assessments characterize historical and current conditions and associated trends, and document accelerated changes in vegetation patterns, fish and wildlife distributions, and terrestrial and aquatic ecosystem processes that have occurred in the past century.

Idaho Department of Environmental Quality (1998). *Lower Snake River subbasin, Snake River subbasin, Lower Salmon River subbasin and Little Salmon River subbasin bull trout problem assessment.*
In 1995, Idaho Governor Phil Batt initiated development of a conservation plan to restore bull trout populations in Idaho. This problem assessment and conservation strategy for the Lower Snake and Snake River subbasins is consistent with the first phase of the Governor's Conservation Plan. The goal of this assessment is to provide Watershed Advisory Group (WAG) members with a scientific framework on bull trout ecology, threats to bull trout, bull trout distribution and abundance, habitat conditions, and watershed characteristics in the

above listed subbasin. The assessment provides the WAG with lists of important sub-watersheds and priority management actions to maintain or enhance bull trout populations and habitats.

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 assessment includes the upper half of the Snake Hells Canyon subbasin in its discussion of Hells Canyon, and makes a preliminary problem statement for the Snake River - Hells Canyon TMDL.

Nez Perce Tribe (1999). *Salmon Habitat Recovery Plan with Multi-Species Habitat Strategy*. This plan outlines habitat recommendations for salmonids and other vertebrate species It analyzes Imnaha River water quantity, water quality, stream structure, substrate, and habitat features. Appendices include social and economic infrastructure, land use history, and vegetation.

Nowakowski, M. J. (1978). *Soil Depth and Elevation as a Basis for Predicting Three Steppe Habitat Types of Wallowa County, Oregon*. M.S. Thesis. Botany Department, Washington State University. This thesis studies three steppe habitat types by measuring aspect, slope, elevation and soil depth, and vegetation coverage, frequency and productivity. Soil depth and elevation were the best indicators of habitat types.

United States Forest Service (1994). *Upper Grande Ronde Watershed Analysis*. Watersheds 85 and 86. LaGrande Ranger District, Wallowa-Whitman NF. This analysis provides a description of the dominant physical, biological, and human dimension features, characteristics and uses of the watershed that assess ecosystem function and condition in watersheds 85 and 86 in the Upper Grande Ronde River system. The assessment also provides a framework for managing upland and riparian landscapes, analyze cumulative effects, and to guide planning, management, restoration, and monitoring activities.

Washington Department of Fish and Wildlife (WDFW), Confederated Tribes of the Umatilla Indian Reservation, Idaho Department of Fish and Game, Nez Perce Tribe, Oregon Department of Fish and Wildlife, Shoshone-Bannock Tribes of Fort Hall (1990). *Snake River Subbasin (mainstem from mouth to Hells Canyon Dam) Salmon and Steelhead Production Plan.* developed in response to the need for an Integrated System Plan, as part of the Northwest Power Planning Council's Fish and Wildlife Program. The plan provided the basis for salmon and steelhead production strategies, documented current and potential production, summarized agency and Tribal management goals and objectives, documented current management efforts, identified problems and opportunities associated with increasing salmon and steelhead numbers, and presented preferred and alternative management strategies.

Washington Department of Fish and Wildlife (1993). *1992 Washington State Salmon and Steelhead Stock Inventory*. Olympia. This report documents the current conditions of Washington's naturally reproducing anadromous salmonid populations.

Washington Department of Fish and Wildlife (1998). *1998 Washington State Salmonid Stock Inventory: Bull Trout/Dolly Varden*. This report identifies wild salmonid stocks, assesses their current status, and describes limiting factors.

## Limiting Factors

### Fish

#### General Discussion

It is generally accepted that hydropower development on the lower Snake River and Columbia River is the primary cause of decline and continued suppression of Snake River salmon and steelhead (IDFG 1998; CBFWA 1991; NPPC 1992; NMFS 1995 and 1997; NRC 1995; Williams et al. 1998). However, less agreement exists about whether the hydropower system is the primary factor limiting recovery (Marmorek et al. 1998). This limiting factor keeps yearly effective population size low and increases genetic and demographic risk of localized extinction.

Adult escapement of anadromous species remains low even given significant hatchery production/reintroduction efforts. Low adult abundance has resulted in stocking at variable rates between years, depending on the availability of brood fish (Walters et al. 2001). Smolt-to-adult return rates (SAR), from smolts at the uppermost dam to adults returning to the Columbia River mouth, averaged 5.2% in the 1960s before hydrosystem completion and only 1.2% from 1977-1994 (Petrosky et al. in press; Figure 28). This is below the 2%-6% needed for recovery (Marmorek et al. 1998).

In contrast to the decline in SAR, numbers of smolts per spawner from Snake River tributaries did not decrease during this period, averaging 62 smolts per spawner before hydrosystem completion and 100 smolts per spawner afterward (Petrosky et al. in press; Figure 28). In this summary both spawner escapement and smolt yield are measured at the uppermost mainstem dam (currently Lower Granite). The increase in smolts per spawner was due to a reduction in density dependent mortality as spawner abundance declined. Accounting for density dependence, a modest decrease occurred in smolts per spawner from Snake River tributaries over this period, but not of a magnitude to explain the severe decline in life-cycle survival (Petrosky et al. in press).

The dams cause direct, indirect, or delayed mortality, mainly to emigrating juveniles (IDFG 1998; Nemeth and Kiefer 1999). As a result of this increased mortality, Snake River spring and summer chinook declined at a greater rate than downriver stocks, coincident with completion of the federal hydropower system (Schaller et al. 1999). Schaller et al. (1999) concluded that factors other than hydropower development have not played a significant role in the differential decline in performance between upriver and downriver stocks. The Snake River stocks above eight dams survived one-third as well as downriver stocks migrating through 3 dams for this time period after taking into account factors common to both groups (Schaller et al. 1999; Deriso *in press*). The additional decline in productivity of upriver stocks relative to downriver stocks indicates this portion of the mortality is related to factors unique to upriver stocks. Patterns of Pacific Decadal Oscillation and salmon production would indicate that poor ocean conditions existed for Columbia River salmon after the late 1970s (Hare et al. 1999). However, the natural fluctuations of ocean productivity affecting all Columbia River stocks, in combination with mortality as a result of the hydrosystem, appear to have caused the severe declines in productivity and survival rates for the Snake River stocks. Temporal and spatial

patterns of hatchery release numbers did not coincide with the differential changes in survival rates between upriver and downriver stocks (Schaller et al. 1999). Harvest rates were drastically reduced in the early 1970s, in response to declines in upriver stream-type chinook abundance. Given that changes in smolts per spawner cannot explain the decreases in SAR or overall survival rates for Snake River stocks, it appears the altered migration corridor has had a strong influence on the mortality that causes these differences in stock performance.

The SAR and smolt per spawner observations (Figure 28) indicate that the overall survival decline is consistent primarily with hydrosystem impacts and poorer ocean (out-of-subbasin factors), rather than large-scale impacts within the subbasins between the 1960s and present (Schaller et al. 1999; Petrosky et al. in press). Because the smolt/spawner data represent aggregate populations from a mix of habitat qualities throughout the Snake River basin, and are from a period after development, they do not imply there is no room for survival improvement within the Salmon, Clearwater, Grande Ronde and Imnaha subbasins. However, because of limiting factors outside the subbasin, and critically reduced life-cycle survival for populations even in pristine watersheds, it is unlikely that potential survival improvements within the Snake River subbasins alone can increase survival to a level that ensures recovery of anadromous fish populations

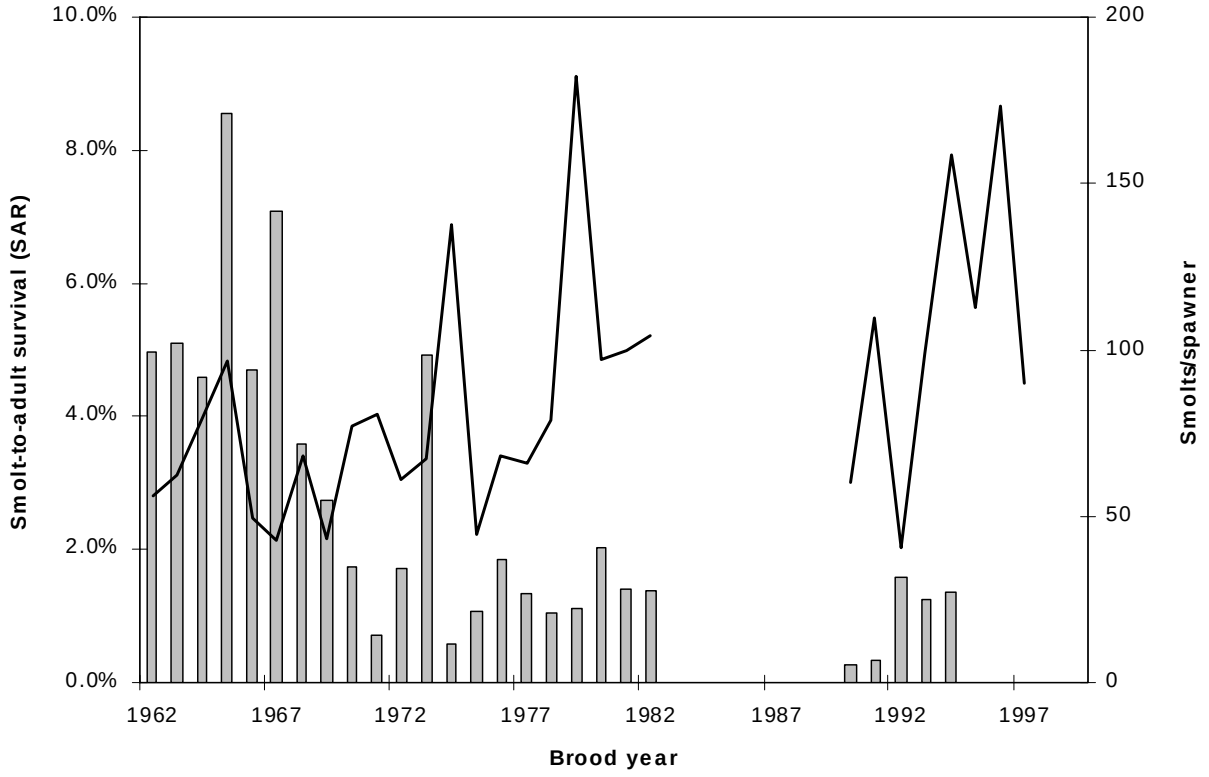


Figure 28. Smolt-to-adult survival rates (bars; SAR) and smolts/spawner (solid line) for wild Snake River spring and summer chinook. The SAR describes survival during mainstem downstream migration to adult returns whereas the number of smolts per spawner describes freshwater productivity in upstream freshwater spawning and rearing areas (from Petrosky et al. in press)

#### Fall Chinook

Several factors have caused the decline of fall chinook salmon in the Snake Hells Canyon subbasin. Hatcheries, hydropower development, habitat degradation, harvest and predation have been cited as posing particular threats to the Snake River stock of fall chinook (BLM 2000a).

##### Hatcheries

The wild component of the Snake River fall chinook Evolutionarily Significant Unit (ESU) is currently considered to be at some risk of extinction due in part to the influence of hatcheries (NMFS 2000a). The hatchery contribution to Snake River escapement has been estimated at greater than 47 percent[1] (Myers et al. 1998). The effectiveness of hatchery fish spawning in the wild has been considered to influence the growth rate of wild fall chinook (NMFS 2000a). The National Marine Fisheries service estimates the growth rate (lambda) of Snake River fall chinook to be between 0.94-0.86 (determined over a sixteen-year base period[2]). Extinction estimates 100 years from now range from 0.40, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), to 1.00, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%) (Tables B-5 and B-6 in McClure et al. 2000b).

##### Hydropower/Water Storage

Fall chinook are particularly susceptible to the effects of hydroelectric development because of inundation of its preferred spawning and rearing habitats in mainstem rivers and because juveniles migrate to the ocean in late spring, summer and fall during low summer flows and high water temperatures (Mendel 1998). The changes to habitat, flow, and thermal regimes have affected spawn timing, spawning location, and outmigration success of fall chinook in the Mid-Snake subbasin.

Flow releases from Hells Canyon Complex were determined to play a significant role in shaping flow and temperature regimes in the Snake River downstream to RM 167 during adult immigration, spawning and egg incubation life history phases (Rondorf and Miller 1994; Rondorf and Tiffan 1995; 1996). Reservoir heating of water in upriver pools during summer months and its subsequent release out of Hells Canyon Dam likely contribute to documented higher water temperatures above the confluence of the Salmon River (Rondorf and Tiffan 1996). These temperatures may exacerbate fall chinook immigration and spawning delays, while accelerating egg incubation and juvenile emigration (Rondorf and Tiffan 1996). Consequently, the fish from the Snake Hells Canyon subbasin arrive at Lower Granite Dam, on average, up to 4 weeks later than they did before development of the Hells Canyon Complex and the Corps' four lower Snake River projects (NMFS 2000a). Johnson and Stangl (BLM 2000a) found that fall chinook fry emerging later than Mid-May may not be large enough to begin their downstream migration as age=0 fish. Delays in chinook outmigration may also occur due to slack water impoundments (i.e. upper pool of Lower Granite Dam). Combined, the delays place juvenile

[1] See Mendel (2000) for run composition at Lower Granite Dam. Initially, 67% of fish at Lower Granite Dam were hatchery origin, but with removal of hatchery fish at the dam this value was reduced to 47% hatchery escapement past the dam.

[2] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1996 adult returns. Population trends are projected under the assumption that all conditions will stay the same in the future.

migrants in reservoirs during periods when water temperatures approach chinook salmon's thermal tolerance (NMFS 2000a).

Studies examining smoltification timing suggest that the protracted emigration exhibited by Snake Hells Canyon subbasin fall chinook may confer a survival disadvantage to downstream migration life history phases (Rondorf and Tiffan 1997). Gill ATPase followed a trend of increasing activity until late June, then a decline throughout the remainder of the summer (Rondorf and Tiffan 1997). Similarly, subyearling chinook exhibited the most net downstream movement at velocities of 6-18 inches/second early in the season, and less movement as the season progressed. This delay often places late arriving fall chinook in unsuitable reservoir environments, and may increase their susceptibility to predation.

#### Habitat degradation

The effects of the hydrosystem have considerably reduced fall chinook habitat. Preferred spawning and rearing habitats have been inundated, and water quality limited. Increased sediment deposition in mainstem Snake River substrate may limit spawning and rearing success, although amounts appear to currently be at acceptable levels (BLM 2000a). Temperature and flow modifications have restricted spawning areas to those that will accumulate a minimum of 960 thermal units from November 15 (spawning phase) to early May (emergence/early rearing phase) (BLM 2000a). These areas have generally shifted from upstream to downstream areas over the last seven years. Other factors that reduce egg-to-fry survival include redd disturbance and excavation, bottom scour, and microbial infestation (see *harvest* section below) (BLM 2000a). Poor water quality resulting from toxic spills (i.e. fuels, chemicals) may also adversely affect fall chinook productivity.

#### Harvest

Snake River fall chinook were harvested up to a 70-80% exploitation rate in the lower Columbia River and the ocean (G. Mendel, WDFW, personal communication, May, 2001). Harvest on the Snake River stock was especially high during the years when they were mixed with particularly large returns of fall chinook salmon destined for the Hanford Reach of the mid Columbia River. The listing of fall chinook under the ESA and renegotiations under the Columbia River Fishery Management Plan has substantially reduced the exploitation rate on the Snake River stock of fall chinook (G. Mendel, WDFW, personal communication, May, 2001).

Incidental harvest of Snake River fall chinook by steelhead fisherman has been documented in the Snake Hells Canyon subbasin (G. Mendel, WDFW, personal communication, May, 2001; BLM 2000a). The chance for hooking mortality or illegal harvest during the fall does exist and may represent a minor threat to the population.

The presence of steelhead fishermen and recreational jet boaters on reaches used during fall chinook migration, spawning, and rearing life history phases may pose a harassment or habitat disturbance threat to the species (BLM 2000a; 2000b). This threat is greatest during spawning and incubation periods, as boaters can cause disturbance or mortality to spawning fish and/or physical harm to redds and incubating eggs (BLM 2000a; 2000b). Redds at highest risk are those constructed in shallow waters, however, maintenance of Snake River flows from Hells Canyon Dam reduces the overall threat.

#### Predation (applies to all anadromous salmonids)

Predation of fall chinook in the Snake Hells Canyon subbasin constitutes a potential limiting factor to chinook abundance. Studies of juvenile fall chinook loss to smallmouth bass predation

in 1996 and 1997 determined that predation was greatest near hatchery release sites (i.e. Pittsburg Landing), directly after hatchery releases (Tiffan et al. 1999). The 1996-1997 study, which encompassed a 67 mile reach of the Snake River between Asotin, WA (RM 147) and Hells Canyon Dam (RM 215), estimated there to be 256 smallmouth/mile measuring ≥175mm, with the greatest concentration of fish (254 fish/mile) occurring downstream from the confluence of the Salmon River (Tiffan et al. 1999).

Despite smallmouth bass concentrations, predation on wild subyearling fall chinook salmon by smallmouth bass in the Middle Snake reach was determined to be low and infrequent, yet may represent a small portion of the mortality encompassed in survival estimates of the juvenile fall chinook outmigration to Lower Granite Dam (Tiffan et al. 1999). Predator-prey size relationships, such as those observed by Zimmerman (1997), may be related to the percentage of mortality realized by predation losses of subyearling chinook. Smallmouth bass were found to consume smaller chinook in the spring than did northern pikeminnow (see below), and consumed far more subyearling chinook salmon in summer than yearling chinook salmon in spring (Zimmerman 1997). The size selectivity of smallmouth predation on chinook may reflect the degree and timing of habitat overlap, as suggested by Tabor et al. (1993), who attributed high levels of smallmouth bass predation on subyearling chinook salmon in the Colubia River to the overlap of rearing habitat of subyearling chinook with the preferred habitats of smallmouth bass in summer. The consequence of size-selective predation would be increased vulnerability of wild juvenile salmonids, which are smaller than chinook salmon and steelhead reared in hatcheries (Zimmerman 1997).

Predation of salmon smolts by northern pikeminnow also represents a potential limiting factor to survival, particularly within reservoirs. Pike minnow, a native predator, have become well adapted to the habitat created by river impoundment (Beamesderfer and Rieman 1991). Petersen (1994) estimated the annual loss (between 1983-1986) of juvenile salmonids to predation by northern pikeminnow in John Day Reservoir to be 1.4 million, or approximately 7.3% of all juvenile salmonids entering the reservoir, while Collis et al. (1995) estimated that 15 to 20 million juvenile salmonids succumb to pike minnow predation annually. Within the Snake Hells Canyon subbasin however, the level of predation by pikeminnow is not considered to pose a significant threat to outmigrating salmon due to the riverine nature of the reach. Shively et al. (1996) found that pikeminnow predation would be minimized at smolt bypass systems when water velocity was greater than 1 m/second and water depth exceeded 10 meters.

Other key piscivorous fish species, which may pose a potential limiting factor to anadromous salmonids, include walleye, channel catfish, pacific lamprey, yellow perch, largemouth bass, northern pike, and bull trout (NMFS 2000b). Although not necessarily associated with the Middle Snake reach, these species have been found to consume considerable numbers of outmigrating subyearling chinook and steelhead, and are most closely associated with areas upstream and downstream of impoundments. Avian predator populations are also blamed for salmonid predation. These include the Caspian tern, double-crested cormorant, and three species of gulls (NMFS 2000b). Marine mammals, specifically members of the order pinnepedia, represent additional threats to chinook and steelhead (NMFS 200b).

#### Spring Chinook

Similar to the plight of fall chinook, spring/summer chinook production and/or population stability in the Snake Hells Canyon subbasin is limited by hatcheries, hydropower development, habitat degradation, harvest and predation (BLM 2000b; BLM 2000a).

### Hatcheries

The wild component of the Snake River spring/summer chinook Evolutionarily Significant Unit (ESU) is currently considered to be at some risk of extinction due in part to the influence of hatcheries (NMFS 2000a). Chinook salmon of hatchery origin comprise an estimated 80% of the Columbia River run (Lichatowich and Mobrand 1995).

The effectiveness of hatchery fish spawning in the wild has been considered to influence the growth rate of wild spring/summer chinook (NMFS 2000a). The National Marine Fisheries service estimates the growth rate (lambda) of Snake River spring/summer chinook to be between 0.96-0.80 (determined over a nineteen-year base period[3]). Extinction estimates 100 years from now range from 0.0 for Johnson Creek[4] and 0.78 for the Imnaha River, assuming that hatchery fish spawning in the wild have not reproduced (i.e., hatchery effectiveness = 0), to 0.0 in Johnson Creek and 1.00 in the Imnaha River, assuming that the hatchery fish spawning in the wild have been as productive as wild-origin fish (hatchery effectiveness = 100%) (Tables B-5 and B-6 in McClure et al. 2000b).

### Hydropower/Water Storage

Construction and operation of the mainstem dams on the Columbia and Snake River are considered the major cause of the decline of anadromous fish (WDFW et al. 1990). Below Lower Granite Dam, outmigrating Middle Snake spring/summer chinook may experience increased mortality by 1) changes in water pressure and gas saturation between the top of the dam and the base of the dam, 2) the impact of the turbine blades as fish pass through the dam, and 3) exposure to predators at the base of the dam, particularly if the fish become stunned during dam passage (WDFW et al. 1990).

Currently the estimated direct survival of Snake River spring/summer chinook smolts through the hydrosystem is between 40% and 60%, compared with an estimated survival rate during the 1970's of 5% to 40%. These improvements have occurred as a result of changes in the operation and configuration of the Federal Columbia River Power System (FCRPS), which include increased spill, barging, increased flow, changes in the operation of turbines, and new extended-length screens at McNary, Little Goose, and Lower Granite dams (NMFS 2000a).

### Habitat Degradation

Spring/summer chinook habitat within the Snake Hells Canyon subbasin , excluding the five primary tributaries (Clearwater River, Asotin Creek, Grande Ronde River, Imnaha River and Salmon River), may limit key life history phases (BLM 2000b; BLM 2000a). Stream-type chinook habitat below the Salmon confluence has been degraded by road construction, timber harvest, development in riparian areas and floodplains, agriculture, livestock grazing, recreation, and water uses (i.e. irrigation, water diversions) (BLM 2000b). The effects of these land uses have reduced the water quality, water quantity, habitat diversity and quality, thereby limiting the amount and availability of migratory, spawning, and rearing habitat of spring/summer chinook. High flow events have also resulted in habitat degradation (BLM 2000b) by scouring spawning substrate, filling pool habitat, and in some cases exporting large organic material from respective watersheds.

[3] Estimates of median population growth rate, risk of extinction, and the likelihood of meeting recovery goals are based on population trends observed during a base period beginning in 1980 and including 1999 adult returns. Population trends are projected under the assumption that all conditions will stay the same in the future.

[4] Johnson Creek is a tributary to the Salmon River in Idaho

Spring/summer chinook habitat in Granite and Sheep creeks is less limited than that occurring in other tributaries due to their wilderness designation. Similar to the lower portion of the subbasin, high flow events (such as those occurring in 1996) have caused severe channel scouring in some tributaries (BLM 2000a). Channel characteristics in the Middle Snake, such as high gradient tributaries and large stream size (i.e. mainstem Snake River), are also considered to limit the amount of usable habitat by spring/summer chinook (NPPC 1990; BLM 2000a; 2000b). The mainstem Snake River has elevated summer water temperatures that are sub-optimal for rearing, while tributary streams may be either inaccessible due to excessive gradient or low stream flows (BLM 2000b).

##### Harvest

Because harvest of wild chinook salmon has been curtailed in Idaho, Oregon, and Washington, the effects may not be considered a limiting factor to stream-type chinook within the Snake Hells Canyon subbasin . Out of basin harvest may however, limit overall production of the species in the study reach.

##### Predation

(Refer to fall chinook discussion).

#### Steelhead

Since summer steelhead rely on tributaries for spawning and a majority of rearing, they are most limited by access and/or habitat suitability. A variety of land uses have impacted steelhead trout and their associated habitats with the subbasin. These include roads, timber harvest, livestock grazing, mining, agriculture, and recreation. Many tributaries have elevated levels of sediment and high summer water temperatures or low summer flows.

A formal limiting factors analysis has not been completed for Ten Mile and Couse creeks, however local technical consensus has identified limiting factors for these two watersheds. Since these two streams are similar to Asotin Creek in all aspects, excluding the large acreage of state and federal ownership found in the Asotin Creek watershed, technical consensus has identified temperature, low summer flows, sediment and lack of suitable habitat for adults and juveniles to be limiting salmonid production. Recently the ACCD (Asotin County Conservation District) has worked with WDFW to identify spawning and rearing steelhead in both these streams (Mendel et al. 2001) resulting in habitat projects becoming a priority. These runs of steelhead are of wild origin and hatchery fish have never been released into these two streams (refer to Johnson et al. *in preparation*).

#### Bull Trout

The primary factor limiting bull trout in the Snake Hells Canyon subbasin is a decline in the amount, quality, and availability of habitat. Bull trout habitat occurring below the Salmon River confluence (i.e. Asotin Creek) is limited by the effects of land use and natural disturbance. The other factor considered to limit bull trout production in the Snake Hells Canyon subbasin is attributed to the loss of the anadromous prey base upon which bull trout become particularly reliant on during subadult and adult life history stages (Rieman and McIntyre 1993).

Because bull trout primarily use habitat in the mainstem Middle Snake during adult migration (August-September) and/or subadult foraging, and rearing life history phases (year-long), isolation and degradation of habitat (respectively) are considered to be primary limiting factors. Although currently undefined, the Imnaha/Snake River bull trout core population may be

at risk if migratory connectivity is lost (M. Hanson, ODFW, personal communication, April 19, 2001). Bull trout occurring in smaller mainstem tributary streams, such as Granite and Sheep creeks, may be reliant upon the refounding capacity of fluvial fish (e.g. Rieman and McIntyre 1993) originating from larger tributaries such as the Imnaha or Grande Ronde Rivers. While this interaction currently represents a data gap (M. Hanson, ODFW, personal communication, April 19, 2001), studies have established the importance of the mainstem Snake as migration habitat (Buchanan et al 1997; Hemmingsen et al. 2001a; Hemmingsen et al. 2001b; USFWS 2000) connecting the lower Salmon River, the Imnaha River, Grande Ronde River, and upriver portions of the Snake (BLM 2000b; BLM 2000a). Inadequate water quality (i.e. excessive stream temperatures) or inadequate flow may jeopardize access to the smaller systems, and may limit potential utilization of mainstem habitat (refer to Appendicies B and C).

#### White Sturgeon

Although sturgeon appear to be reproducing successfully in the middle section of the Snake River, the population may be limited by reductions or losses of certain life history pathways. Critical habitat for sturgeon in the 4 to 15 year-old age class (three to six foot sturgeon) appears to be restricting, as indicated by the excessively slow growth rates demonstrated by Coon (Coon et al. 1977; Coon 1978).

Hydroelectric projects have isolated Middle Snake sturgeon populations by restricting their movements into or out of the reach. Downstream impoundments have dramatically affected the food base upon which white sturgeon have evolved with, as illustrated by the marked decrease in anadromous and lamprey returns following construction of the lower four Snake River dams (CBFWA 1999). The influence of upstream impoundments on flows may limit spawning and incubation success, alter thermal regimes, and decrease the amount of nutrients flowing downriver. In addition, power peaking may have reduced the usable habitat for aquatic insect larvae and freshwater mussels, which are also food for sturgeon.

### Wildlife

#### Loss of native prairie grasslands

The Snake Hells Canyon subbasin contains some of the healthiest grassland communities remaining in the Columbia Basin but has still been affected by the disturbances that have eliminated most of these communities in the region (USDA Forest Service 1999). Approximately 41,639 acres of the subbasin that once contained native grasslands are now cultivated (Figure 15). Native grasslands of the region evolved without the heavy grazing pressures that occurred on the Great Plains (Mancuso and Mosely 1994). Overgrazing particularly in the late 1800s and early 1900s has led to alterations in the community structure and aided in colonization by exotic annual grasses and noxious weeds (USDA Forest Service 1999).

#### Riparian degredation

Heavy grazing has also impacted the health of the riparian communities in the subbasin. Poor shrub regeneration was observed in riparian and shrubby draw habitats in the Craig Mountain area that were heavily used by livestock, this has reduced the suitability of these areas for yellow warblers and other shrub nesting birds (Mancuso and Mosely 1994). Damage to the hackberry communities along the Snake River is particularly damaging because of the many bird and other small animals that feed on their berries (Mancuso and Mosely 1994). Grazing pressure has aided in the colonization of the subbasins riparian zone by non-native species. Conditions in

the riparian zones have generally improved due to protection and restoration resulting from the 1992 listing of salmon as a threatened species (USDA Forest Service 1999).

The Hells Canyon hydroelectric dam complex has altered flow and interrupted sediment processes within the mainstem Snake River. Historically, the upstream reaches of the Snake River and its tributaries provided sediment for the development and maintenance of fluvial and alluvial features within Hells Canyon. Clear water releases from Hells Canyon complex dams are reducing the abundance, size, and special distribution of fluvial and alluvial features, including beaches, within Hells Canyon. A comparison of sandbars before and after the installation of the Hells Canyon dam found that the surface area and number of beaches had declined by 75%. Resulting in fewer depositional sites where riparian communities can develop (USDA Forest Service 1999).

The construction of Lower Granite Dam 34 miles downsteam of the mouth of the Middle-Snake subbasin created a reservoir that extends into the subbasin as far as the town of Asotin. This reservoir has impacted the quality of wildlife habitat in the lowest section of the subbasin and may have impacted connectivity between wildlife populations in the Middle-Snake subbasin and neighboring subbasins. Prior to the Dams construction, alluvial soils associated with the river valley supported diverse riparian habitat filled with trees and/ or shrubs. Riparian forests in these areas often consisted of large mature trees more than 100 year old, providing wildlife with abundant cover and important structural elements like snags. Most of these areas were flooded when the reservoir filled, and riparian zones have been slow to reestablish at the new water level due to poor soils, riprapped banks and water level fluctuations. Today less than 50% of the area along the lower Snake River that used to support riparian forests continues to. Most existing riparian zones in the area are composed of young tree species or shrubs. Of the 129 acres of riparian forest currently located along the area inundated by the four lower Snake River dams 28 percent is located on Habitat Management Units (HMUs) administrated by the USACE (USACE 2001).

#### Loss of Ponderosa Pine Habitats

Ponderosa pine forests have decreased across the Columbia Basin with an even more significant decrease in mature ponderosa pine. Loss of this habitat type is perhaps less pronounced in the Snake Hells Canyon subbasin than in other areas. This is primarily due to the large areas designated as wilderness where timber harvest is now precluded and the uneven-aged forest management practices adopted on the HRCNA in 1975 (USDA Forest Service 1999).

Before the initiation of logging and fire suppression, much of the Craig Mountain uplands likely supported an open ponderosa pine Douglas-fir forest. This savanna-like structure was maintained by regular underburning and contained relatively more shrubs than at present. North aspects and other cool/moist microsites were probably dominated by grand fir communities, or more closed forests, such as Douglas-fir thickets. Fires resulted in mixed-severity burns and were less common compared to nearby parklike forest stands. Overall, fires resulted in a patterned landscape, with greater structural diversity and shrub abundance. The extensive grand fir stands now in place are a response to management discriminating against seral forest species (Johnson, pers. comm. 1994).

#### Noxious weeds

The introduction of non-native plant and animal species to the Snake Hells Canyon subbasin has reduced its ability to support native wildlife and plant species. Introduced plants in the subbasin often out compete native plant species and alter ecological processes reducing habitat suitability

(Quigley and Arbelbide 1997). The Invaders database has documented the occurrence of 73 plant species legally designated as "noxious" by Idaho, Oregon or Washington state, in the five counties partially contained in the Snake Hells Canyon subbasin (Appendix D). Not all of these 73 species have been documented to occur within the Snake Hells Canyon subbasin but many have. Because of their proximity to the subbasin the noxious weed species presented in Appendix D have the greatest potential to establish in the subbasin and pose the greatest threat to its wildlife. Without exception, the worst weed infestations at Craig.Mountain are areas that have been subjected to many years of chronic disturbance. The most ubiquitous disturbance factor has been intensive livestock grazing. Road building has also been an important purveyor of weeds (

Table 11). The naturally open structure of the grassland vegetation, soils and related factors, and geographic and climatic factors have likely contributed to the canyon grasslands being somewhat predisposed to weed invasion, especially by species of Mediterranean origin. . Of the 650 plant species documented for Craig Mountain, about 150 (23%) are non-native, the majority of these non-native species are found in the grassland habitats (Mancuso and Mosely 1994). Weedy species such as the annual bromes (Bromus spp.) and yellow starthistle are nearly ubiquitous within the canyon grasslands (Mancuso and Mosely 1994). Yellow-star thistle is considered the greatest threat to the habitat of the Black Butte bighorn sheep herd, despite aggressive aerial application of herbicides yellow-star thistle in the area continues to expand (Washington Department of Fish and Wildlife 1999c).

#### Nutrient Flow Reduction

Spawning salmon populations form an important link between the aquatic, riparian, and terrestrial communities. Anadromous salmon help to maintain ecosystem productivity and may be regarded as a keystone species. Salmon runs input organic matter and nutrients to the trophic system through multiple levels and pathways including direct consumption, excretion, decomposition, and primary production. Direct consumption occurs in the form of predation, parasitism, or scavenging of the live spawner, carcass, egg, or fry life stages. Carcass decomposition and the particulate and dissolved organic matter released by spawning fish deliver nutrients to primary producers (Cederholm *et al.* 2000). Cederholm identified nine wildlife species that have (or historically had) a strong consistent relation ship with salmon; of these the common merganser, osprey, bald eagle, black bear, and northern river otter are thought to occur in the Snake Hells Canyon subbasin . Eighty-three other wildlife species were identified as having a recurrent or indirect relation ship with salmon, and many of these also occur in the Snake Hells Canyon subbasin (Cederholm *et al.* 2000). The golden eagle, bald eagle, peregrine falcon, and bank swallow are among those that are state or federally listed/candidate species (Table 10).

#### Disturbance of Caves

Human caused disturbance at the cave sites in the subbasin is limiting their ability to support bats and the other wildlife species that depend on them. During winter, rising out of torpor requires a large caloric output, and repeated disturbance can lead to starvation. 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 1 each year. Four important caves in Hells Canyon are gated, but at least three more are needed (USDA Forest Service 1999).

Protection of the natural vegetation around cave openings is also very important since it affects the microclimate of the habitat area. Forest vegetation provides a thermal buffer,

keeping the caves cooler on hot days and warmer in cold weather. This is important due to the very specific temperature requirements of many bat species, which cannot tolerate wide temperature fluctuations at hibernation or breeding sites (USDA Forest Service 1999).

#### Roads

Even though road densities in the subbasin are relatively low, the transportation system of the Snake Hells Canyon subbasin s is a potential limiting factor to 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. Wisdom *et al* (2000) identified 13 factors that were consistently associated with roads in a manner deleterious to terrestrial vertebrates (
Table 11).

Table 11. 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 activites 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

### Idaho Department of Fish and Game

The Idaho Department of Fish and Game operates anadromous artificial production programs in the subbasin for harvest mitigation, supplementation, and conservation. These anadromous fish artificial production programs conform to statewide fisheries policies and management goals identified in the 2001-2006 Fisheries Management Plan (IDFG 2001). Hatchery Genetic Management Plans (HGMPs), specified in the National Marine Fisheries Service's (NMFS) 2000 Federal Columbia River Power System and 1999 Hatchery biological opinions, are being prepared for all anadromous hatchery programs in Idaho. The complete HGMPs are not available for inclusion in this document.

#### Harvest Mitigation Programs

Chinook salmon and steelhead harvest mitigation is provided through hatchery programs funded by the Idaho Power Company (IPC) and the USFWS-Lower Snake River Compensation Plan (LSRCP). The Idaho Department of Fish and Game operates hatchery programs funded by the Idaho Power Company; LSRCP authorized programs are operated by IDFG and the USFWS. The IDFG strongly emphasizes maintaining selective fisheries with the steelhead and chinook salmon programs. All harvest mitigation fish production (also called reserve production) is currently externally marked with an adipose fin clip to enable selective fisheries and provide for origin-specific stock monitoring and brood stock management at trapping and spawning sites.

Idaho Power Company provides funding for the operation of Oxbow, and Rapid River fish hatcheries. Oxbow Fish Hatchery is in the Snake Hells Canyon subbasin at the Hells Canyon Complex. Rapid River Fish Hatchery is located on Rapid River, a tributary to the Little Salmon River, a tributary to the Salmon River, near Riggins. Chinook salmon trapped at the Oxbow (Snake River, Hells Canyon) facility are transferred to Rapid River Fish Hatchery for holding, spawning, incubation, and juvenile rearing.

The purpose of the IPC facilities is to mitigate for anadromous production habitat lost as a result of construction of the Hell's Canyon complex dams on the Snake River. The annual mitigation objective for the IPC hatcheries is to release 400,000 pounds of steelhead smolts (at approximately 4.5 fish per pound) and 4 million chinook salmon smolts. No adult return objectives are specified in the IPC mitigation agreement.

The LSRCP program in Idaho attempts to provide in-kind mitigation for spring/summer chinook salmon and steelhead losses associated with the construction of the four lower Snake River hydroelectric projects. An extensive monitoring and evaluation program in the basin documents hatchery practices and evaluates the success of the hatchery programs at meeting LSRCP mitigation objectives and IDFG management objectives, and it monitors and evaluates the success of supplementation programs. The IDFG-LSRCP hatchery monitoring and evaluation program identifies hatchery rearing and release strategies that will allow the LSRCP program to meet its mitigation requirements and improve the survival of hatchery fish while avoiding negative impacts to natural (including listed) populations. In some cases, particularly in light of ESA requirements and Idaho Supplementation Study (ISS) plans, hatcheries may be used to enhance naturally reproducing populations.

To properly evaluate the LSRCP program, adult returns to facilities, spawning areas, and fisheries that result from hatchery releases are documented. IDFG's LSRCP program

requires the cooperative efforts of its Hatchery Evaluation Study, Harvest Monitoring Project, and Coded Wire Tag Laboratory. The Hatchery Evaluation Study evaluates and provides oversight of certain hatchery operational practices (brood stock selection, size and number of fish reared, disease history, and time of release). Hatchery practices are assessed in relation to their effects on adult returns, and recommendations for improvement of hatchery operations are made. The Hatchery Evaluation Study and IDFG's BPA-funded supplementation research projects are continuously coordinated because these programs overlap in several areas including: juvenile outplanting, brood stock collection, and spawning (mating) strategies. LSRCP hatchery production plays a substantial role in IDFG's supplementation research.

The Harvest Monitoring Project provides comprehensive harvest information, which is key to evaluating the success of the LSRCP in meeting adult return goals. Numbers of hatchery and wild/natural fish in the fisheryies and overall returns to the project area in Idaho are estimated. Data on the timing and distribution of the marked hatchery and wild stocks in the fishery are also collected and analyzed to develop LSRCP harvest management plans. Harvest data provided by the Harvest Monitoring Project are coupled with hatchery return data to estimate returns from LSRCP releases. Coded-wire tags are used extensively to evaluate fisheries contribution of representative groups of LSRCP production releases. However, most of these fish serve experimental purposes as well, for evaluating hatchery-controlled variables such as size, time, and location of release, rearing densities, and natural rearing.

#### Supplementation Programs.

Two tiers of supplementation programs are carried out in the subbasin. Tier 1 supplementation consists of intensive research projects approved within the NPPC Fish and Wildlife Program and funded by BPA. Separate projects for steelhead (Steelhead Supplementation Studies in Idaho Rivers) and chinook salmon (Idaho Supplementation Studies) supplementation are currently active in the subbasin.

Brood stock and juvenile production for the Tier 1-supplementation programs are managed and maintained separate from other hatchery programs. Supplementation brood stock typically consists of natural origin adult recruits and adult returns from prior supplementation brood stocks. Adults from the reserve (or harvest mitigation) production programs may be incorporated into some supplementation brood stocks. The progeny of a supplementation brood stock are marked differently (pelvic fin clip or CWT-no fin clip) than reserve production fish. If a hatchery is at juvenile rearing capacity, the rearing of Tier 1 supplementation fish may displace some reserve production.

Tier 2 supplementation actions are those not associated with the on-going intensive evaluations. Returns of reserve production adults in some years may exceed a hatchery's need with respect to an egg-take goal. Excess adults or their progeny (eggs, fry, parr) have primarily been used in on-site and off-site tribal supplementation programs. Tier 2 supplementation actions are coordinated and agreed to among state and tribal co-managers. Hatcheries may be involved in rearing eggs or juveniles for Tier 2 supplementation. Attempts are being made to identify unique marks for fish released as juveniles so they may be adequately monitored and managed when returning as adults. Rearing space priority at hatcheries, if at production capacity, is 1) reserve production, 2) Tier 1 supplementation production, and 3) Tier 2 supplementation production.

#### Conservation Programs

The IDFG Chinook Salmon Captive Rearing program is the primary artificial production program in the Mid-Snake subbasin that addresses anadromous fish conservation. This program differs from typical artificial production programs in that fish culture, not propagation, is the primary activity used to achieve program objectives. Hence production, as used in classical hatchery terminology, is not an objective of the program. This program represents the application of two different captive culture strategies, brood stock and rearing, to achieve conservation and rebuilding objectives. This captive culture effort is consistent with Section 9.6.4 (Artificial Propagation Measures) direction in the 2000 FCRPS Biological Opinion and with sections III.C (biological objectives) and III.D (strategies) of the Northwest Power Planning Council's 2000 Columbia River Basin Fish and Wildlife Program.

The IDFG initiated a captive rearing research program for populations at high risk of extinction to maintain metapopulation structure. Captive rearing is a short-term approach to species preservation. The main goal of the captive rearing approach is to avoid demographic and environmental risks of cohort extinction; maintaining the genetic identity of the breeding unit is an important but secondary objective. The strategy of captive rearing is to prevent cohort collapse in the specified target populations by providing captive-reared adult spawners to the natural environment, which in turn, maintain the continuum of generation to generation smolt production. Each generation of smolts, then, provides the opportunity for population maintenance or increase should environmental conditions prove favorable for that cohort. A captive rearing approach is most appropriate when the primary limiting factors depressing a population operate during the smolt to adult return life-cycle stage (outside of the subbasin). In this case, captive-rearing intervention for a portion of a cohort preempts exposure to external limiting factors. Freshwater spawning and production for the cohort is maintained while limiting factors external to the subbasin are addressed.

The captive rearing program was developed primarily as a way to maximize the number of breeding units that can be cultured while minimizing intervention impacts through the collection and subsequent rearing of early life stages through adulthood. Only enough juveniles or eggs are collected from target populations to provide an adequate number of spawners, about 20, to ensure that acceptable genetic diversity can be maintained without additional natural escapement. (According to the Stanley Basin Sockeye Technical Oversight Committee, it is reasonable to assume that 20 fish could encompass 95% of the genetic diversity of the population.) However, this number remains somewhat speculative because of uncertainties associated with the ability of the captive rearing approach to produce adults with the desired characteristics for release into the wild (Fleming and Gross 1992, 1993; Joyce et al. 1993; Flagg and Mahnken 1995). Juveniles and/or eggs would be collected each year from cohorts of low resiliency populations, those expected to return 10 or fewer spawning pair to their respective spawning areas. In order to meet its objectives, the program must be able to produce an adequate number of adults with the proper morphological, physiological, and behavioral attributes to successfully spawn and produce viable offspring in their native habitats.

Little scientific information regarding captive culture techniques for Pacific salmonids was available at the inception of this program. Following Flagg and Mahnken's (1995) work the IDFG captive rearing program was initiated to develop the technology for captive culture of chinook salmon and to monitor and evaluate captive-reared fish during both the rearing and post-release/spawning phases. In addition to technology development, the IDFG program also addresses population dynamics and population persistence concerns. These

population level concerns include 1) maintaining a minimum number of spawners in high-risk populations, and 2) maintaining metapopulation structure by preventing local extinction.

### Lower Snake River Compensation Program

The Lower Snake River Compensation Program (LSRCP) was initiated in the early 1980s to mitigate for fish losses caused by construction and operation of the four lower Snake River dams and reservoirs for steelhead, trout and salmon. The program has also been directed by the ESA listings of salmon and steelhead and the need to contribute to the recovery of those listed populations. The Lyons Ferry Complex is comprised of Lyons Ferry and Tucannon hatcheries, operated by WDFW, and a system of acclimation ponds throughout Southeastern Washington. The Nez Perce Tribe operates three acclimation facilities above Lower Granite Dam for fall chinook from Lyons Ferry Hatchery, two in the Snake River and one in the Clearwater River. These hatchery and acclimation facilities rear and release fish to compensate for 18,300 Snake River fall chinook, 1,152 Tucannon River spring chinook, 4,656 Snake River summer steelhead and 67,500 angler days of recreation on resident fish. Management intent for each species is different and will be discussed in each species section below. No rainbow trout, spring chinook or steelhead are released directly into the mid-Snake River.

#### Fall Chinook

The Lyons Ferry Hatchery (LFH) operation represents the sole fall chinook salmon compensation effort under the LSRCP in the Snake River basin (Nez Perce Tribal Hatchery will become operational in 2002 or 2003), and utilizes native stock Snake River fall chinook for the program. These fish are part of the Snake River fall chinook Evolutionarily Significant Unit (ESU) and have been identified by NMFS as the appropriate stock for recovering the population.

While planning and designing the LSRCP facilities in the 1970s, the steep fall chinook decline caused concern that these fish might become extinct before mitigation facilities could be completed to maintain and enhance the run. A fall chinook egg bank program was initiated in 1976 to preserve genetic material for compensation of 18,300 adults. Production releases from LFH began in the mid 1980's with fish from the egg bank program. Recent releases and returns have increased while maintaining the genetic integrity of the stock.

Current management objectives for LFH are driven by the ESA and the Columbia River Fish Management Plan. Those include 1) maintain genetic integrity of LFH / Snake River stock, 2) produce 900,000 yearling smolts (450,000 on-station release: 450,000 for three equal releases at Pittsburg Landing, Capt. John, and Big Canyon acclimation sites above Lower Granite Dam), and produce subyearlings as possible for release at Lyons Ferry Hatchery and above Lower Granite Dam, and 3) reduce stray hatchery fish escaping above Lower Granite Dam to maintain the genetic integrity of Snake River fall chinook. The program produces subyearlings, even though their survival is lower than for yearlings, to mimic the natural life history of Snake River fall chinook.

Evaluation of the program has included 1) tagging all releases by WDFW and a portion of those released above Lower Granite Dam, and monitoring adult returns to LFH and LGR, 2) determining the most effective release strategy between barging or direct stream releases, 3) determining adult fall back rate at IHR and LGR and providing the recommendations for the best trapping location of broodstock, and 4) experiments with cryopreserved semen. Evaluation work conducted in the early 1980's showed a nearly 11 fold survival advantage of releasing yearling smolts versus subyearling smolts at LFH. This work has supported management decisions to release yearling smolts to increased available broodstock, with

subyearling released occurring after baseline production is achieved. Ongoing evaluations are being conducted by the NPT and USFWS with fall chinook released above LGR, while WDFW monitors hatchery operations and adult returns to the lower Snake River below LGR.

#### Future Plans

The WDFW has released subyearlings from LFH for the past three years, concurrently with the subyearling releases above LGR from Tribal facilities. WDFW is proposing continued LFH subyearling releases rather than solely releasing fish above LGR. Low broodstock numbers have been an obstacle to program success which has been influenced by the following: 1) a small founding population, 2) low smolt to adult survival of sub-yearling and yearling fall chinook in the main stem corridor, and 3) removing stray Columbia River chinook from the broodstock during the late 1980s and early 1990s. However, recent increases in total smolt releases have had a positive effect on the number of adults returning to the Snake River basin. Spawning practices at LFH and trapping operations at LGR have maintained the genetic integrity of the stock. Production and Monitoring and Evaluation for FY2002 will not change significantly from past years, but will continue to focus on maximizing smolt-to-adult survival, and maintaining stock integrity.

### Summer Steelhead

Annually, approximately 60,000-120,000 hatchery summer steelhead smolts have been reared and released into the Snake River near LFH. The original intent of these releases was to build broodstock returns to LFH to support the mitigation program, return adults to meet the LSRCP goal, and reestablish successful steelhead fisheries. Although maintaining populations of wild steelhead in the basin was and is a management intent of the co-managers, no specific supplementation goals for Snake River populations were identified. Stocks of fish released into the river generally have been Wells (1983-86), Wallowa (1984-89) and Lyons Ferry (1987-present), with incidental releases of Clearwater, Oxbow and Skamania stocks occurring infrequently in the past. However, during the life of the LSRCP program, wild populations throughout the Snake River basin generally declined (except for run years 1999 and 2000).

The LSRCP program is successfully returning adult hatchery origin steelhead which meet or exceed LSRCP goals, and these fish have created and supported successful sport fisheries within the Snake River basin and some of its tributaries. Releases of summer steelhead for the Washington portion of the Snake River decreased in 2000, but currently have not been agreed to through the CRFMP negotiation process. Decreased releases of the LFH stock into the Snake resulted from a management response following the NMFS determination that the LFH stock constitutes a jeopardy to the listed natural populations (April 2, 1999 Biological Opinion issued by NMFS). Concurrent with this mitigation success has been increasing concern with possible effects of hatchery returns on wild populations as they return to their release site, or stray into adjacent subbasins which support natural populations.

#### Future Plans

Past evaluations have focused on increasing the survival of hatchery reared steelhead and assessing the contribution of LFH released fish to Columbia and Snake basins fisheries. Areas of concern include stray rates of hatchery stock steelhead into tributary rivers, the degree of incidental hooking mortality on natural adults, whether hatchery steelhead are contributing to the decline in wild populations, and whether a more appropriate stock for compensation and proposed supplementation in the basin is available. Evaluations will continue to monitor Snake

River steelhead releases and harvest, and focus on ways to minimize effects of the compensation program on natural populations, such as size and time of release or other release strategies that may decrease the potentially negative interactions between hatchery and wild fish. Further, the evaluation programs will continue to assess the potential for mitigation fisheries (identified in the original LSRCP legislation and consistent with the NWPPC recognition of the value of "Harvest Hatcheries") where possible. In addition, expanded genetic evaluation of hatchery and naturally produced steelhead has begun to more fully describe the genetic stock structure within the basin, and possibly the availability of an acceptable locally adapted broodstock for use in the program.

#### Idaho Power Company

The Idaho Power Company has fall chinook mitigation requirements that include releasing fall chinook smolts from Lyons Ferry Hatchery into Hells Canyon. The first releases of subyearling fall chinook are to occur in the spring of 2000.

#### Nez Perce Tribe

The Nez Perce Tribe has a hatchery under construction in the Clearwater River that should be operational by 2002 or 2003. It will release large numbers of spring chinook and fall chinook salmon into the Clearwater Basin.

### Existing and Past Efforts

BPA Funded Activities

Table 12. BPA-funded Columbia River Basin Fish and Wildlife Program activities (Columbia Basin Fish and Wildlife Authority 1999; Bonneville Power Administration and Northwest Power Planning Council 1999; Pacific States Marine Fisheries Commission 2001)

| Project | BPA # | Sponsor | Duration |
|---|---|---|---|
| Habitat Enhancement | | | |
| Craig Mountain WMA grassland and forest restoration- prescribed burning | 9205700 trust fund | IDFG | 2002-ongoing |
| Craig Mountain WMA tree and shrub plantings | 9205700 trust fund | IDFG | 1994-pngoing |
| Craig Mountain WMA noxious weed spraying and bio-control | 9205700 trust fund | IDFG | 1994-pngoing |
| Craig Mountain WMA grass planting, food [lots, irrigation improvements for wildlife | 9205700 trust fund | IDFG | 1994-pngoing |
| Artificial Propagation | | | |
| NPTH construction and operation | | NPT | 2000-ongoing |

Table 13. Non BPA-funded fish and wildlife activities within the Snake Hells Canyon subbasin (Shaw 1997; Oregon Department of Environmental Quality et al. 2000; U. S. Forest Service 1990)

| Project | Funding/Lead Agency | Status |
|---|---|---|
| Habitat Enhancement | | |
| Wildlife Habitat Improvements- Forest Restoration | IDFG | 1993-ongoing |
| Projects that address temperature and sedimentation in agricultural lands in Washington | Asotin CCD | 1996-ongoing |
| | | |
| Artificial Production | | |
| Idaho Power Co. fall chinook mitigation | IPC | 2001-ongoin |
| LSRCP steelhead and fall chinook production | WDFW | 1985-ongoing |
| LSRCP fall chinook acclimation and releases | NPT | 1995-ongoing |
| Idaho Power and IDFG | IDFG | |

**NRCS Tammany Creek PL-566 Supplemental Watershed Protection Plan/Environmental Assessment**

The Tammany Creek PL-566 Supplemental Watershed Protection Plan/Environmental Assessment was developed by the Idaho NRCS to supplement the original Tammany Creek Watershed Protection Plan/EA completed in 1986 and currently under implementation encompassing 34,160 acres in Nez Perce County, Idaho. Tammany Creek enters the Snake River just south of the city of Lewiston, about 4 miles south of the confluence of the Snake and Clearwater Rivers. The Watershed Sponsors include the Nez Perce Soil and Water Conservation District, Nez Perce County Commissioners, Nez Perce Tribe, Idaho Department of Fish and Game, Idaho Department of Environmental Quality, and the Idaho Soil Conservation Commission

The supplemental plan provides P.L. 566 financial and technical assistance to allow for the implementation of land treatment -measures on private non-irrigated cropland, AFOs, county roads, and on riparian zones along Tammany Creek and its tributaries. The primary objective of the supplemental plan is to reduce the maximum mid-summer stream temperature in Tammany Creek by 2 degrees centigrade to help maintain the optimum temperature for anadromous and resident cold-water fish. To achieve this objective, conservation practices are being installed to enhance and protect riparian vegetation, which in turn will reduce stream temperatures through increased stream shading. Enhanced riparian vegetation will also reduce streambank erosion, improve fish cover, and improve the overall efficiency of the Tammany Creek riparian system to filter and retain sediment and associated nutrients and bacteria.

The planned action will also reduce off-site sediment yields from 169,940 tons to 56,080 tons per year, a 67 percent reduction. This reduction will enhance the quality of water entering the Snake River and improve anadromous and resident fish habitat. Implementation of the Supplemental Watershed Protection Plan/EA will provide the treatment necessary to remove Tammany Creek (17060103-021) from the Idaho 303(d) list.

**Projects in Washington Agricultural Land (From Brad Johnson, Asotin County Conservation District (ACCD)**

In the Washington portion of the subbasin, riparian projects to reduce sedimentation and temperature and improve bank stability include fencing streams to reduce direct animal pressure on streambanks and allow for natural reproduction of riparian areas; alternative water developments with fencing projects to allow animals sources of water without utilizing the stream; and tree planting in areas where instream structures have been installed by ACCD and where floods or human impacts have devastated the vegetation. During the period from 1996 – 2000, the ACCD has utilized $33,099 in Washington State funding to install 26,410 feet of riparian fencing. Alternative water developments and riparian revegetation projects have been identified by landowners and the District to be implemented beginning in 2001. These types of projects have not been completed prior to 2001 because funds have not been available for projects in the Snake River Basin.

**Uplands in Washington (From Brad Johnson, Asotin County Conservation District)**

Most of the sediment delivered to Snake River and its tributaries in Washington comes from the upland agricultural areas. Best Management Practices (BMPs) can be installed to reduce the amount of soil leaving these areas. BMPs targeted to improve water quality and fish habitat include upland sediment basins designed to catch sediment, terraces to direct runoff to sediment basins or grassed water ways and filter strips, strip cropping, and direct seeding of crops reducing summer-fallow acres and reducing erosion by 95% on those acres (Figure 29). A total of $142,376 of Washington State funds were targeted to upland practices from 1996 – 2000 through the Asotin County Conservation District.

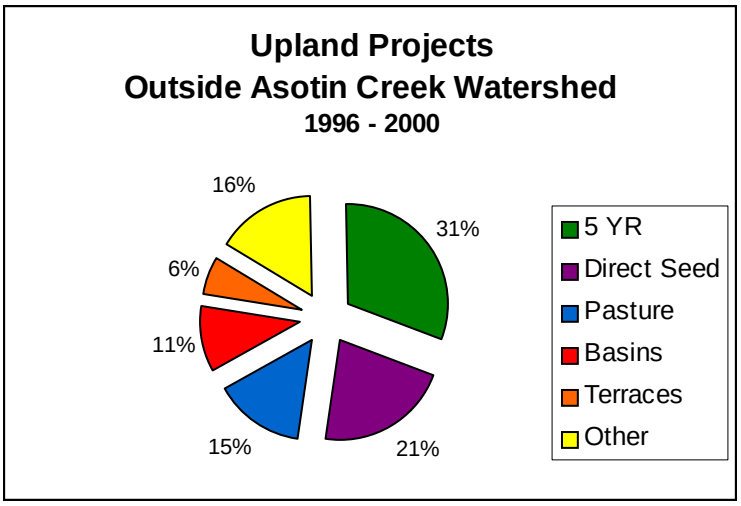


Figure 29. Upland restoration projects occurring outside of the Asotin Creek Watershed

**Ten Mile Creek and Couse Creek in Washington (From Brad Johnson, Asotin County Conservation District)**

Currently ACCD is working with landowners in the headwaters of Ten Mile and Couse Creeks to reduce sedimentation through Best Management Practices (BMPs). Ten Mile and Couse Creeks lie outside the Asotin Creek watershed boundary and have not benefited from BPA funding. The ACCD has worked with the Washington State Conservation Commission (WCC), Salmon Recovery Funding Board (SRFB) and Federal USDA Programs to implement projects

for water quality and habitat improvements. While goods things are being accomplished in these watersheds, only 14% of the dollars received by ACCD, or $176,000 have been spent outside the Asotin Creek Watershed. This is compared to $1,098,960 available for projects inside the Asotin Creek watershed.

Funding for riparian and instream projects and continued upland practices are needed in both of these drainages. Having technical participation coupled with data supporting spawning and rearing steelhead we believe that utilizing BPA funds for habitat restoration in these watersheds is a priority.

#### USDA in Washington (From Brad Johnson, Asotin County Conservation District)

Another important factor in Asotin County are USDA sponsored programs. A total of 26,793 acres of marginal crop and pasture lands have been enrolled in the Conservation Reserve Program (CRP). The Environment Quality Incentives Program (EQIP), targeted to the uplands, has also proven to be a popular program. The majority of funds have been used to implement an additional 1,522 acres in direct seeding over five years. Other projects implemented through EQIP include grassed waterways, sediment basins and pasture/hayland planting.

## Present Subbasin Management

### Existing Management

Multiple agencies and entities are involved in management and protection of fish and wildlife populations and their habitats in the Snake Hells Canyon subbasin . Federal, state, and local regulations, plans, policies, initiatives, and guidelines are part of this effort. The NPT, ODFW, WDFW and IDFG share co-management authority over the fisheries resource. Federal involvement in this arena stems from Endangered Species Act responsibilities and from management responsibilities for federal lands, most notably the Hells Canyon National Recreation Area. Numerous federal, state, and local land managers are responsible for multipurpose land and water use management, including the protection and restoration of fish and wildlife habitat. Management entities and their associated legal and regulatory underpinnings for resource management and protection and species recovery are outlined below.

#### Federal Government

As a result of the federal government's significant role in the Columbia Basin, not only through the development of the federal hydropower system but as a land manager, and its responsibilities under Section 7(a) of the Endangered Species Act (ESA), several important documents have been published in the last year that will guide federal involvement in the Snake Hells Canyon subbasin and Blue Mountain Province. These documents are relevant to and provide opportunities for states, tribes, local governments, and private parties to strengthen existing projects, pursue new or additional restoration actions, and develop the institutional infrastructure for comprehensive fish and wildlife protection. The key documents include the FCRPS Biological Opinion, the federal All-H paper entitled, *Conservation of Columbia Basin Salmon: A Coordinated Federal Strategy for the Recovery of the Columbia-Snake River Basin Salmon,* and the Interior Columbia Basin Ecosystem Management Project (ICBEMP). All are briefly outlined below.

#### FCRPS Biological Opinion (BiOp)

This biological opinion written by NMFS and the Fish and Wildlife Service (FWS) regarding the operation of the federal hydropower system on the Columbia River fulfills consultation requirements with the U.S. Army Corps of Engineers (USACE), the Bureau of Reclamation (USBR), and the Bonneville Power Administration (BPA) under Section 7 of the ESA. Significantly, BiOp concluded that off-site mitigation in tributaries is necessary to continue to operate the hydropower system.

#### Federal Caucus All-H Paper

The *Basinwide Salmon Recovery Strategy* (also known as the All-H paper) is a framework for basin-wide salmon recovery and identifies strategies for harvest management, hatchery reform, habitat restoration, and hydropower system operations. This strategy outlines specific actions to be taken by the federal government, and proposes additional actions for tribal, state and local governments, which together will prevent extinction of these 12 species and lead to their ultimate recovery. Its biological goals are to halt the decline in salmon populations within five to ten years, and establish increasing trends in abundance within 25 years.

#### ICBEMP (http//:www.icbemp.gov)

This document is a framework for management of federal lands over the interior Columbia Basin, and was produced by the primary federal land management agencies, including the Forest Service (USFS) and the Bureau of Land Management (BLM). Significantly, this document (if approved) will affect how these federal agencies prioritize actions and undertake and fund restoration activities. The Interior Columbia Basin Ecosystem Management Project (ICBEMP) is a regional-scale land-use plan that covers 63 million acres of federal lands in Oregon, Washington, Idaho, and Montana (www.icbemp.gov). The BLM and USFS released a Supplemental Draft Environmental Impact Statement for the ICBEMP Project in March 2000. The EIS focuses on the critical broad scale issues related to landscape health, aquatic and terrestrial habitats, human needs, and products and services. If approved, ICBEMP will replace the interim management strategies, providing for longer-term management of lands east of the Cascades. As ICBEMP is implemented, subbasin and watershed assessments and plans will target further habitat work (NMFS 2000).

### Federal Agencies with responsibilities in the Snake Hells Canyon subbasin

#### Bonneville Power Administration

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 spend power revenues to mitigate the damage caused to fish and wildlife populations and habitat from federal hydropower development. The BPA provides funding for fisheries enhancement projects to mitigate for the damage caused to the Snake River's fisheries from the completion of the four lower Snake River Dams. These funds are provided and administered through the Lower Snake River Compensation Plan (LSRCP).

#### Columbia Basin Fish and Wildlife Authority

The CBFWA is made up of Columbia Basin fish and wildlife agencies (state and federal) and the Columbia Basin tribes. CBFWA's intent 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.

#### Farm Services Agency - Washington

The Farm Services Agency (FSA) administers U.S. Department of Agriculture farm commodity programs, 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 the CRP and the Environmental Quality Incentives Program (EQIP). Technical assistance for these programs is provided by the NRCS. Delivery of programs is completed through the Clarkston Field Office co-located with the NRCS and the ACCD in Clarkston, WA.

#### Natural Resource Conservation Service - Washington

The NRCS's major purpose is to provide consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. The 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 the CRP, River Basin Studies, Forestry Incentive Program, Wildlife Habitat Improvement Program, EQIP and Wetlands Reserve Program.

#### Natural Resource Conservation Service - Idaho

NRCS is an agency of the U.S. Department of Agriculture with professionally staffed field offices in Clearwater, Idaho, Latah, Lewis, and Nez Perce Counties. The agency's major purpose is to provide 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.

#### Lower Snake River Compensation Plan (from USACE 2001)

*The Fish and Wildlife Compensation Plan for the Lower Snake River* project was authorized by the Water Resources Development Act of 1976 (Public Law 94-587, 94th Congress 2d Session), and was approved October 22, 1976. The Water Resources Development Act of 1986 (Public Law 99-662, 99th Congress, 2d Session), approved November 17, 1986, modified the project to the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP), in accordance with the recommendations contained in the report of the Chief of Engineers dated March 6, 1985.

The facilities and lands of the LSRCP are primarily located in the upper, middle, and lower subbasins of the Snake River drainage, in Washington, Oregon, and Idaho. The remaining

facilities and lands are located in the Upper Columbia, Yakima, and Mid-Columbia subbasins, east of the Cascade Mountain Range in Washington and Oregon. The project consists of fish hatcheries, satellite fish facilities, a fish laboratory, wildlife habitat areas and development areas, and lands with fishing and hunting access. Some development is located on existing Federal lands, but the majority is on additionally-acquired lands and easements. The project is designed to compensate for the loss of wildlife habitat and anadromous and resident fisheries caused by the construction of the four lower Snake River dams (Ice Harbor, Lower Monumental, Little Goose, and Lower Granite).

#### 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, twith 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. The Corps manages properties and levees where the Lower Granite Dam (on the Snake River) pool inundates the Snake River up to Asotin.

#### 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 19$^{th}$ 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, IDEQ and WDOE in each of their states 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 USFWS administers the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP) which was authorized by the Water Resources Development Act of 1976, Public Law (P.L.) 94-587, to mitigate and compensate for fish and wildlife resource losses caused by the construction and operation of the four lower Snake River dams and navigation lock projects. The fishery resource compensation plan identified the need to replace adult salmon and steelhead and resident trout fishing opportunities, and the size of the anadromous program was based on estimates of salmon and steelhead adult returns to the Snake River basin prior to the construction of the four lower Snake River dams. A summary document describing the LSRCP and its role in individual subbasins has been compiled and submitted under separate cover to the ISRP and CBFWA (U.S. Fish and Wildlife Service 2001a).

#### 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.

#### 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 Government

#### 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. Tribal government

headquarters are located in the Clearwater River subbasin in Lapwai, with offices in Kamiah and Orofino. 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 Snake Hells Canyon 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.

### State Government

#### Idaho Department of Agriculture

"The Idaho State Department of Agriculture (ISDA) serves the state's agricultural community through a wide variety of services. ISDA provides technical assistance, financial assistance, laboratory testing, national and international marketing, inspection, and licensing programs" (ISDA Web Page 2000).

ISDA is composed of several divisions: Agriculture Inspection Division, Agriculture Resources Division, Animal Industries Division, Plant Industries Division, and the Division of Marketing and Support Services. Through its divisions, ISDA administers several programs that are important for natural resource in the subbasin. Such programs include those that monitor pesticide use and application: pesticide licensing, certification and training; pesticide registration, disposal, and environmental toxicology; pesticide record keeping; and pesticide investigations. Programs dealing directly with natural resources include the Groundwater Program, Wildlife Laboratory, Noxious Weed Control, Noxious Weed Free Forage and Straw Certification Program, and a chemical container recycling program (ISDA Web Page 2000).

#### Idaho Department of Environmental Quality

""The Department of Environmental Quality (IDEQ) is responsible for protecting human health and preserving the quality of Idaho's environment. IDEQ administers a number of core federal

environmental protection programs, which support a broad range of activities: these include 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 Strategic Plan 2001 – 2006). The closest IDEQ office is located in Lewiston. IDEQ is composed of several divisions, each with a different responsibility and set of goals. These include:

1. Waste management and remediation
2. Water quality
3. Air quality

IDEQ has identified four agency priorities to be included in its 2002 – 2007 Strategic Plan; of these, three seem relevant to the Snake Hells Canyon subbasin (Jim Bellatty, IDEQ, personal communication, March 28, 2001):

1. Improve ground water quality in degraded areas and protect all ground water
2. Improve the surface water quality in areas identified as not supporting their beneficial uses or where the state believes threatened or endangered species exist
3. Improve environmental quality in areas subject to past or present mining activities

The IDEQ administers several programs designed to monitor, protect, and restore water quality and aquatic life uses. These include BURP monitoring, 305(b) water quality assessments, 303(d) reports of impaired waters and pollutants, TMDL assessments, pollutant reduction allocations, and implementation plans, bull trout recovery planning, 319 nonpoint source pollution management, antidegradation policy, water quality certifications; municipal wastewater grants and loans, NPDES inspections, water quality standards promulgation and enforcement, general ground water monitoring and protection, source water assessments, and specific watershed management plans identified by the legislature. The Idaho Board of Environmental Quality oversees direction of the agency to meet responsibilities mandated through Idaho Code, Executive Orders, court orders, and agreements with other parties.

#### Idaho Department of Fish and Game

Under Title 36 of the Idaho Code, the Idaho Department of Fish and Game is responsible for preserving, protecting, perpetuating and managing fish and wildlife in the state of Idaho, and for providing continued supplies of fish and wildlife for hunting, fishing, and trapping. IDFG management plans and policies relevant to fish and wildlife and their habitat in the Snake Hells Canyon subbasin include the *A Vision for the Future: Idaho Department of Fish and Game Policy Plan, 1990-2005*; the Idaho Department of Fish and Game Strategic Plan (IDFG 2001); State of Idaho Wildlife Conservation and Restoration Program Comprehensive Program. (IDFG 2001a); the *Idaho Department of Fish and Game Five Year Fish Management Plan: 2001-2006*; *White-tailed Deer, Mule Deer and Elk Management Plan* (Idaho Department of Fish and Game 1999); the *Black Bear Management Plan 2000-2010* (Idaho Department of Fish and Game 1998); the *Nongame Plan 1991-1995*; the *Upland Game Plan 1991-1995*; the *Waterfowl Plan 1991-1995*; the *Moose, Sheep and Goat Plan 1991-1995*; the *Mountain Lion Plan 1991-1995* and the *Furbearer Plan 1991-1995*.

#### Idaho Conservation Data Center

Idaho Conservation Data Center (CDC), 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 name was changed to Idaho Conservation Data Center in 1992. The Idaho CDC is part of an expanding international network of Natural Heritage Programs. Through the leadership of The Nature Conservancy similar heritage programs have been established (primarily within state government) throughout North America. Programs within the natural heritage network collect and maintain information on the status of rare, threatened, and endangered plant and animal species; exemplary ecological reference and natural areas; and terrestrial and aquatic habitats and plant communities using standardized methods and protocols in the framework of an integrated, relational data management system (The Nature Conservancy 1982; The Nature Conservancy et al. 1996).

#### Idaho Department of Lands

The Idaho Department of Lands (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 Web Page 2000).

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

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

"The 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 Web Page 2000).

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 Web Page 2000).

#### Idaho Department of Parks and Recreation

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

"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 Web Page 2000). IFPC goals include

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

#### Idaho Geological Survey

"The Idaho Geological Survey is the special public service and research agency at the University of Idaho mandated by law to collect and disseminate 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. Staff geologists conduct this applied research with a strong emphasis on producing geologic maps. 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 Web Page 2000).

#### Idaho Rangeland Resource Commission

"The Idaho Rangeland Resource Commission (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 Web Page 2000)

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

IRRC is a flagship for the industry's important long-term information and education needs through implementation of their mission statement. (IRRC Web Page 2000).

#### Idaho Soil and Water Conservation Districts ( from Title 22, Chapter 36 Idaho Code, and Schnepf and Hasselstrom. (1995). Idaho Soil Conservation Districts Supervisors' Handbook)

Soil and water conservation districts are non-regulatory subdivisions of Idaho State government. A board of five or seven supervisors, who are local residents, and who serve without pay,

governs each. All supervisors are elected officials and must be landowners (including urban property owners located within district boundaries) or farm operators in the district to which they are elected. Soil and water conservation districts develop and implement programs to protect and conserve natural resources on nonfederal lands. Districts organize technical advisory groups for projects and call upon local, state, tribal and federal agency specialists, industry representatives, and interested individuals.

Districts receive limited funds from local (county) and state (general fund) government. Districts may receive other funds for local project work through the Water Quality Program for Agriculture program (ISCC) and other funding agencies, institutions, or organizations. Working cooperatively, with other entities, districts provide technical assistance to agriculturists and other private landowners based on long standing agreements with the USDA Natural Resources Conservation Service, Idaho Soil Conservation Commission, and other federal and state agencies. Specific conservation districts are described in entries in alphabetical order in this section

#### Idaho Soil Conservation Commission

"The Idaho Soil Conservation Commission (SCC) was created in 1939 from Idaho legislation originated to deal with the soil erosion crisis of the Dust Bowl. Today the Commission's purpose is to provide support and service to Idaho's 51 Soil Conservation districts for the wise use and enhancement of soil, water and related resources. The Commission consists of five members appointed to five-year terms by Idaho's Governor. The Commission has a 25-member staff responsible for water quality program delivery and administrative programs. Most staff work through a District in the field, providing technical assistance directly to Idaho land owners and assisting with projects" (SCC Web Page 2000).

"Responsibilities of the Commission are: organize Districts and provide assistance, coordination, information and training to District supervisors; ensure that Districts function legally and properly as local subdivisions of state government; administer general funds appropriated by the Idaho Legislature to Districts so they can install resource conservation practices; provide technical assistance personnel to Districts administering water quality projects and conducting soil surveys; and provide timely educational information to Districts" (SCC Web Site 2000).

#### Oregon Department of Environmental Quality

The 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 Department 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

Oregon Department of Fish and Wildlife is responsible for protecting and enhancing Oregon's fish and wildlife and their habitats for present and future generations. ODFW co-manages fishery resources in the subbasin with the NPT. Management of fish and wildlife and their

habitats in and along the Snake Hells Canyon subbasin is guided by ODFW policies, 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. For example, Oregon Administrative Rule (OAR) 635 Division 07 – *Fish Management and Hatchery Operation* sets forth policies on general fish management goals, the Natural Production Policy, the Wild Fish Management Policy, and other fish management policies. OAR 635 Division 008 – *Department of Wildlife Lands* sets forth management goals for each State Wildlife Area, OAR Divisions 068-071 set deer and elk seasons, and OAR Division 100 – *Wildlife Diversity Plan* sets outlines wildlife diversity program goals and objectives, identifies species listings, establishes survival guidelines, and creates other wildlife diversity policy. OAR Division 400 – *Instream Water Rights Rules* provides guidelines for inflow measurement methodologies, establishes processes for applying for instream water rights, and sets forth other instream water rights policies. OAR Division 415 - *Fish and Wildlife Habitat Mitigation Policy* establishes mitigation requirements and recommendations, outlines mitigation goals and standards, and provides other mitigation guidelines. Another pertinent ODFW policy is the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (ODFW 1997b). *Vision 2006* is a six-year strategic operational plan providing guidance for the Department in the next six years. In addition to these OAR's, ODFW has a variety of species-specific plans (discussed below).

♦ Mule Deer Management Plan

The goal of ODFW's Mule Deer Management Plan (ODFW 1990) is to manage mule deer populations to provide optimum recreational benefits to the public, and to be compatible with habitat capability and primary land uses. The plan summarizes the life history of mule deer and their management in Oregon, lists concerns and the strategies to be used in addressing identified problems, and provides management direction to inform the interested public of how mule deer will be managed.

♦ Elk Management Plan

The goal of ODFW's Elk Management Plan (ODFW 1992) 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. The plan summarizes the life history of elk and their management in Oregon. The plan also lists concerns and the strategies to be used in addressing identified problems and provides management direction to inform the interested public of how elk will be managed.

♦ Bighorn Sheep Management Plan

ODFW's Bighorn Sheep Management Plan (ODFW 1992) summarizes the history and status of Oregon's bighorn sheep and presents a means by which they will be restored to remaining suitable habitat. The plan serves as a guide for transplanting efforts, assists concerned resource management agencies with wildlife planning efforts, and provides management direction for Oregon's bighorn sheep program. The plan describes 16 bighorn sheep management concerns and recommends strategies to address these concerns.

♦ Cougar Management Plan

The three goals of ODFW's Cougar Management Plan (ODFW 1993) are 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 and into the future, and 3) conduct a management program that maintains healthy populations of cougar and recognizes the desires of the public and the statutory obligations of the Department. The plan summarizes the life history of cougar and their management in Oregon. The plan also lists concerns and the strategies to be used in addressing identified problems. Management direction is provided to inform the interested public of how cougar will be managed.

♦ Black Bear Management Plan

The three goals of ODFW's Black Bear Management Plan (ODFW 1987) are 1) recognize the black bear as an important part of Oregon's wildlife fauna, valued by many Oregonians, 2) maintain healthy black bear populations within the state and into the future, and 3) conduct a management program that maintains healthy populations of black bear and recognizes the desires of the public and the statutory obligations of ODFW. The plan summarizes the life history of black bear and their management in Oregon. The plan lists concerns and the strategies to be used in addressing identified problems and provides management direction to inform the interested public of how black bear will be managed.

♦ Migratory Game Bird Program Strategic Management Plan

The mission of ODFW's Migratory Game Bird Program Strategic Management Plan (ODFW 1993) is to protect and enhance populations and habitats of native migratory game birds and associated species at prescribed levels as determined by national, state, and flyway plans) throughout natural geographic ranges in Oregon and the Pacific Flyway to contribute to Oregon's wildlife diversity and the uses of those resources. Strategies are described that assist in the development of specific operational plans to achieve the program mission and integrate with other state and federal agencies and private organizations. The plan mandates the formation and implementation of more specific operational plans, especially in regard to habitat programs and biological surveys.

♦ Oregon Wildlife Diversity Plan

ODFW's Oregon Wildlife Diversity Plan (ODFW 1993) provides policy direction for the maintenance and enhancement of the vertebrate wildlife resources in Oregon. The plan identifies goals and objectives for maintaining a diversity of non-game wildlife species in Oregon, and provides for coordination of game and non-game activities for the benefit of all species.

**Oregon Department of Forestry**

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

**Oregon Department of Transportation**

The Oregon Department of Transportation (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

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

#### Oregon House Bill 3609

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

#### Oregon Plan (http//:www.oregon-plan.org)

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 (OWEB) 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 Commission

The Land Conservation and Development Commission in Oregon 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 Plan for Salmon and Watersheds

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

#### 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 (TMDL) as a section of the Water Quality Management Plan (WQMP).

#### Oregon State Police

The Fish and Wildlife Division of the Oregon State Police (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 Excecutive Order 99-01.

#### Oregon Water Resource Department

The Oregon Water Resources Department (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. Statutes for water appropriation (ORS 537) govern the use of public waters; Water Right Certificates pertinent to the different lands within the subbasin specify the maximum rate and/or volume of water that can be legally diverted. Oregon water law is based on the prior appropriation doctrine, which results in water being distributed to senior water right holders over junior water right holders during times of deficiency. The law also requires diverted water be put to beneficial use without waste. WRD acts as trustee for in-stream water rights issued by the state of Oregon and held in trust for the people of the state. The Water Allocation Policy (1992) tailors future appropriations to the capacity of the resource, and considers water to be "over-appropriated" if there is not enough water to meet all demands at least 80% of the time (80% exceedence). The OWRD is a partner in the Oregon Plan and has developed streamflow restoration priorities for fish.

#### Washington Department of Ecology

The WDE's mission is to protect, preserve, and enhance Washington's environment and promote the wise management of air, land, and water for the benefit of current and future generations. The agency monitors and sets regulatory standards for water quality within theWashington portion of the subbasin.

In addition to regulating water quality, the WDE is responsible for water resource management, instream flow rule development, shoreline management, floodplain management, wetland management, and providing support for watershed management in the Snake Hells Canyon subbasin .

#### Washington Department of Fish and Wildlife

The WDFW is responsible for preserving, protecting, and perpetuating populations of fish and wildlife. Washington State laws, policies or guidance that WDFW uses to carry out its responsibilities include:

Hydraulic Code (RCW 75.20.100-160):

This law requires that any person, organization, or government agency that conducts any construction activity in or near state waters must comply with the terms of a Hydraulic Project Approval permit issued by WDFW. State waters include all marine waters and fresh waters. The law's purpose is to ensure that needed construction is done in a manner that prevents damage to the state's fish, shellfish, and their associated habitat(s).

Strategy to Recover Salmon (part of Extinction is not an Option):

The strategy is intended to be a guide, and it articulates the mission, goals, and objectives for salmon recovery. The goal is to restore salmon, steelhead, and trout populations to healthy harvestable levels and improve those habitats on which the fish rely. The early action plan identifies specific activities related to salmon recovery that state agencies will undertake in the 1999-2001 biennium and forms the first chapter in a long-term implementation plan currently under development. The early actions are driven by the goals and objectives of the Strategy. Many of the expected outcomes from the early actions will directly benefit regional and local recovery efforts.

The Bull Trout and Dolly Varden Management Plan:

Describes the goal, objectives, and strategies to restore and maintain the health and diversity of self-sustaining bull trout and Dolly Varden stock and their habitats.

The Wild Salmonid Policy for Washington:

Describes the direction the WDFW will take to protect and enhance native salmonid fish. The document includes proposed changes in hatchery management, general fish management, habitat management, and regulation/enforcement.

The Draft Steelhead Management Plan:

Describes the goals, objectives, policies, and guidelines to be used to manage the steelhead resource.

Washington Priority Habitats and Species (PHS):

A guide to management of fish and wildlife "critical areas" habitat on all State and private lands as they relate to the Growth Management Act of 1990. The recommendations address upland as well as riparian habitat and place emphasis on managing for the most critical species and its habitat.

Specific wildlife species management or recovery plans, (e.g., *Blue Mt. Elk Herd Management Plan 2000, Statewide Elk Management Plan, Bighorn Sheep Herd and Statewide Management Plan, Black Bear, State Ferruginous Hawk Recovery Plan, Bald Eagle Recovery Plan*).

The Draft Snake River Wild Steelhead Recovery Plan:

This plan is an assessment of problems associated with the continuing decline in natural steelhead populations within the Snake River basin and includes recommendations to reverse the decline. The WDFW manages fisheries and fish populations to provide diverse recreational opportunity and conserve or enhance indigenous populations.

The Lower Snake River Compensation Plan:

This program is funded by BPA and the USFWS through the LSRCP office, and the WDFW administers and implements the Washington portion of the program. The program mitigates for the loss of fish populations and recreational opportunities resulting from construction of the four lower Snake River dams. Specific mitigation goals include “in-place” and “in-kind” replacement of adult salmon and steelhead. The WDFW developed implementation plans as part of the LSRCP program.

The WDFW Snake River Fishery Management and Evaluation Plan (FMEP):

A plan required by NMFS for all fisheries in the Snake River and its tributaries in Washington. The plan is an assessment of fisheries effects on listed anadromous salmonids.

WDFW Enforcement Program

The WDFW Enforcement Program enforces state laws concerning illegal harvest, fish passage, water surface screening requirements and stream hydraulics permitting. These state laws are normally in direct support of the protection provisions of the ESA for listed species. In the Asotin subbasin, officers patrol streams for closed season harvest or taking of protected species listed under both state law and the federal ESA, such as spring chinook salmon, fall chinook, summer steelhead, and bull trout. Officers also monitor for illegal habitat modification, alteration and destruction activities on area streams and ensure work occuring within the ordinary high water area of streams is conducted under authority of and in accordance with appropriate state hydraulic project approval (HPA) permits.

**Washington Department of Ecology**

The WDOE's mission is to protect, preserve, and enhance Washington's environment and promote the wise management of air, land, and water for the benefit of current and future generations. The agency monitors and sets regulatory standards for water quality within the subbasin.

In addition to regulating water quality the WDOE is responsible for water resource management, instream flow rule development, shoreline management, floodplain management, wetland management, and providing support for watershed management in the Asotin Creek subbasin.

The WDOE regulates surface and ground water quality within the Asotin Creek subbasin. The 1972 Federal Clean Water Act authorizes and requires states to establish water quality standards for specific pollutants. Every two years, the WDOE is required to list in Section 303(d) of the Clean Water Act those water bodies that do not meet surface water quality standards. The WDOE utilizes data collected by agency staff as well as data from tribal, state, local governments, and industries to determine whether or not a waterbody is listed on the 303(d) list. Total Maximum Daily Loads must be completed for every parameter that exceeds state water quality standards on listed water bodies.

The WDOE proposes several changes to surface water quality standards and the classification system. The revised standards must be applied so that they support the same uses covered under the current classification structure. Changes to the surface water quality standards will affect many programs, including monitoring, permits, TMDLs, and the 303(d) list.

**Washington Department of Natural Resources**

The main goal of the WDNR is to maximize monetary returns from state lands in order to fund school construction. This type of management often reduces the habitat value for wildlife on WDNR lands. The WDNR also enforces and monitors logging practice regulations on private lands.

### Local Government

**Asotin County**

Asotin County has enacted strong policies and ordinances to provide for the preservation of local streams and their riparian areas. These local regulations will, in turn, aid in the preservation and restoration of fish populations. The following is an overview of local regulations.

Asotin County Shorelines Master Program (1994):

The Shorelines Master Program (Program) is responsible for protecting the classified Shorelines of Statewide Significance. Its paramount objectives are to protect and restore the valuable natural resources that shorelines represent and to plan for and foster all reasonable and appropriate uses that are dependant upon a waterfront location or that offer opportunities for the public to enjoy the states shorelines.

..The Program is based on specific goals and objectives directed towards specific land uses that are within 200 feet of the ordinary high water mark. The Program offers a cooperative balance by local and statewide interests in the management and development of the shoreline areas by requiring local governments to plan and regulate shoreline development. The program is essentially a shoreline comprehensive plan with a distinct environmental orientation applicable to shoreline areas and customized to local circumstances.

Asotin County Zoning Ordinance (April 2001):

Asotin County has three separate zones within the areas of the Asotin Creek subbasin: Ag-Transition, Rural Residential, and Agricultural. To minimize development impacts within the subbasin, Asotin County designated minimum lot sizes for each zone. The Ag-Transition zone, 5 percent of the watershed, has a minimum lot size of one acre. The Rural Residential zone, approximately 25 percent of the watershed, consists of a five 5-acre minimum lot size. The Agricultural zone, 70 percent of the watershed, is comprised of 40-acre minimums.

Flood Damage Prevention Ordinance (1988):

The intent of this ordinance is to restrict or prohibit uses which may be dangerous to health, safety, and property due to water or erosion hazards. The ordinance also is intended to control the alteration of the natural floodplain and stream channel, which would help keep the stream channel within the riparian areas. Filling, grading, and dredging within the floodplain are also addressed and monitored by Asotin County.

Critical Areas Ordinance (1988):

This ordinance is primarily an overlay of the above stated programs and ordinances in recognizing the sensitivity of the shorelines, floodplains, riparian areas, and wetlands, and minimizes the impacts from development.

**Asotin County Noxious Weed Board**

"The primary function of the Asotin County Noxious Weed Control Program is to provide technical assistance to the citizens of the county in developing effective control strategy's in dealing with their noxious weed problems and encourage people to be good land stewards."

*Performance Objectives*

1. Develop and maintain an accurate and comprehensive noxious weed inventory – with special emphasis toward locating and destroying new invading species.
2. Develop an effective educational program to be disseminated as required to schools and all user groups as necessary.
3. Weed control staff will strive to be current with the latest techniques in noxious weed control methods.
4. Weed control staff will maintain response to public need as the top priority.

5. Every effort will be made to facilitate landowners in achieving compliance with RCW 17.10.

Currently the County has a three-quarter-time position working on an important resource issue within the county. Getting everyone to understand and take responsibility for weed issues within the county and do their part to reduce the associated damages from the invasion of noxious weeds. Funding for the program is through local county tax revenues, either from a county general fund or by weed assessment. Since 1986, more than $100,000 from both state and county funds have been utilized for Yellowstar Thistle control measures.

#### Asotin County Conservation District

The ACCD is Asotin County's designated lead agency for watershed planning and implementation. The ACCD is responsible for the implementation and management of the *Asotin Creek Model Watershed Plan* and the Washington State Salmon Recovery Act within Asotin County. The primary function of the ACCD is to assist landowners and others who participate in making land use decisions. This takes the form of encouraging proper use and treatment of renewable resources and making available the necessary technical and financial assistance. ACCD also identifies resource conservation issues and provides opportunities for solving these issues. ACCD's goal is to maintain and improve the quality of the resource base, protect and improve the quality of the environment, provide planning and financial assistance to landowners and provide a comprehensive Information & Education (I&E) Program. ACCD's Mission: *"To advocate, educate and assist people in responsible land management and agricultural practices that conserve and improve air, soil and water quality and fish and wildlife habitat for present and future generations."*

The ACCD works with local landowners, growers, and others to enact voluntary agricultural and other BMP's on private lands and has "Memorandum of Understandings" (MOU's) with the Natural Resource Conservation Service (NRCS), Farm Service Agency (FSA), Asotin County Commissioners, U.S. Forest Service Pomeroy Ranger District and Department of Ecology (DOE). Other partners include local schools, landowners, citizens, Washington Conservation Commission (WCC), Washington Department of Fish & Wildlife (WDFW), Nez Perce Tribe, Nez Perce Salmon Corps, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. Without these partnerships completing prioritized habitat projects could not be accomplished.

#### **Idaho County**

With a land area of 8,503 square miles, Idaho County is larger than some Eastern states. Although over half of the county lies within the Clearwater subbasin, the southern and western portions of the county drain into the Salmon and Snake Rivers. The county seat is the town of Grangeville. Idaho County was established in 1864 by the First Idaho Territorial Legislature, with the county seat at Florence. In 1875 the county seat was moved to the town of Mount Idaho, and in 1902 to Grangeville.

#### **Nez Perce County**

Nez Perce County has a land area of 855 square miles with the county seat located at Lewiston at the confluence of the Clearwater and Snake Rivers. The county was established in 1864 by the Idaho Territorial Legislature, and named for the Nez Perce Indians. Nez Perce county was one

of the original four counties in Idaho in 1863 from which all 44 counties have been derived. The present boundaries of the county were set in 1911.

Nez Perce County government is composed of the following departments: auditor/recorder, commissioners, coroner, court services, district court, emergency management, general roads, juvenile detention, noxious weeds, planning/building, sheriff, veterans services, assessor, computer services, county services, DARE, elections, extension office, jail, maintenance, personnel, prosecuting attorney, and Treasurer.

#### Oregon Soil and Water Conservation Districts

The various soil and water conservation districts are responsible for protecting and promoting the natural resources within their boundaries. Soil and Water Conservation Districts within the Snake Hells Canyon subbasin include the Wallowa County SWCD. ORS 568.225 stipulates the need for conservation of renewable natural resources. ORS 568.210 to 568.808 and 569.900 to 568.933 authorize the SWCDs to participate in effectuating the policy set forth in ORS 568.225.

#### Wallowa County

County commissioners have established Comprehensive Plans for land use within Wallowa county. While this plan provides detailed information for the rest of the county strategies, it make no reference to the portion of the county within the Snake Hells Canyon subbasin .

##### Wallowa County Weed Control District

The mission of the Wallowa County Weed Control District is to "Work cooperatively to promote and implement noxious weed control in Wallowa County; to contain existing weed populations and eradicate new invaders; to raise the value of the land economically and biologically; to improve the health of the community, promote stewardship, preserve natural resources, and provide examples and leadership for other counties in effective vegetation management." The District is supervised by the Wallowa County Weed Board who's purpose is "to act as the advisory board to the Wallowa County Court on issues and decisions regarding the control of noxious weeds." Some of the actions conducted by the District include county weed inventory, reviewing yearly herbicide application records, prioritize weed control efforts, coordinating control efforts, seek funding for weed control efforts, road shoulder weed control, weed control education, and conduct an annual weed tour (Wallowa County Weed Control District Strategic Plan 1999).

### Other Entities and Organizations

#### The Nature Conservancy

The Nature Conservancy protects the lands and waters which plant and animals species need to survive. The conservancy is instrumental in purchasing lands for habitat protection, working with agencies with similar objectives, and has been involved in the Snake Hells Canyon subbasin . The Nature Conservancy owns and manages the Garden Creek Preserve in the Idaho portion of the subbasin.

#### 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.

## Existing Goals, Objectives, and Strategies

The Snake Hells Canyon 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 Snake Hells Canyon 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 Snake Hells Canyon subbasin .

### Federal Government

#### National Marine Fisheries Service and Federal Caucus

The goal of the NMFS with respect to the Snake Hells Canyon subbasin is to achieve the recovery of the salmon resource. This requires the development of watershed-wide properly functioning habitat conditions and a population level that is viable according to standards and criteria identified by NMFS in two key documents: Matrix of Pathways and Indicators (NMFS 1996); Viable Salmonid Populations (McElhany et al. 2000). Actions which contribute to these objectives include moisture retention on crop lands, development of riparian vegetation, restoration of streamflow and appropriate hydrologic peak flow conditions, passage improvements and screening, and many other activities. By virtue of Section 7 responsibilities, any federal action requires consultation with NMFS. The recovery planning framework and effort will build upon existing conservation measures and develop additional critical information useful to fish and wildlife managers.

The Basinwide Strategy for Salmon Recovery developed by the federal caucus (2000) identifies immediate and long-term actions in the hydropower, hatchery, harvest, and habitat arenas. Importantly for this summary, it commits federal assistance to local efforts in these areas and is quite specific to the Snake Hells Canyon subbasin . These goals are outlined below.

##### 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 of tributary and estuary habitat and water quality. Near-term (5- 10 year) objectives for tributary habitat within the Snake Hells Canyon 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 Snake Hells Canyon subbasin .

Action 1.1. USBR to implement actions in the Upper Snake Hells Canyon 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 Snake Hells Canyon 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 Snake Hells Canyon 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

- Conserve species. Avoid extinction and foster long-term survival and recovery of columbia basin salmon and steelhead and other aquatic species.
- Conserve ecosystems. Conserve the ecosystems upon which salmon and steelhead depend.
- 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.
- 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.
- 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.
- 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

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

#### Ecological Objectives

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

#### Water Quality Objective

- 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

- Select actions to restore and enhance fish and their habitat that achieve the biological and ecological objectives at the least cost.
- Mitigate for significant social and economic impacts and explore creative alternatives for achieving these objectives.
- Seek adequate funding and implementation for strategies and actions.
- Coordinate restoration efforts to avoid inefficiency and unnecessary costs.
- Restore salmon and steelhead to population levels that will support tribal and non-tribal harvest.
- Select actions that consider or take into account tribal socio-economic or cultural concerns.

#### Strategies for Habitat:

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

#### Strategies for Harvest:

- Fishery management: to manage fisheries in a manner that prevents overharvest and does not thwart recovery efforts.
- 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:

- Hatchery reform: reduce potentially harmful hatchery practices.
- 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.

### US Fish and Wildlife Service Goal for Anadromous Salmonids

The action agencies shall determine the presence of, and use by, bull trout in the mainstem Snake River, and shall implement monitoring and studies to provide critical information on bull trout distribution, timing, and usage of the Lower Snake River dams and reservoir system. If the information from these studies warrants consideration of additional modifications to facilities or operations, as determined by the Service in consultation with the action agencies, then the Service will work with the action agencies to implement these measures, as appropriate, or to

reinitiate consultation, if necessary. (This includes Bull Trout use in the Snake above the Clearwater River, although the document did not consider the Snake Hells Canyon subbasin in any detail).

Goal: Protect, restore, and enhance native anadromous and resident fish populations in the Snake River basin.

Objective 1. Reverse declining trends of bull trout populations in the Snake River basin.
- Strategy 1.1 Monitor population size and trends.
- Strategy 1.2 Determine bull trout distribution in the Snake River basin
- Strategy 1.3 Identify and implement habitat improvement projects.
- Strategy 1.4 Eradicate and control non-native char populations in the Snake River basin.
- Strategy 1.5 Evaluate bull trout populations for presence of pathogens

Objective 2. Increase natural production of anadromous salmonids to meet carrying capacities of the basin.
- Strategy 2.1 Determine the various anadromous salmonid carrying capacities for the Snake basin.
- Strategy 2.2 Evaluate supplementation efforts to rebuild fall chinook salmon populations in Snake River Basin.
- Strategy 2.3 Monitor spawning distribution of fall chinook salmon in the Snake River.
- Strategy 2.4 Monitor natural fall chinook salmon emergence and growth in the Snake River basin.
- Strategy 2.5 Evaluate natural fall chinook salmon juvenile emigration survival to Lower Granite Dam.
- Strategy 2.6 Determine if gravel recruitment or inter-gravel flow are limiting fall chinook salmon production.

Strategy 2.7 .. Develop a systematic plan for sampling wild, natural, and feral fish populations for pathogens that potentially would affect wild fish, attempts to restore stock, and hatchery fish released into the system.

USFS and BLM (PACFISH)

**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 (Table x)

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

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

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

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

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

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

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

General Riparian Area Management

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

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

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

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

Watershed and Habitat Restoration

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

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

Fisheries and Wildlife Restoration

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

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

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

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

#### 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).

### Tribal Government

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

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

Habitat Objectives (CRITFC 1995)

- Increase anadromous and resident fish populations through tribal, federal, and state coordinated supplementation, management, and habitat restoration.
- Restrict or eliminate land management activities such as logging, road builing, grazing, and mining that are harming the health of riparian ecosystems including water quality degradation, stream habitat degradation, loss of riparian vegetation, streambank destabilizaion, and altered hydrology.
- Improve water quality including reducing temperatures (for cold water biota T<60F), sedimentation, and agricultural runoff.
- Restore riparian ecosystems
- Restore in-stream habitat to natural conditions.
- Restore spawning and rearing habitat

Habitat Strategies

- Coordinate habitat protection and restoration as co-managers with federal, state, and local agencies.
- Develop watershed assessments to help prioritize restoration work, resource management, and planning efforts.
- Continue and implement projects designed to restore hillslope hydrology.
- Reduce sedimentation, cobble embeddedness, stream temperature to CRITFC water quality standards for streams supporting cold water biota.

- 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.
- Continue and implement projects to reduce grazing impacts on stream systems and riparian areas.
- Implement projects that investigate the impacts of invasive exotic plants and participate in coordinated control efforts.
- Implement projects to restore areas impacted by mining activity.
- Continue and implement projects to reduce road densities
- Inventory and evaluate natural and artificial passage barriers.
- Provide passage for aquatic species as a part of developing sustainable and productive aquatic ecosystems.
- Develop a monitoring and evaluation program to determine the extent and quality of habitat available to anadromous and resident fishes.
- Continue and expand monitoring to evaluate the success of restoration projects.
- Coordinate monitoring programs at the subbasin scale in order to facilitate data sharing.
- Use data from all monitoring and evaluation efforts to improve watershed-scale planning, decision-making, as well as refine management and restoration practices.
- Inventory riparian and wetland areas
- Acquire lands for improved habitat protection, restoration, and connectivity and for mitigation of lost fisheries/wildlife habitat

Management Objectives

- Restore and recover historically present fish species.
- Provide for harvestable, self-sustaining populations of anadromous and resident fish species in their native habitat.
- Manage salmon and steelhead for long-term population persistence.
- Manage aquatic resources for healthy ecosystem function and rich species biodiversity.
- Implement and enforce existing federal laws for protection of water quality, habitat and aquatic resources.
- Protect and enhance treaty fishing rights and fishing opportunities.
- Provide optimum tributary stream flows to meet life stage specific habitat requirements of resident and anadromous fish species and all other aquatic species.
- Provide optimum mainstem river flows for anadromous fish passage and water spill at mainstem dams to maximize fish survival.
- Integrate aquatic habitat and species management with terrestrial species management.
- Maintain a natural smolt-to-adult survival rate of 2 to 6% for salmon and steelhead.
- Meet federal fisheries mitigation responsibilities for LSRCP program.
- Provide for Tribal hatchery production needs in federal and state managed facilities.
- Address key limiting survival factors at mainstem hydroelectric facilities.
- 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.
- Develop conservation hatcheries for supplementation of ESA listed fish populations.

**Nez Perce Tribal Fisheries/Conservation Enforcement (from Vigg, 2000)**

*Goals:*

- Protect and enhance anadromous salmon & steelhead fishery resources.
- Protect and enhance sturgeon, resident fish, and wildlife resources.
- Protect and enhance fish and wildlife habitats, watersheds, and the entire natural ecosystem, as a whole.
- Protect Nez Perce cultural resources, including enforcement of ARPA and NAGPRA, Antiquities Act, and other related laws.
- Enhance the ability of tribal members to gather various natural products for traditional uses such as fuel, food, medicine, and for ceremonial purposes.
- Protect and ensure the safety of tribal members exercising Treaty Rights.
- Coordinate with tribal, state and federal enforcement entities and regional fish and wildlife managers to align NPT Fisheries/Conservation Enforcement with high priority resource protection needs.

*Objectives:*

- Provide enhanced enforcement of laws and rules for the protection of anadromous fish, wildlife, and their habitats--with an emphasis on depleted populations on the Nez Perce Reservation and ceded lands, including stocks listed under the Endangered Species Act.
- Improve cost-effectiveness of fisheries and habitat enforcement efforts via improved coordination with other Columbia Basin conservation enforcement and regulatory agencies through appropriate coordination mechanisms.
- Optimize voluntary compliance of laws and rules to protect Columbia Basin fishes and their critical habitats--via increased public involvement and deterrence of illegal activities.
- Maximize the annual and long-term efficacy of conservation enforcement efforts through the development of annual operation and 5-year strategic plans for Nez Perce fisheries, wildlife and critical habitat--within the framework of a comprehensive watershed and ecosystem management plan.
- Maximize the accountability of the enhanced conservation law enforcement program and achievement of results for the protection of fish & wildlife and their critical habitats via monitoring and evaluation (M&E) of the efficacy of the program in terms of qualitative and quantitative performance criteria.
- Enhance the prosecution success rate by increased levels of technical and legal support of state, tribal and federal prosecution processes relative to fisheries cases made as a result of the increased conservation enforcement within the Nez Perce Jurisdiction.

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

Anadromous Fish Management Goals

Idaho's overall anadromous fisheries goal is to recover wild Snake River salmon and steelhead populations and restore productive salmon and steelhead fisheries. Idaho believes long-term direction must improve in-river conditions enough to provide sustainable 2% to 6% smolt-to-adult survival to achieve recovery (Idaho's comments to NMFS on draft supplemental Biological Opinion for the FCRPS from Governor Batt, April 3, 1998, as included in Idaho Department of Fish and Game (1998). Specific goals and strategies of IDFG (Idaho Department of Fish and Game 2001), to meet the overall Idaho anadromous fisheries goal, are as follows.

Goal 1. Maintain genetic and life history diversity and integrity of both naturally-and hatchery-produced fish.

- Strategy 1.1. Prepare genetic management and conservation plans for wild salmon and steelhead populations using known genetic diversity and genetic structure data.
- Strategy 1.2. Maintain and establish wild production refugia for salmon and steelhead populations.
- Strategy 1.3. Minimize harvest impacts on protected naturally reproducing fish stocks through selective fisheries on marked fish and harvest regulations.
- Strategy 1.4. Establish facilities for captive culture of salmon and steelhead populations likely to become extirpated in the near-term future.
- Strategy 1.5. Monitor appropriate population parameters to assess population status, trends, and persistence.
- Strategy 1.6. Establish captive populations for stocks or populations likely to become extinct in the near-term future.
- Strategy 1.7. Preserve genetic diversity through gamete cryopreservation.

Goal 2. Rebuild naturally reproducing populations of anadromous fish to utilize existing and potential habitat at an optimal level.

- Strategy 2.1. Use appropriate and proven supplementation techniques to restore and rebuild populations outside of wild production refugia.
- Strategy 2.2. Achieve and maintain production level in wild populations at 70% of parr carrying capacity.
- Strategy 2.3. Minimize harvest impacts on protected naturally producing fish through selective fisheries on marked fish and harvest regulations.

Strategy 2.4. Continue selective sport fisheries, based on adipose fin-clips, to safeguard naturally produced fish while providing fishing opportunity for surplus hatchery fish.

Strategy 2.5. Implement proven hatchery intervention where necessary and ecologically prudent to provide a safety net for selected populations at risk.

Strategy 2.6. Balance genetic and demographic risks of unproven hatchery intervention strategies with risk of extinction.

Strategy 2.7. Implement proven nutrient fertilization programs where feasible in conjunction and coordination with on-going studies and coordinated with appropriate land management agencies.

Goal 3. Achieve equitable mitigation benefits for losses of anadromous fish to utilize existing and potential habitat at an optimal level.

Strategy 3.1. Improve survival associated with juvenile and adult migration through the federal hydroelectric system by strengthening the scientific foundation from which management alternatives are considered and assessed.

Strategy 3.2. Pursuant to the current configuration of federal dams and reservoirs, take more aggressive actions to address significant sources of direct and delayed discretionary mortality while providing risk assessment to judge effectiveness of actions within the context of environmental variability.

Strategy 3.3. Maintain current mitigation hatchery programs at design capacity to fulfill mitigation harvest objectives.

Strategy 3.4. Mark all hatchery harvest production to maximize harvest potential.

Strategy 3.5. Reduce potential ecological impacts of hatchery produced fish on wild fish.

Strategy 3.6. Produce fish that maintain optimum survival to adults through disease control, fish culture practices, and release strategies.

Goal 4. Improve overall life cycle survival sufficient for delisting and recovery by addressing key limiting factors identified in all "H;s" of hydropower, habitat, harvest, and hatchery effects.

Strategy 4.1. Safeguard naturally produced fish while providing fishing opportunity for surplus hatchery fish by externally marking hatchery production (e.g. adipose fin clip).

Strategy 4.2. Balance genetic and demographic risks of unproven hatchery intervention

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 4$^{th}$ 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.

Idaho Conservation Data Center (CDC).

The CDC works with federal, state, and private agencies and organizations to maintain high quality information on the conservation of biological diversity. CDC 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*

- Encourage and promote BMPs to reduce soil erosion, and enhance water quality
- Improve water quality on 303(d) listed streams
- Improve fish and wildlife habitat

*Objectives*

- Enhance education and information program
- Coordinate with NRCS and other state and federal agencies engaged in conservation

*Strategies*

- Encourage and provide assistance for conservation planning on private lands
- Encourage and provide assistance for riparian and upland BMP implementation
- Design and implement road treatments in cooperation with Idaho County Road Department
- 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.

### Washington Department of Fish and Wildlife

The WDFW recommends the following fish goals and objectives for the mid Snake River subbasin:

Goals:

1. Protect, restore, and enhance the abundance and distribution of wild summer steelhead, spring and fall chinook salmon, bull trout and other indigenous fish in the subbasin to provide non-consumptive fish benefits including cultural or ecological values.
2. Maintain, enhance or restore sustainable fishery and harvest opportunities for anadromous and resident fish.
3. Maintain or enhance genetic and other biological characteristics of naturally and hatchery produced anadromous and resident fish.

Objective 1. Increase native fall chinook salmon to sustainable and harvestable levels. Determine the wild escapement goal to meet this objective and assist with efforts to meet the LSRCP goal to return an average of 18,3000 hatchery produced fall chinook annually to the Snake River basin.

Objective 2. Increase native summer steelhead to sustainable and harvestable levels. Refine the wild fish escapement goal and needs. Meet the LSRCP mitigation goals for harvest and fishing opportunity.

Objective 3. Restore and maintain the health and diversity of bull trout and other resident salmonids to sustainable and harvestable levels. Determine the spawning escapement goal and population needs of resident fish.

Objective 5. Maintain LSRCP trout mitigation for resident trout and maintain or increase stream fishing opportunities for trout.

Strategy 1. Protect, enhance or restore the abundance and distribution of indigenous fish.

- Evaluate or refine methods to establish recovery goals, escapement goals and desired future conditions or other goals. Refine methods for determining carrying capacities for salmonids in streams within the basin to establish biologically sound restoration and target goals.
- Establish wild/natural fish goals for recovery, escapement, desired future condition and harvest implementation plans.
- Provide protection for federal and state threatened and sensitive fish species in resource management plans.
- Enforce federal, state, tribal and local land use regulations to protect fish habitats.
- Increase enforcement of laws and fishing regulations pertaining to illegal take of fish (all life stages).

Strategy 2. Protect, enhance or restore water quality to improve the survival, abundance and distribution of anadromous and resident fish

- Reduce stream temperatures by restoring or enhancing riparian vegetation, floodplain function and increasing hypothetic and instream flows.
- Increase water quality monitoring and enforcement of existing regulations to maintain or enhance water quality. Use the Clean Water Act, Section 401,

and the Washington Fish and Forests regulations to protect and restore water quality and fish habitat.

- Complete the Total Maximum Daily Load (TMDL) process and implement measures to remove streams from 303d listings under the Clean Water Act and improve water quality.
- Support timely updates and resource inventories related to local land use plans to prevent further development and degradation of floodplains, wetlands, riparian buffers and other sensitive areas.
- Properly maintain, relocate or eliminate forest, public and private roads in riparian or other sensitive areas.
- Implement the Conservation Reserve Enhancement Program (CREP), Continuous Conservation Reserve Program (CCRP), Wetland Reserve Program and other pertinent federal, state, tribal and local programs along riparian and other sensitive areas.
- Monitor and evaluate efforts to improve water quality and use the data to assist in management decisions.
- Use existing programs to reduce sediment delivery to stream channels from roads, agriculture, logging, and other land use activities.

Strategy 3. Protect, enhance and restore instream and riparian habitat to improve the survival, abundance and distribution of anadromous and resident fish.

- Enforce federal, state, tribal and local land use regulations to protect fish habitats.
- In the short term, plant native vegetation, construct pools and place woody debris in streams to increase channel complexity and provide pools and cover for fish.
- Over the long term, modify land use to improve stream sinuosity, channel stability, width/depth ratio, pool frequency, size and quality, and large woody debris recruitment in the stream to provide benefits to fish habitat quantity and quality.
- Reduce sediment deposition in area streams by reducing erosion and sediment delivery to waterways.
- Improve watershed conditions to reduce high water events and reduce instream substrate scour, deposition or movement.
- Improve floodplain function to improve stream channel stability, hypothetic flows and instream habitat diversity.
- Improve or eliminate stream fords and other substrate disturbances.
- Monitor and evaluate the quantity and quality of fish habitat in the basin to provide baseline information and to assess the success of management strategies.
- Monitor and evaluate efforts to protect, enhance and restore instream and riparian habitats and utilize the data to assist in management decisions.
- Identify, prioritize and protect critical habitat to improve production and survival of indigenous fish.

Strategy 4. Protect, enhance and restore instream flows to improve passage conditions and increase rearing habitat for anadromous and resident fish.

- Evaluate the location and timing of dewatered or flow limited stream reaches and prioritize them for instream water flow restoration and enhancement activities.
- Refine and/or determine flows needed for salmonid migration and rearing.
- Increase stream flows by improving the efficiency of irrigation systems and conversion of conserved water to instream flows.
- Increase stream flows by lease and/or purchase of water rights.
- Increase monitoring of water use and instream flows. Use collaborative efforts or enforcement of existing regulations and water rights to increase available instream water.
- Modify state water laws to allow water users to transfer water for instream use and to provide adequate protection downstream.
- Evaluate efforts to protect, enhance and restore instream flows

Strategy 5. Restore or enhance upstream or downstream passage for resident and anadromous fish.

- . Identify and evaluate passage or screening needs within the basin and prioritize implementation of restoration.
- . Modify or remove culverts, bridges, grade controls and water diversion structures as necessary to improve passage.
- . Implement screening of all diversions (pump and gravity) to meet State and NMFS criteria. Achieve compliance with state screening and passage laws.
- . Operate and maintain all fish passage facilities to ensure proper function and efficient passage of fish.
- . Monitor river conditions and operation of passage facilities to ensure adequate fish passage.

Strategy 6. Use artificial production, as necessary, to maintain, restore or enhance indigenous fish populations and harvest opportunities.

- . Evaluate the need for further hatchery supplementation or augmentation for bull trout, steelhead, spring chinook, resident trout, etc. Complete the artificial production Master Plan or HGMP for the subbasin before increasing hatchery production. Implement artificial production plans (Master Plan or HGMP).
- . Continue existing LSRCP hatchery production and releases for fall chinook and steelhead to restore endemic populations and/or to provide harvest opportunities.
- . Modify LSRCP production programs as needed to minimize their potential effects on wild salmonid populations and to address ESA concerns.
- . Evaluate acclimation benefits and costs for hatchery fall chinook. Complete long-term planning for the use of acclimation.

Strategy 7. Implement artificial production practices that minimize adverse effects on fish habitat and maintain the viability and stock characteristics of hatchery fish.

- . Monitor hatchery facility discharges to ensure they are within NPDES permit requirements.
- . Use IHOT genetics guidelines for broodstock selection, mating and rearing.
- . Monitor the health and disease status of hatchery fish.

Strategy 8. Monitor and evaluate hatchery programs to ensure they are successful and minimize adverse effects on listed or other indigenous species.

- . Continue to monitor and evaluate the performance of the LSRCP spring chinook supplementation program.
- . Continue to monitor and evaluate the LSRCP captive brood program for spring chinook salmon.
- . Continue to monitor and evaluate the performance of the LSRCP steelhead program.
- . Continue to monitor and evaluate the recreational and tribal fisheries in the basin and the contribution by hatchery programs.
- . Conduct baseline genetic monitoring and evaluation of hatchery populations in the subbasin.

Strategy 9. Maintain or enhance fishery and harvest opportunities for anadromous and resident salmonids.

- Maintain the congressionally mandated Lower Snake River Compensation Plan (LSRCP) harvest mitigation for steelhead, fall chinook and resident trout in Washington.
- Continue hatchery production and releases of steelhead from Lyons Ferry Hatchery to provide harvest and recreational fishing opportunities and meet mitigation goals.
- Modify LSRCP production programs as needed to minimize their potential effects on wild salmonid populations. Continue to manage steelhead sport fisheries to maximize recreational opportunity within the basin through consumptive and non-consumptive fisheries, while protecting wild populations through regulations and sanctuary area closures.
- Continue hatchery production and releases of rainbow trout in area ponds and lakes to provide harvest and recreational fishing opportunities to provide mitigation for lost fishing opportunities.
- Monitor the hatchery programs to ensure they are successful and that they have minimal effects on indigenous species.
- Monitor and assess the effects of fishing seasons on the survival of indigenous species.

Strategy 10. Maintain warmwater or other fisheries as appropriate without conflicting with indigenous fish needs.

- . Assess distribution, abundance and biological characteristics of nonindigenous fish within the basin.

- . Evaluate non-indigenous fisheries.
- . Develop a fishery management plan for non-indigenous fish.
- . Monitor the fishery and adjust the plan, regulations, etc. as necessary.

Strategy 11. Monitor and evaluate the productivity, abundance, distribution, and genetic and other biological characteristics of indigenous anadromous and resident fish to provide baseline data and to assess the success of management strategies.
- Conduct redd and carcass surveys to monitor and determine adult salmonid spawning escapements.
- Evaluate the need for additional trapping or counting facilities.
- . Conduct biological surveys to monitor and evaluate juvenile anadromous and resident fish distribution, abundance, condition, habitat use, life history, etc.
- Continue baseline genetic and biological monitoring and evaluation of indigenous salmonid populations in the subbasin.

Strategy 12. Improve out-of-basin survival of migratory fish.
- Support efforts to improve passage and survival of migrant fish downstream of the subbasin.
- Support research within the Columbia River basin to fully understand the role of native and introduced predators on indigenous fish.
- Conduct monitoring of migratory fish to determine survival rates, timing and distribution outside the basin.

#### 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 Mid-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 preceeding 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: Monitoor 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 inmigratory 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 Steelhead Plan

The first goal of Oregon's Steelhead Plan is to sustain healthy and abundant wild populations of steelhead. The following objectives will be used to achieve this goal:

Objective 1. Protect and restore spawning and rearing habitat.
Objective 2. Provide safe migration corridors .
Objective 3. Protect wild populations of steelhead from overharvest.
Objective 4. Protect wild populations of steelhead from detrimental interactions with hatchery fish .

Objective 5. Monitor the status of wild steelhead populations so that long-term trends in populations can be determined.

The second goal of Oregon's Steelhead Plan is to provide recreational, economic, cultural and aesthetic benefits from fishing and non-fishing uses of steelhead. The following objectives will be used to achieve this goal:

Objective 6. Provide for harvest by Treaty Tribes without overharvesting wild fish.
Objective 7. Provide recreational angling opportunities reflecting the desires of the public while minimizing impacts on wild fish.
Objective 8. Increase non-angling uses of steelhead that provide recreation.

The third goal of Oregon's Steelhead Plan is to involve the public in steelhead management and coordinate ODFW actions with Tribes and other agencies. The following objectives will be used to achieve this goal:

Objective 9. Increase awareness of issues facing steelhead management and ODFW's management programs.
Objective 10. Provide a forum for public input on steelhead management.
Objective 11. Coordinate ODFW steelhead management activities with other habitat and fisheries managers.

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.

### Tribal and State

Snake River Subbasin Goals (from WDFW et al. 1990)

**Habitat Protection Objectives and Strategies**

1. Restore stocks of fish historically produced in the Snake River mainstem
2. Achieve optimum fish production from existing habitat
3. Contribute to Northwest Power Planning Council's doubling goal
4. Restore historic fisheries (tribal and non-tribal) within subbasin

5. Contribute to Columbia River and ocean tribal and non-tribal fisheries
6. Protect indigenous genetic resources of salmonid stocks
7. Comport with tribal treaty-reserved rights to fish
8. Comport with Pacific Salmon Treaty and *United States vs. Oregon* production agreements, the Lower Snake River Compensation Plan, and with other applicable laws and regulations
9. Prevent further loss of habitat and enhance existing habitat
10. Provide improved passage conditions for migration, spawning and rearing habitat in the mainstem
11. Establish minimum streamflow for migrations, spawning and rearing in the mainstem
12. Protect riparian zones from degradation by domestic livestock, forestry and agricultural practices, and by urban, and commercial development
13. Protect fish habitat from point and non-point source pollution, including sediments

Strategies

1. Implement measures in Section 403 of the Columbia River Fish and Wildlife Program, and construct adequate fish bypass screens at Lower Monumental and Ice Harbor Dams
2. Reviw and develop data and criteria for minimum flow requirements in mainstem Snake
3. Develop a riparian protection plan. A more comprehensive, subbasin-wide, riparian protection strategy is needed. This strategy should be a joint effort of all local, county, state, tribal and federal government units in the subbasin. This should included a subbasin-wide erosion and sediment-control strategy
4. Identify potential impacts of mainstem dredging operations and develop guidelines for disposal of dredge spoils

### County Government

Asotin County Conservation District

The indigenous salmonid fish species most actively targeted for management in the Asotin County watersheds are spring chinook salmon, bull trout, and summer steelhead. Only steelhead are known to exist in the Asotin County portion of the Snake Hells Canyon subbasin (excluding Asotin Creek, which is covered in a separate summary document). The goal for these species is to restore sustainable, naturally producing populations to support tribal and non-tribal harvest and cultural and economic practices while protecting the biological integrity and genetic diversity of these species in the watersheds where they are found.

Objective 1. Reduce pre-spawner adult mortality.

Strategies:

1. Implement riparian planting projects for long-term LWD recruitment and shade.
2. Increase habitat complexity by adding LWD into in-stream projects.
3. Increase pool quantity and quality, decrease width/depth ratio by in-stream structures, and long-term natural floodplain and channel restoration.
4. Increase sinuosity to return river to natural form.

Objective 2. Increase incubation success.

Strategies:

1. Continue upland cost-share for sediment reduction projects.
2. Construct in-stream structures designed to scour and sort spawning gravels.
3. Implement riparian plantings for streambank stabilization and LWD recruitment.
4. Design riparian management plans for alternative water and fencing projects.

5. Increase sinuosity to return river to natural form.

Objective 3. Increase juvenile salmonid survival.

Strategies:

1. Implement in-stream habitat restoration according to sound fluvial geomorphic principals.
2. Increase pools w/LWD to improve over-winter survival of juveniles.
3. Decrease width and increase stream depth.
4. Identify cool water refugia and protect and restore in-stream and riparian habitat.
5. Construct off-channel rearing areas from springs and add LWD component for habitat complexity.
6. Implement riparian plantings for shade, cover, and LWD recruitment.
7. Design riparian management plans with fencing and off-site watering.
8. Increase sinuosity to return river to natural form.

### Nez Perce Soil and Water Conservation District

(From the Nez Perce SWCD Resource Conservation Plan 2001)

*Goals*

- Develop watershed based resource plans for watersheds within the NPSWCD boundaries.
- Cooperate and coordinate in developing watershed plans for watersheds located within multiple conservation districts.
- Implement BMPs identified in the watershed plans on all land uses.
- Coordinate technical/financial resources for the implementation of BMPs on private lands.
- Reduce erosion and improve water quality and fisheries habitat on cropland, forestland, and rangeland resources.
- Assist landowners, communities, and tribes in meeting state, local, and federal regulations including the Clean Water Act, Endangered Species Act, and NEPA regulations.
- Improve the condition fisheries habitat including riparian and wetland areas.
- Improve grazing land and cropland productivity.
- Establish fish and wildlife habitat, water quality and resource condition monitoring programs.
- Develop and promote public awareness programs to promote good stewardship.

*Objectives*

- Develop one watershed based resource plan annually.
- Conduct one meeting annually to coordinate watershed efforts and technical/financial resources for BMP implementation with local stakeholders.
- Implement 50% of the identified BMPs to improve priority fish habitats within 10 years.
- Reduce erosion and identified pollutants by 60% in identified priority areas within 10 years.
- By 2010, water quality will be improved to meet TMDL standards in identified watersheds.
- By 2010, improve riparian and wetland areas to proper functioning condition.
- By 2015, improve rangeland condition from “fair” to “good”.
- By 2015, reduce cropland and urban erosion to “T”.
- By 2005, complete 25% of the identified animal feeding operation improvements.
- By 2005, 50% of the streams within the District will be monitored for stream temperature.

- By 2005, develop volunteer-based stream assessment or improvement projects on 5 streams.
- By 2005, implement water quality/fisheries habitat education program targeting the urban public.

*Strategies*

- Assess watershed conditions and identify priority areas for treatment.
- Monitor resource conditions and implement additional monitoring sites with landowners.
- Install BMPs to improve water quality and fisheries habitat on cropland, rangeland, forestland, and urban resources including roads and stormwater sources.
- Identify priority fish habitat enhancement/restoration or protection areas and implement identified BMPs.
- Inventory, assess and install BMPs on riparian and wetland areas.
- Identify priority erosion control and water quality improvement areas.
- Conduct on-site investigations, feasibility analysis and complete designs for identified BMPs. Inventory, plan and develop alternatives, and develop BMPs for private landowners, units of government, and local interest groups for problems identified in watershed plans.
- Identify and obtain commitments from volunteer groups to implement stream monitoring or improvement projects.
- Protect and restore freshwater habitats for key species. Restore and increase the connections between rivers and their floodplains and riparian zones.
- Coordinate with local conservation partners to implement public awareness/education campaign.

### 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 Snake Hells Canyon 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.

## Research, Monitoring, and Evaluation Activities

Research, monitoring, and evaluation activities within the Snake Hells Canyon subbasin that compliment fish and wildlife projects are provided in Table 14 and Table 15.

Table 14. BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities

| **Completed Monitoring and Evaluation Projects** | BPA # | Sponsor | Duration |
|---|---|---|---|
| Upstream Passage, Spawning, and Stock Identification of Fall Chinook in the Snake River, 1991 through 1993 | 199204600 | WDFW | 1991-93 |
| Vegetation Description, Rare Plant Inventory, and Vegetation Monitoring for Craig Mountain Idaho | 199206900 | IDFG | 1993 |
| Wildlife Inventory, Craig Mountain, Idaho | 199206900 | IDFG | 1993-94 |
| Forest Inventory—Peter T. Johnson Wildlife Mitigation Unit—Craig Mountain Idaho | 199206900 | IDFG | 1993-94 |
| Spawning Distribution of Fall Chinook Salmon in the Snake River | 199801003 | USFWS | 1998-2000 |
| | | | |
| Ongoing Monitoring and Evaluation Projects | BPA # | Sponsor | Duration |
| Monitoring and Evaluation Of Yearling Snake River Fall Chinook Released Upstream Of Lower Granite Dam | 199801004 | NPT | 1998-present |
| Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin | 199700900 | NPT | 1997 to present |
| Idaho Natural Production Monitoring and Evaluation | 199107300 | IDFG | 1984 to present |
| Dworshak Wildlife Mitigation Trust | *9205700* | IDFG | 1992 to present |
| | | | |

*Idaho Natural Production Monitoring and Evaluation* (BPA No. 199107300). This is an ongoing project to monitor trends in spring/summer chinook salmon and steelhead trout populations in the Salmon, Clearwater and lower Snake River drainages. Project goals include establishing a long-term parr monitoring database, estimating adult escapement in key tributaries, evaluating egg-to-parr survival in streams treated with habitat improvement structures, monitoring stock-recruitment trends, and estimating smolt-to-adult survival (Jody Brostrom, IDFG, Personal Communication, May 14, 2001).

*Dworshak Wildlife Mitigation Trust (BPA No. 9205700)* The 78,679 acre Craig Mountain Wildlife Management Area (CMWMA) is located south of Lewiston, Idaho, just north and east of the confluence of the Snake and Salmon rivers. The 60,000 acre Peter T. Johnson Wildlife Mitigation Unit was purchased by Bonneville Power Administration (BPA) under terms of the 1992 Dworshak Dam Wildlife Mitigation Agreement among BPA, the State of Idaho, and the Nez Perce Tribe. Because of its size and elevational ranges the CMWMA provides a unique laboratory to study and manage wildlife and habitats on an ecosystem basis.

From 1992 to 1994, IDFG and other entities conducted an exhaustive and unprecedented survey of baseline wildlife and wildlife habitat conditions on the CMWMA. Surveys included rare plants, various habitat types, timber volumes, sensitive wildlife species, target wildlife species, wildlife communities, big game aerial surveys, undesirable plants (noxious weeds), amphibians and reptiles, aquatic macroinvertebrates and physical structures. All data has been or is currently being entered into the IDFG Geographic Information System (GIS). Cultural resource surveys have been conducted in areas where ground-breaking activities have taken place.

Management of the CMWMA is directed at restoring habitats impacted by past logging and grazing activities, providing biologically diverse plant and wildlife communities, and providing for opportunities for wildlife-associated recreation and solitude. Target species of wildlife specifically identified include elk, white-tailed deer, river otter, pileated woodpecker, yellow warbler, and black-capped chickadee. A-run steelhead and spring and fall chinook occur in the major streams on the CMWMA and in the Snake and Salmon mainstems. Special management direction is provided to protect and provide habitat for these species. Under the 1992 Dworshak Wildlife Mitigation Agreement, IDFG is responsible for monitoring and evaluating the effect of management activities on wildlife and wildlife habitat on the Peter T. Johnson Wildlife Mitigation Unit (Jody Brostrom, IDFG, Personal Communication, May 14, 2001).

Table 15. Non BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities

| Project | Funding/Lead Agency | Status |
|---|---|---|
| Hells Canyon Initiative | Multiple/IDFG | ongoing |
| Creel census of steelhead trout sport fisheries are conducted during open seasons for each. The results of the surveys include estimated angler participation (hours fished) and harvest. Harvest can be cataloged by specific hatchery contribution (marked fish only). Angler use and harvest vary from year to year. | IDFG, LSRCP/WDFW | 1982-Present |
| | | |

## Statement of Fish and Wildlife Needs

### 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 fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These M&E activities are critical to evaluating the effectiveness of projects in improving habitat, watershed health and enhancing production of target species.
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 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.
10. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
11. 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

#### General

1. Continue ongoing mitigation programs to provide sport and tribal fisheries.
2. Ensure natural river strategy alternative is implemented as required for recovery of listed anadromous species.
3. Improve and maintain quality control of fish marking programs.

#### Water Quality

1. Continue coordinated temperature monitoring throughout the subbasin. Identify spatial and temporal gaps, establish additional flow and temperature gauging stations and upgrade existing ones to provide real-time data, and expand longitudinal profiles. Fish distribution and habitat quality are highly influenced by water temperature. This parameter most be

monitored in both wilderness and managed watersheds to provide baselines to evaluate population recovery and watershed restoration activities.
2. Reduce stream temperature, sediment and embeddedness to levels meeting appropriate standards for supporting self-sustaining populations of aquatic species. This is the core of the objectives of the TMDL process.
3. Restore and augment streamflows at critical times using (but not limited to) water right leases, transfers, or purchases, and improved irrigation efficiency.
4. Reduce impacts from agriculatural sediment, fertilizer, pesticide loading, confined animal operations, stormwater and road runoff and wastewater effluent.

#### Habitat / Passage

1. Protect and restore riparian and instream habitat structure, form and function to provide suitable holding, spawning and rearing areas for anadromous and resident fish.
2. Protect, restore and create riparian, wetland, and floodplain areas within the subbasin and establish connectivity.
3. Investigate connectivity between populations and the role of natural and artificial barriers in population isolation.

##### Aquatic Habitat Enhancement

1. Replace or remove culverts based on past or ongoing assessments.
2. 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 when feasible
   - Reduce sediment, fertilizer and pesticide loading from agricultural practices
   - 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 where they are defined or can be shown to be a potential problem

#### Genetic Conservation

1. Continue gene conservation efforts (cryopreservation) for fall chinook salmon and steelhead in the subbasin.
2. Develop gene conservation efforts (cryopreservation) to preserve genetic diversity within the geographic population structure for bull trout and cutthroat trout.

#### Hatchery-Wild Interactions

1. Continue and expand investigations of interactions between hatchery and wild chinook, steelhead, and resident fish.
2. Quantify the types and extent (amount) of straying by chinook and steelhead occurring within subbasins, within the Blue Mountain Province, and within designated ESU's.

3. Complete a province-wide chinook salmon genetic assessment which will provide a baseline for monitoring hactchery introgression into wild populations.
4. Continue and expand genetic profiling to define steelhead sub-populations within the subbasin to determine geographic structure, gene flow, genetic similarity and hatchery introgression into wild populations.
5. 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 that have received little attention to date. In particular, westslope cutthroat trout, bull trout, sand roller and Pacific lamprey appear to be well below historic population levels. Collect life history, distribution, abundance by life stage, genetic and homing behavior attributes.
2. Determine habitat requirements, distribution, and limiting factors of sand roller.
3. Monitor impacts of illegal, incidental, sport and tribal harvest on resident native populations.
4. 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 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.

#### Redband Trout

1. Investigate the existence, life history, genetics of redband trout in the subbasin. Include populations in allopatry and sympatry with steelhead, identifying genetic and spatial segregation and overlap using current DNA-marker and GIS technology.

#### Pacific Lamprey

1. Conduct a presence/absence surveys to determine if lampetra (spp.) occur in the subbasin.
2. Depending on survey results, develop and implement a plan to
    - Determine habitat requirements and limiting factors for Pacific lamprey production in the subbasin
    - Assess the rehabilitation potential of Pacific lamprey in the subbasin
    - Assess the rehabilitation process for Pacific lamprey in the subbasin.

#### Chinook Salmon (Includes all races unless specifically noted)

1. Gather improved population status information for wild, natural and hatchery chinook salmon including life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. A mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program within Idaho.

2. Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
3. Monitor spring chinook by examining population trends and develop modeling and monitoring tools to determine out-of-basin impacts to Middle Snake chinook
4. Continue evaluating reintroduction efforts for fall chinook salmon.
5. Complete genetic profiling within the subbasin to determine population structure, gene flow and genetic similarity to support integration of hatchery recovery/conservation and harvest augmentation goals.
6. Continue natural production monitoring (i.e. returns per spawner) in order to gauge improvements resulting from hatchery programs, habitat improvements, and smolt passage facilities at Columbia River dams. Look for ways to better integrate existing chinook monitoring with basin research projects.
7. Continue LSRCP hatchery monitoring and evaluation to determine hatchery reared chinook performance and spawning ground surveys and provide for applied adaptive management.
8. Continue and enhance gene conservation efforts through expansion of the germplasm repository.
9. Continue gene conservation efforts (cryopreservation) for spring and summer chinook salmon in the subbasin.
10. Quantify mortality rates and straying of adult chinook salmon from Lower Granite Dam to natural production areas.
11. Complete NEOH planning and implementation of facility needs in the Snake Hells Canyon subbasin to meet production changes resulting from ESA listings and to meet subbasin goals.
12. Externally mark all hatchery fish to facilitate determination of run composition at Lower Granite Dam and determination of hatchery and wild escapements and progress towards NMFS recovery standards.

#### Summer Steelhead

1. Complete genetic profiling within the subbasin to determine population structure, gene flow and genetic similarity to support integration of hatchery recovery/conservation and harvest augmentation goals.
2. Continue Natural Production Monitoring through the implementation of the following:
   - Collect population status information for wild steelhead including adult spawner abundance, spawner to spawner ratios, spawning locations, and spawning timing
   - Validate index areas for summer steelhead to ensure they are appropriate measures of productivity
   - Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams. Consider alternative approaches to assessing population status
   - Continue and expand efforts to quantify juvenile abundance and smolt-to-adult return rates (SAR) of wild/natural and hatchery reared steelhead within the subbasin through the Smolt Monitoring Project Studies
   - Monitor adult movement to determine if and where passage impediments exist within the basin for summer steelhead
   - Investigate distribution and abundance of redds, diversity of life history traits, and genetic composition of wild steelhead

3. Continue gene conservation efforts (cryopreservation) for steelhead to preserve genetic diversity within the subbasin.
4. Redevelop hatchery broodstock as necessary to meet hatchery conservation and harvest augmentation goals.
5. Determine anadromous/resident life history relationship for O. mykiss.
6. Continue and expand monitoring of hatchery supplementation and interactions with natural fish.
7. Gather improved wild, natural, and hatchery A-run and B-run steelhead population status information including tributary specific life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. A mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program within Idaho.
8. Determine the efficacy of using dorsal fin erosion to identify un-marked hatchery steelhead.
9. Evaluate the effects of hooking mortality on wild steelhead in the Snake River.

#### Monitoring, Evaluation and Assessment

1. Develop appropriate intensity and spatial distribution of monitoring to estimate parr carrying capacity to compliment and enhance Natural Production Monitoring.
2. Refine aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts.
3. Continue Nez Perce Tribal Hatchery Monitoring and Evaluation to determine hatchery chinook performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
4. Continue Lower Snake River Compensation Hatchery Monitoring and Evaluation to determine hatchery chinook and steelhead performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
5. Establish or continue monitoring and evaluation efforts for all new or existing projects (respectively). Efforts should be consistent and repeatable between entities and coordinated at a subbasin scale so as to maximize effectiveness and minimize redundancy.
6. Continue to develop and update watershed assessments at multiple scales (i.e. transect, reach, watershed) to facilitate integrated resource management and planning efforts. Ensure that databases used for the development of assessments are sufficiently maintained and available to relevant entities.
7. Establish a centralized data repository.
8. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal and local entities.
9. Continue coordinated temperature monitoring throughout the subbasin
10. Periodically conduct longitudinal temperature profiles (such as FLIR) to better monitor temperature changes, while conducting long-term annual monitoring at point sites.
11. 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
12. Continue WDFW monitoring of LSRCP fall chinook releases and returns and evaluate direct stream releases vs acclimated releases.

13. Develop monitoring, evaluation and coordination of the Idaho Power Co. fall chinook mitigation program and returns to the subbasin. Evaluate direct stream releases and the potential need for acclimation.

### 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. 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.
2. Research broad ecological relationships and identify limiting factors for focal and other wildlife species within the subbasin.
3. 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.
4. Address and mitigate hydropower impacts on loss of wildlife and wildlife habitat within the basin, based on species-specific habitat units.
5. Continue long-term landbird monitoring.
6. Assess predator impacts on big game and gain insight into predator/prey dynamics.
7. Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
8. 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).
9. Implement and (where applicable) continue noxious weed control programs.
10. Assist landowners with land holdings and easements for restoration and enhancement of wildlife habitat.
11. Mitigate hydropower impacts on loss of wildlife and wildlife habitats, including indirect impacts caused by the introduction of cheap power and water to the subbasin.
12. Participate in threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
13. Monitor use of existing reference areas to assure consistency with the maintenance of ecologic values.
14. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.

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

#### Ponderosa pine communities

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.
2. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine communities and for mitigation of lost wildlife habitat for ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
3. Work with landowners and managers to restore ponderosa pine communities
4. Create and maintain large diameter snags in ponderosa pine communities.
5. Participate in a cooperative stewardship program to foster ponderosa pine protection.
6. Prepare a conservation plan for the protection of ponderosa pine-dominated old growth forest.

#### Whitebark pine communities

1. Inventory and map the distribution of whitebark pine communities within the subbasin.
2. Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands of the subbasin.

#### Native prairie and grassland ecosystems

1. Inventory and map the distribution of canyon grasslands within the subbasin.
2. Prepare a plan for the conservation of high quality, representative stands of native prairie and canyon grassland within the subbasin.
3. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for native prairie ecosystems and for mitigation of lost wildlife habitat for native prairie ecosystem associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
4. Work with landowners and managers to restore native prairie ecosystems
5. Support native plant nurseries and seedbanks
6. Support continued restoration of native prairie flora (i.e. sharp-tail grouse) and fauna (Spalding's catch fly).

#### Classified Wetlands

1. Continue wetland inventory in watersheds throughout the subbasin.
2. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for classified wetlands and for mitigation of lost wildlife habitat for classified wetland associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
3. Protect, restore and create wetland and riparian habitat particularly in lower elevation riparian areas.
4. Participate in a cooperative stewardship program to foster classified wetland community protection.

#### 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.

#### Loss of legacy resources

1. Work with landowners and managers to retain late successional habitats on state, and private lands (land exchanges, conservation easements).
2. Develop and implement active management prescriptions to restore and promote late successional habitats.
3. Develop an information and education stewardship program to foster late seral community protection

#### 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.

#### Site specific needs

Additonal needs for specific tributaries or reaches have been identified by individual agencies. Refer to Asotin Creek subbasin summary (*in preparation*) for a more in depth discussion of:

##### Ten Mile Creek

- Need riparian revegetation to reduce stream temperatures (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need projects to improve steelhead habitat (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need implementation of upland BMPs to control erosion (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)

##### Couse Creek

- Need riparian revegetation to reduce stream temperatures (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)

- Need projects to improve steelhead habitat (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need implementation of upland BMPs to control erosion (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)

Project: 27010 – Snake River Hells Canyon Tributary Enhancements

**Sponsor: Idaho Department of Fish and Game**
**Short Description**

**Protect and enhance important aquatic and terrestrial habitats in Snake River tributaries in the Idaho portion of the Snake Hells Canyon subbasin.**

**Abbreviated Abstract**

Protect and enhance aquatic and terrestrial habitats in key tributaries to the Snake River in Idaho, through the acquisition of conservation easements, fee-title, land trades, or long-term agreements. Specific area includes from Granite Creek (below Hells Canyon Dam) to Tammany Creek (south of the city of Lewiston, Idaho) (Figure 1.) First year activities will include the development of a landscape level plan for the study area, including a prioritized list of actions. Restoration actions will improve water quality, enhance riparian and native grassland habitats, and benefit steelhead trout, spring chinook salmon, bull trout, bighorn sheep, mountain quail, and a variety of other fish and wildlife species in the Snake Hells Canyon subbasin.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 92205700 | Craig Mountain Wildlife Mitigation Project | Implementation of proposed project will complement on-going wildlife mitigation/restoration activities on Craig Mountain. |
| 9107300 | Idaho Natural Production Monitoring and Evaluation | On-going project to monitor trends in spring/summer chinook salmon and steelhead trout populations in the Salmon, Clearwater, and lower Snake River drainages. Has quantified the benefits in parr carrying capacity observed from habitat enhancements. |

**Relationship to Existing Goals, Objectives and Strategies**

**Review Comments**

This project addresses 400. Reviewers indicate that there are watershed assessments completed for some of the areas. Although an objective/strategy exists for FY02, there is a lack of specific details regarding implementation. In addition, the objectives are not clearly stated for the out-years. The reviewers note that the proposal was insufficient, but believe the concept is a recommended action.

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $101,000<br>Category: Recommended Action<br>Comments: | $906,000<br>Category: Recommended Action | $1,041,000<br>Category: Recommended Action |

## Project: 27015 – Develop Long-Term Management Plan for Snake River (Hells Canyon Reach) White Sturgeon

**Sponsor:** Idaho Department of Fish and Game and IOSC

**Short Description**

The project will cooperate with the Idaho Power Company and the Nez Perce Tribe to develop a long-term management plan for white sturgeon in the Hells Canyon reach of the Snake River.

**Abbreviated Abstract**

The white sturgeon *Acipenser tansmontanus* is a species critically affected by hydroelectric development. Because of the declining status of many sturgeon populations, catch and release angling has become an integral part of current fisheries management activities directed at sustaining or recovering populations of these fish in Idaho. Since the institution of catch and release in 1970, a number of studies have documented positive responses in population abundance in the Bliss (rm 494-560) and Hells Canyon (rm 137-250) reaches of the Snake River. In FY2002, Idaho Power Company will be developing a white sturgeon conservation plan as part of the relicensing effort for the Hells Canyon complex hydroelectric facilities. In addition, the Nez Perce Tribe will be developing a final completion report and associated management plan for their multi-year investigations of white sturgeon in the Hells Canyon reach of the Snake River. The Idaho Department of Fish and Game is a cooperator in both of these projects and, as Idaho's fish and wildlife management authority, will be an instrumental partner in the development of both of these documents. The development of a reliable population simulation model will greatly aid managers in looking at responses of this sturgeon population under various management regulations, without adversely impacting populations. This project is relevant to the resident fish goal and sturgeon mitigation as described in Section 10 of the FWP. Results from this project will enable fisheries managers to make more knowledgeable decisions for sustaining or recovering populations of white sturgeon and provide a long-term management plan to benefit all users of the resource.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 9700900 | Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin | Cooperatively develop long-term management plan with Nez Perce Tribe and in coordination with Idaho Power Company. |

**Relationship to Existing Goals, Objectives and Strategies**

**Review Comments**

Because the reviewers are unfamiliar with the model and the fact that there were no responses to the ISRP, the reviewers question whether the model is valid/appropriate for the plan. This work needs to be coordinated with ODFW and the NPT.

The RFC suggests the proposed work could complement management actions and should be performed jointly with Project 199700900 (potential cost savings).

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $116,500<br>Category: Recommended Action<br>Comments: | $45,000<br>Category: Recommended Action | $<br>Category: |

**Actions by Others**

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Project: 27016 – Evaluate the effects of hyporheic discharge on egg pocket water termperature in the Snake River fall Chinook salmon spawning areas

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**Sponsor:** Pacific Northwest National Laboratory

**Short Description**

Evaluate the relationships among river discharge, hyporheic zone characteristics, and egg pocket water temperature in Snake River fall chinook salmon spawning areas; evaluate the potential for improving Snake River fall chinook salmon smolt survival

**Abbreviated Abstract**

The development of the Snake River hydroelectric system has affected fall chinook salmon smolts by shifting their migration timing to a period (mid- to late-summer) when downstream reservoir conditions are unfavorable for survival. Subsequent to the Snake River chinook salmon fall-run Evolutionary Significant Unit being listed as Threatened under the Endangered Species Act, recovery planning has included changes in hydrosystem operations (e.g., summer flow augmentation) to improve water temperature and flow conditions during the juvenile chinook salmon summer migration period. In light of the limited water supplies from Dworshak reservoir for summer flow augmentation, and the associated uncertainties regarding benefits to migrating fall chinook salmon smolts, additional approaches for improved smolt survival need to be evaluated. The research to be conducted under this proposal will evaluate the relationships among river discharge, hyporheic zone characteristics, and egg pocket water temperature in Snake River fall chinook salmon spawning areas. The overall objective of this project is to evaluate the potential for improving juvenile Snake River fall chinook salmon survival by modifying the discharge operations of Hells Canyon Dam. The potential for improved survival would be gained by increasing the rate at which early life history events proceed (i.e., incubation and emergence), thereby allowing smolts to migrate through downstream reservoirs during early- to mid-summer when river conditions are more favorable for survival.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 199102900 | Understanding the effects of | Collaborative effort to estimate survival |

| Project ID | Title | Nature of Relationship |
|---|---|---|
| | summer flow augmentation on the migratory behavior and survival of fall Chinook salmon migrating through Lower Granite Reservoir | of wild fall Chinook salmon in the Snake River. Data and Information sharing. |

**Relationship to Existing Goals, Objectives and Strategies**

**Review Comments**

The overall objective of this project is to evaluate the potential for improving juvenile Snake River fall chinook salmon survival by modifying the discharge operations of Hells Canyon Dam. The potential for improved survival would be gained by increasing the rate at which early life history events proceed (i.e., incubation and emergence), thereby allowing smolts to migrate through downstream reservoirs during early- to mid-summer when river conditions are more favorable for survival. This proposal is in response to an ISAB report in which they asked for alternatives that could be affecting migration timing. Reviewers expressed concern about the potential benefits from this project because realized benefits will be dependent on Idaho Power (would assist in the funding of this proposed work) agreement to adjust the flows. The reviewers acknowledge that the proposal is well written by a respected researcher; however, the proposal may be more suitable for consideration through the Innovative Project process.

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $154,136<br>Category: Recommended action<br>Comments: | $256,393<br>Category: Recommended Action | $281,247<br>Category: Recommended Action |

**Actions by Others**

## Project: 199700900 – Evaluate Potential Means of Rebuilding Sturgeon Populations in the Snake River Between Lower Granite and Hells Canyon Dams

**Sponsor:** Nez Perce Tribe

**Short Description**

Evaluate the need for and identify potential measures to protect and restore white sturgeon between Hells Canyon and Lower Granite dams to obtain a sustainable annual harvest.

**Abbreviated Abstract**

The goal of the Nez Perce Tribe's (NPT) White Sturgeon Program is to restore and rebuild the white sturgeon populations in the Snake River between Hells Canyon and Lower Granite dams to support a sustainable subsistence harvest of white sturgeon by the Nez Perce People equivalent to 5 kg/ha/yr. This project addresses measure 10.4A.4 of the Northwest Power Planning Council Fish and Wildlife Program (1994) to "…fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams." In 1996, a biological assessment of the Upper Snake River White Sturgeon was conducted by the Nez Perce Tribe (NPT) as part of BPA

project # 8605000. The Upper Snake River Sturgeon Assessment was successful in identifying: 1) regional sturgeon management objectives, and 2) potential mitigative actions needed to restore and protect the population. However, the risks and uncertainties associated with their implementation could not be fully assessed because critical data concerning the status of the population and their habitat requirements are unknown. Currently, under BPA project # 199700900, data on the health and status of the population and the specific life history attributes are being collected. From these data an adaptive management plan will be developed that will 1) reassess potential mitigative actions, 2) recommend the implementation of needed mitigative action(s), and 3) present a monitoring and evaluation plan.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 8605000 | White Sturgeon Mitigation And Restoration In The Columbia And Snake Rivers | Complementary work to restore white sturgeon outside the bounds of this project. Information exchange on means of data collection, analytical methods and other technical issues. Information crucial to comparing health of the project's population with var |
| 9902200 | Assessing Genetic Variation Among Columbia Basin White Sturgeon Populations | Information exchanged used to track gene flow from other populations and identify the genetic health of the population. |
| 8806400 | Kootenai River White Sturgeon Studies and Conservation Aquaculture | Complementary work to restore white sturgeon isolated outside the bounds of this project. Information exchange on means of data collection. Information on population characteristics indicative of a white sturgeon population in danger. |
| 8806500 | Kootenai River Fisheries Recovery Investigations | Complementary work to restore white sturgeon isolated outside the bounds of this project. Information exchange on means of data collection. Information on population characteristics indicative of a white sturgeon population in danger. |
| 9903200 | Oxbow/Hells Canyon Reservoirs Consumptive Sturgeon Fishery | Study to test feasibility of providing a sturgeon fishery to offset loss of production due to hydro-system. Information exchange on means of data collection, analytical methods and other technical issues. |

**Relationship to Existing Goals, Objectives and Strategies**

This proposal is consistent with many of the goals, objectives, and strategies detailed in the Snake Hells Canyon Subbasin Summary (Statler et al. 2001). Specifically those goals list by the Nez Perce Tribe to "conserve, restore and recover native resident fish populations including sturgeon…" and "Protect and enhance sturgeon, resident fish, and wildlife resources" (Statler et al. 2001). Other needs that are addressed in the Snake Hells Canyon Subbasin Summary (Statler et al. 2001) that are closely related to this proposal include:

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.

Additionally, this ongoing project has be highly coordinated with fisheries co-managers and accomplished in a cooperative approach. This proposal plays an active role in supporting needs 8 and 9 in the "Combined Aquatic and Terrestrial Needs" section of the Snake Hells Canyon Subbasin Summary (Statler et al. 2001).

The intended goals of the 2000 Fish and Wildlife Program (NPPC 2000) are furthered with the initiation of this project: 1) "Halt declining trends in salmon populations above Bonneville Dam by 2005" 2) "Restore the widest possible set of healthy naturally reproducing populations of salmon in each relevant province by 2012" 3) "Increase total adult salmon runs above Bonneville Dam by 2025".

This project will provide information as directed by the Columbia River Basin Fish and Wildlife Program. The 2000 Columbia River Basin Fish and Wildlife Program directs that significant attention to rebuilding healthy, natural producing fish populations by protecting and restoring habitats and the biological systems within them (NPPC 2000). This proposal supports an adaptive management process using an experimental approach to achieve abundant and productive fisheries and to implement no-net decline management actions that support the recovery of ESA listed stocks, and evaluate effectiveness of management actions (NPPC 2000). The 2000 Columbia River Basin Fish and Wildlife Program has three primary strategies: (1) identify and resolve key uncertainties for the program; (2) monitor, evaluate, and apply results, and; (3) make information from this program readily available.

Any proposed recovery efforts for Snake River white sturgeon require knowledge of specific life history strategies, critical habitat for spawning and rearing, downstream emigration, and upstream migration. This information will provide data to describe responses of populations to habitat conditions in terms of productivity and life history diversity (biological performance) as well as description of the environmental conditions or changes that will achieve the desired population characteristics (environmental characteristics). Biological objectives should be empirically measurable and based on explicit scientific rationale and should become increasingly quantitative and measurable at smaller levels (i.e. basin, province, sub-basin, etc.) (NPPC 2000). Information from this project will provide quality

data that can be better utilized to provide the basis for improved monitoring techniques as requested in the Columbia River Basin Fish and Wildlife Program (NPPC 2000).

This project also addresses measure 10.4A.4 of the Northwest Power Planning Council Fish and Wildlife Program (1994) to "…fund an evaluation, including a biological assessment (Section 7.3B.1) of potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon dams." The NPPC encouraged the identified sturgeon studies to be undertaken and completed quickly and on-the-ground projects identified and implemented as soon as possible to address the needs of this species. The NPPC also encouraged sturgeon studies be coordinated to avoid redundant work and to increase the potential for learning.

#### Review Comments

The development of a management plan will follow the completion of field activities in 2002. Reviewers question whether the harvest value is correct.

The RFC suggests the timeframes in out years look long. In addition, a closer working relationship needs to be developed with IDFG, either by including a subcontract for their participation in analyzing and interpreting data or by a separate contract as in proposal 27015. The RFC expressed concerns that there may be opportunities for simultaneous work that are not mentioned. The harvest goal in the proposal is a NPT goal and is not shared by IDFG. A working group that monitors this project's progress should be formed (IDFG, ODFW, NPT, IPC). Or they may be able to cooperate with the IPC WSTAC.

The BRAT Review identified catch and release fishing in the Hells Canyon reach as one of the major potential limiting factors for sturgeon here. Future proposals should clarify why this is not being investigated. USGS has put forth proposals to investigate these fishery affects, and this is the reach that seems most appropriate for the investigation.

Food availability was also listed in the BRAT review as a potential limiting factor. Bioenergetics work to describe available resources compared to those needed for sturgeon production seems appropriate but is not being pursued. While comments from the ISRP are probably valid given they have no contact with the project proponents, the RFC has confidence in the described methods and analyses. The RFC indicated that progress by project personnel in completing reports, making population information available, etc., is unclear.

#### Budget

| FY02 | FY03 | FY04 |
|---|---|---|
| $290,510<br>Category: High priority<br>Comments: | $275,000<br>Category: High priority | $500,000<br>Category: High priority |

#### Actions by Others

Concurrent with the work being done by NPT, Idaho Power Company (IPC) is assessing the status and habitat use of white sturgeon in the Hells Canyon Reach of the Snake River (IPC 1997). Because of the similarity in the objectives and tasks being assessed, a formal agreement to share data has been established and the majority of the work proposed by NPT will be conducted on the Snake River below the mouth of the Salmon River. Randomized sampling conducted to estimate the size of the population will not include the Snake River reaches above

the mouth of the Salmon River. Tracking and assessment of spawning and rearing habitat will be conducted throughout the study area, including the Snake River reach above the mouth of the Salmon River. However, coordination with IPC is ongoing to reduce duplication in defining and identifying spawning and rearing habitat throughout the Hells Canyon section of the Snake River

## Project: 199801003 – Spawning distribution of Snake River fall Chinook salmon

**Sponsor:** U.S. Fish and Wildlife Service

**Short Description**

Monitor the status and distribution of Snake River fall chinook salmon, determine if yearling-released supplemented hatchery fish spawn where intended, and gather information on the spawning distribution of fish released as subyearlings and natural fish.

**Abbreviated Abstract**

This project has two components: (1) ongoing fall chinook salmon population monitoring upriver of Lower Granite Dam, and (2) an evaluation of three juvenile fall chinook salmon acclimation-and-release facilities. Both activities are accomplished through a joint effort with other agencies and organizations. Our part in population monitoring involves conducting redd searches in the Snake, Grande Ronde, and Imnaha rivers, and producing a summary report that includes the findings of all redd searches conducted upriver of Lower Granite Dam. Since we started this work in 1991, we improved the accuracy of redd searches, developed a new search technique using underwater video, standardized the search processes, produced nine annual reports, and coauthored three publications on our findings. The need for population monitoring was described in the 1994 FWP (7.1C.), the NMFS Snake River Recover Plan (Chapter IV, page 17), and the FCRPS BIOP (9.6.5.4). Our part in evaluating acclimation facilities used for supplementation is to determine where returning adults migrate and spawn, and if the desired spawning distribution is achieved. Our approach involves radio-tagging returning adults at Lower Granite Dam, following their movements using fixed and mobile radio-tracking methods, and using redd searches to confirm where they spawn. We completed the first four years of this component (the first with funding from the Lower Snake River Compensation Plan), and submitted three annual reports to BPA. The data collected thus far indicate using the three release sites will likely meet the program objective in terms of distributing spawners throughout the areas normally used by fall chinook salmon. For our results to be conclusive we need to tag 330 fish in FY 2002. The need for this work is addressed in the 1994 FWP (7.3B.2), NMFS Snake River Recovery Plan (Chapter V-4, page 22), and the draft BIOP on Artificial Production (10.2.3.).

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 199801004 | Monitoring and Evaluation of Yearling Snake River Fall Chinook | This project (199801004) has the task of making the overall assessment of fall chinook supplementation. Our project provides data on spawning distribution of the supplemented fish. |

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 199900300 | Evaluate spawning of salmon below the four lowermost Columbia River Dams | Share data for Snake and Columbia river fall chinook salmon habitat use |
| 199406900 | A Spawning Habitat Model to Aid Recovery Plans for Snake River Fall Chinook | Share expertise and distribution data |
| 199102900 | Life History and Survival of Fall Chinook Salmon in the Columbia River basin | Data from our project guides research activities for project 199102900 |
| 25033 | Evaluate Restoration Potential of Mainstem Habitat for Anadromous Salmonids in the Columbia and Snake Rivers | Share data for Snake and Columbia river fall chinook salmon habitat use |
| 25035 | Evaluate adult fall chinook salmon fallback at Priest Rapids Dam, Columbia River | Our findings will be useful for comparative purposes. |
| | Hydro RPA Action 107: Assess survival and losses of upstream migrating salmonids. | Findings from our work will contribute to the understanding of fallback at Lower Granite Dam. |
| | RME RPA Action 182: Determine reproductive success of hatchery fish. | Findings from our work will contribute to determining the spatial and temporal distribution of hatchery-origin spawners. |
| | RME RPA Action 184: Contribution of conservation hatcheries to recovery. | Finding from our work contribute by monitoring the adult life stage of hatchery fall chinook salmon. |

**Relationship to Existing Goals, Objectives and Strategies**

**Review Comments**

This project addresses RPA 184.

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $174,162<br>Category: High priority<br>Comments: | $130,900<br>Category: High priority | $130,900<br>Category: High priority |

**Actions by Others**

Project: 199801004 – Monitor and Evaluate Yearling Snake River Fall Chinook Released Upstream of Lower Granite Dam

**Sponsor:** Nez Perce Tribe

**Short Description**

Monitor and evaluate survival and performance of yearling fall chinook from Pittsburg Landing, Big Canyon, and Captain John acclimation facilities (Project 199801005) to maximize success of the fall chinook supplementation program above Lower Granite Dam.

**Abbreviated Abstract**

Fall chinook supplementation above Lower Granite Dam includes acclimating and releasing 450,000 (150,000 at each facility) Lyons Ferry Hatchery (LFH) yearling fall chinook from facilities at Pittsburg Landing and Captain John Rapids on the Snake River and at Big Canyon Creek on the Clearwater River. In addition, subyearling fall chinook have become available for further supplementation and have been acclimated and released from these facilities since 1997. This project has been cooperating with project 9403400 to PIT tag and monitor these subyearling release groups. This proposal seeks to continue the cooperative study to monitor and evaluate fall chinook released above Lower Granite Dam as recommended in the Northwest Power Planning Council's *Fish and Wildlife Program (FWP), NMFS 2000 FCRPS Biological Opinion (NMFS Bi-Op),* and *Wy-Kan-Ush-Mi Wa-Kish-Wit*. This study provides information to promote adaptive management as directed under the *FWP* Scientific Principles (Principle 7) and Basinwide Provision (Strategy 9) as well as Actions 169 and 184 under *NMFS Bi-Op* (9.0) Reasonable and Prudent Alternative. One of the Specific Planning Assumptions in the *FWP* (Basinwide Provisions A.2) states "management actions must be taken in an adaptive, experimental manner…integrating monitoring and research with those management actions to evaluate their effects on the ecosystem." The *NMFS Bi-Op* (9.1.6) directs that "specific studies must be undertaken with rigorous monitoring and evaluation" because "monitoring programs will be a cornerstone in identifying alternative actions and refining recovery efforts."

The goal of this project is to monitor and evaluate pre-release and release condition, post-release behavior, migration timing, and survival of juvenile fall chinook from release to Lower Snake River dams. We will also investigate adult returns and smolt-to-adult survival of juvenile fall chinook released at the acclimation facilities with each other and with releases at Lyons Ferry Hatchery. We will assist the US Fish and Wildlife Service (USFWS) in their evaluation of Snake River Basin fall chinook adult spawner contribution and distribution.

A representative sample of all release groups will be PIT tagged and radio tagged at each acclimation facility and released at similar sizes and times as releases at LFH. Size and condition of PIT tagged fish will be evaluated during migration for fish recaptured through beach seining in the Snake and Clearwater Rivers. Emigration survival will be estimated from PIT tag interrogations at mainstem dams using the Survival Under Proportional Hazards (SURPH) model. Post-release dispersal and emigration behavior will be assessed using radio telemetry.

Preliminary stages of the fall chinook supplementation program appear successful. Returns of adult fall chinook salmon to Lower Granite Dam have increased from an average of 1,038 from 1992-1996 to 3,384 in 1999 and 3,696 in 2000 and redd counts from aerial spawning ground surveys have increased correspondingly.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 20541 | Snake River Fall Chinook Salmon Studies (Umbrella Proposal) | Umbrella proposal to implement Tribal and Federal Snake River fall chinook recovery plans by assessment and M&E of attributes and survival of natural juveniles, Lyons Ferry Hatchery yearlings and subyearlings, and returning adult Snake River fall chinook. |
| 199102900 | Life History and Survival of Fall Chinook Salmon in the Columbia R. Basin | Complementary project monitoring and evaluating post-release attributes and survival of natural and hatchery juvenile fall chinook in the Snake River. Information sharing. |
| 199302900 | Survival Estimates for Passage of Juvenile Salmonids Through Dams and Reservoir | Estimates survival of salmonids, including subyearling fall chinook, during passage through Lower Snake River dams. |
| 199403400 | Assessing Summer and Fall Chinook Restoration in the Snake River Basin | Cooperate to perform fall chinook research in the Clearwater River basin. Collect, analyze and distribute juvenile rearing and migration and adult spawning data. |
| 199801003 | Monitor and Evaluate Spawning Distribution of Snake R. Fall Chinook Salmon | 9801004 cooperates with 9801003 for radio tagging adult fall chinook at Lower Granite Dam and conducting adult fall chinook spawning ground surveys, carcass recovery, and fall chinook adult mobile and fixed telemetry in Snake River and tributaries. |
| 199801005 | Pittsburg Landing, Captain John Rapid, & Big Canyon Fall Chinook Acclimation Facilities | Project 9801005 acclimates 150,000 supplementation yearlings and available subyearlings from each facility for release into the Snake River basin. |
| 199102900 | Understanding the effects of summer flow augmentation on the migratory behavior and survival of fall chinook salmon migrating through L. Granite Res. | Complementary research for fall chinook passage survival studies through the Lower Snake River dams. Information sharing. |
| 198810804 | STREAMNET | Provide information for use in database. |

**Relationship to Existing Goals, Objectives and Strategies**

Fall chinook supplementation above Lower Granite Dam includes acclimating and releasing 450,000 (150,000 at each facility) Lyons Ferry Hatchery (LFH) yearling fall chinook from facilities at Pittsburg Landing and Captain John Rapids on the Snake River and at Big Canyon Creek on the Clearwater River (# 199801005). Supplementation with 122,000 LFH yearling fall chinook in the Snake River above Lower Granite Dam at Pittsburg Landing began in the spring of 1996. The acclimation facility at Big Canyon Creek on the Clearwater River came on line in 1997 and the third facility at Captain John Rapids on the Snake River came on line in 1998. Additional supplementation with acclimated subyearling fall chinook began in 1997.

The purpose of this project is to monitor and evaluate pre-release and release condition, post-release behavior, migration timing, and survival of juvenile fall chinook from release to Lower Snake River dams. We will also investigate adult returns and smolt-to-adult survival of juvenile fall chinook released at the acclimation facilities with each other and with releases at Lyons Ferry Hatchery. We will assist the US Fish and Wildlife Service (USFWS) in their evaluation of Snake River Basin fall chinook adult spawner contribution and distribution.

This project relates to several needs identified in the Clearwater Subbasin Summary as outlined below.

*5.4.1.4.....Coordinate M&E efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.*

Several phases of fall chinook monitoring and evaluation require high levels of coordination and cooperation. We coordinate between several subbasins (Clearwater, Snake Hells Canyon, Lower Snake) and provinces (Blue Mountain, Mountain Snake, Columbia Plateau). Foremost is #199801005, Pittsburg Landing, Captain John Rapids, and Big Canyon Fall Chinook Acclimation Facilities. Our project conducts monitoring and evaluation on the supplementation yearling fall chinook that are acclimated at and released from these facilities. Close cooperation is required between the projects for PIT and radio tagging efforts.

This project works in close collaboration with the NPT project (formerly 199403400, now incorporated into #198335003) Assessing Summer/Fall Chinook Restoration in the Snake River Basin. These projects share personnel, equipment, and vehicles.

In 1997 and 1998 this project coordinated closely with the USGS-BRD. The BRD operated many fixed telemetry antennas and receivers at Lower Granite Dam. In addition to collecting their own radio tracking data, the BRD collected and provided telemetry data at Lower Granite Dam on radio-tagged fish from this project. This BRD project was discontinued for 1999, but was reinstated for 2000. We also coordinate with the University of Idaho to collect and share fixed site telemetry data.

This project collaborates with USFWS, WDFW, UI, and the NPT fall chinook assessment project to monitor adult fall chinook escapement and spawning distribution. The USFWS (#199801003) coordinates telemetry and spawning ground survey activities for supplementation adults returning past Lower Granite Dam. The WDFW complements this project by monitoring and evaluation of fall chinook released at LFH. Each project conducts a portion of the

monitoring effort. This project performs aerial telemetry on the Lower Snake reservoirs, the UI operates mobile and fixed site telemetry on the upstream of Lower Granite reservoir, WDFW performs mobile telemetry, and USFWS and NPT perform aerial telemetry, spawning ground surveys, and carcass collection upstream in the Snake and Clearwater Rivers.

Other efforts include coordinating with WDFW (Lyons Ferry Hatchery and Snake River Lab) and PSMFC (Regional Mark Information System) to collect and report quality control data for coded wire and visual implant elastomer tags.

*5.4.1.5..... Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These M&E activities are critical to evaluating the effectiveness of projects in improving habitat, watershed health and enhancing production of target species.*

This project is a continuation of an ongoing monitoring and evaluation program for fall chinook supplementation.

*5.4.1.8..... Continue and expand 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.*

The coordination efforts listed above in 5.4.1.4 have expanded and improved every year since inception and will continue to expand and improve in the future.

*5.4.1.4..... Improve and maintain quality control of fish marking programs.*

The yearling fall chinook produced for this program at Lyons Ferry Hatchery are tagged with coded wire and visual implant elastomer at the hatchery prior to transfer to the acclimation facilities. This project coordinates with the WDFW to collect and report quality control data for coded wire and visual implant elastomer tagging. We subsample yearlings during PIT tag operations one week prior to release from the acclimation facilities. We then compile the data and report it to WDFW and the PSMFC Regional Mark Information System.

*5.4.2.22... Quantify the types and extent (amount) of straying by chinook and steelhead occurring within subbasins, within the Mountain Snake Province, and within designated ESUs.*

This portion of the fall chinook supplementation program is primarily conducted by #199801003. However, monitoring adult movements requires considerable effort and coordination. We assist #199801003 by conducting aerial and mobile telemetry surveys.

*5.4.2.37... Gather improved population status information for wild, natural and hatchery chinook salmon including life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner*

*ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. Mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program.*

As stated above, the purpose of this project is to monitor and evaluate pre-release and release condition, post-release behavior, migration timing, and survival of juvenile fall chinook from release to Lower Snake River dams. We will also investigate adult returns and smolt-to-adult survival of juvenile fall chinook released at the acclimation facilities with each other and with releases at Lyons Ferry Hatchery. We do so primarily through PIT tag and radio telemetry technology. We assist #199801003 in investigating adult migration patterns and distribution and #199403400 (now incorporated into #198335003) for monitoring adult spawner surveys.

*5.4.2.38.....Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.*

In cooperation with #199403400 (now incorporated into #198335003) we are calculating smolt-to-adult ratios for fall chinook released from the acclimation facilities.

*5.4.2.41..... Continue evaluating reintroduction efforts for fall chinook salmon.*

As stated above, this project is a continuation of an ongoing monitoring and evaluation program for fall chinook supplementation.

**Review Comments**

This project addresses RPA 184.

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $330,241<br>Category: High priority<br>Comments: | $340,148<br>Category: High priority | $350,352<br>Category: High priority |

**Actions by Others**

Non-BPA funded activities regarding fall chinook salmon above Lower Granite Dam include the LSRCP administered by the WDFW. Yearling and subyearling fall chinook that are acclimated and released above Lower Granite Dam are reared at Lyons Ferry Hatchery and the WDFW Snake River Lab is responsible for the corresponding hatchery evaluation efforts.

Other fall chinook activities are conducted by the Idaho Power Corporation. The IPC cooperates with the USFWS-FRO in conducting fall chinook spawning ground surveys in the Snake River. The IPC also receives subyearling fall chinook from Lyons Ferry Hatchery for release into the Snake River near Hells Canyon Dam.

Project: 199801005 – Pittsburg Landing (199801005), Capt. John Rapids (199801007), Big Canyon (199801008) Fall Chinook Acclimation Facilities

**Sponsor:** Nez Perce Tribe

**Short Description**

Supplement natural production of Snake River fall chinook above Lower Granite Dam through acclimation and final rearing of Lyons Ferry yearling and subyearlings at two sites on the Snake River and one site on the Clearwater River.

**Abbreviated Abstract**

Fisheries co-managers of *U.S. v Oregon* supported and directed the construction and operation of acclimation and release facilities for Snake River fall Chinook from Lyons Ferry Hatchery at three sites above Lower Granite Dam. In 1996, Congress instructed the U.S. Army Corps of Engineers (USCOE) to construct, under the Lower Snake River Compensation Plan (LSRCP), final rearing and acclimation facilities for fall Chinook in the Snake River basin to complement their activities and efforts in compensating for fish lost due to construction of the lower Snake River dams. The Nez Perce Tribe played a key role in securing funding and selecting acclimation sites, then assumed responsibility for operation and maintenance of the facilities. In 1997 Bonneville Power Administrative (BPA) was directed to fund operations and maintenance (O&M) for the facilities. Two acclimation facilities, Capt. John Rapids and Pittsburg Landing, are located on the Snake River between Asotin, WA and Hells Canyon Dam and one facility is located on the Clearwater River at Peck. The Capt. John Rapids facility is a single pond while the Pittsburg Landing and Big Canyon sites consist of portable fish rearing tanks assembled and disassembled each year. Acclimation of 450,000 smolts (150,000 each facility) begins in March and ends 6 weeks later. When available, an additional 2,400,000 fall Chinook sub-yearlings may be acclimated for 6 weeks, following the smolt release.

The project goal is to increase the naturally spawning population of Snake River fall chinook salmon upstream of Lower Granite Dam. This is a supplementation project, in that hatchery produced fish are acclimated and released into the natural spawning habitat for the purpose of returning a greater number of spawners to increase natural production. Only Snake River stock is used and the Lyons Ferry hatchery propagating the stock is the designated gene bank source. This is a long-term project, and will ultimately work towards achieving delisting goals established by National Marine Fisheries Service (NMFS). Complete returns for all three acclimation facilities will not occur until the year 2002. Progeny (which would then be listed fish) from those returns will be returning for the next five years, to begin the delisting cycle.

**Relationship to Other Projects**

| Project ID | Title | Nature of Relationship |
|---|---|---|
| 199801004 | Fall Chinook M&E | Conducts monitoring and evaluation of Snake River Fall Chinook smolts acclimated and released upstream of Lower Granite Dam. |
| 198335003 | NPTH M&E | Conducts monitoring and evaluation of adult Snake River fall chinook returning to the Clearwater River drainage. Project includes conducting redd counts and carcass recoveries. |
| 199801003 | Spawning Distribution of | Monitors spawning distribution of Snake |

| Project ID | Title | Nature of Relationship |
|---|---|---|
| | Snake River Fall Chinook Salmon | River fall chinook above Lower Granite Dam. Project conducts redd counts, carcass recoveries and monitors smolt migration |

**Relationship to Existing Goals, Objectives and Strategies**

The Proposed Recovery Plan for Snake River Salmon specifically recommends supplementation of Lyons Ferry fall chinook salmon above Lower Granite Dam, along with careful monitoring and evaluation. The use of acclimation facilities to release fall chinook salmon above Lower Granite Dam is consistent with the management agreement drafted by federal, state and tribal salmon co-managers under the Columbia River Fish Management Plan.

The immediate goal of the project is a concerted effort to ensure that the Snake River fall chinook salmon above Lower Granite Dam do not go extinct. Long-term goals of the project are:

1. Increase the natural population of Snake River fall chinook spawning above Lower Granite Dam.
2. Sustain long-term preservation and genetic integrity of this population.
3. Keep the ecological and genetic impacts of nontarget fish populations within acceptable limits.
4. Assist with the recovery of Snake River fall chinook to remove from ESA listing.
5. Provide harvest opportunities for both tribal and non-tribal anglers.

This is a long-term project that will ultimately work toward achieving the de-listing goals established by NMFS. The Proposed Recovery Plan for Snake River Salmon established a numerical de-listing goal for Snake River fall chinook as an eight-year (approximately two-generations) geometric mean of at least 2,500 natural spawners in the mainstem Snake River annually.

The USFWS, WDFW and NPT have a series of ongoing cooperative monitoring and evaluation studies to assess the success of the project (BPA projects 9801004, 9801003, and 9401004). These activities are in conjunction with ongoing monitoring and evaluation studies at Lyons Ferry Hatchery, and they are intended to achieve a set of six specific scientific objectives:

1) Estimate the contributions of fall chinook salmon acclimation facility releases to escapement and natural spawning above Lower Granite Dam;
2) Estimate and compare smolt-to-adult survival of Pittsburg Landing, Big Canyon and Capt. John Rapids and Lyons Ferry Hatchery releases;
3) Monitor post-release dispersal, migration timing, and survival;
4) Monitor movement of yearling smolts through the Snake River migration corridor;
5) Evaluate juvenile survival and adult returns and progress toward escapement goals;
6) Cooperatively prepare annual reports and share information.

**Review Comments**

Monitoring is performed through Project 199801003 and 199801004. This project is considered BASE by NMFS.

**Budget**

| FY02 | FY03 | FY04 |
|---|---|---|
| $722,000<br>Category: High priority<br>Comments: | $752,000<br>Category: High priority | $772,000<br>Category: High priority |

**Actions by Others**

## *Snake Hells Canyon Research, Monitoring, and Evaluation Activities*

Research, monitoring, and evaluation activities within the Middle Snake subbasin that compliment fish and wildlife projects are provided in Table 16 and Table 17.

Table 16. BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities

| **Completed Monitoring and Evaluation Projects** | BPA # | Sponsor | Duration |
|---|---|---|---|
| Upstream Passage, Spawning, and Stock Identification of Fall Chinook in the Snake River, 1991 through 1993 | 199204600 | WDFW | 1991-93 |
| Vegetation Description, Rare Plant Inventory, and Vegetation Monitoring for Craig Mountain Idaho | 199206900 | IDFG | 1993 |
| Wildlife Inventory, Craig Mountain, Idaho | 199206900 | IDFG | 1993-94 |
| Forest Inventory—Peter T. Johnson Wildlife Mitigation Unit—Craig Mountain Idaho | 199206900 | IDFG | 1993-94 |
| Spawning Distribution of Fall Chinook Salmon in the Snake River | 199801003 | USFWS | 1998-2000 |
| | | | |
| Ongoing Monitoring and Evaluation Projects | BPA # | Sponsor | Duration |
| Monitoring and Evaluation Of Yearling Snake River Fall Chinook Released Upstream Of Lower Granite Dam | 199801004 | NPT | 1998-present |
| Evaluate Rebuilding the White Sturgeon Population in the Lower Snake Basin | 199700900 | NPT | 1997 to present |
| Idaho Natural Production Monitoring and Evaluation | 199107300 | IDFG | 1984 to present |
| Dworshak Wildlife Mitigation Trust | *9205700* | IDFG | 1992 to present |

*Idaho Natural Production Monitoring and Evaluation* (BPA No. 199107300). This is an ongoing project to monitor trends in spring/summer chinook salmon and steelhead trout populations in the Salmon, Clearwater and lower Snake River drainages. Project goals include establishing a long-term parr monitoring database, estimating adult escapement in key tributaries, evaluating egg-to-parr survival in streams treated with habitat improvement structures, monitoring stock-recruitment trends, and estimating smolt-to-adult survival (Jody Brostrom, IDFG, Personal Communication, May 14, 2001).

*Dworshak Wildlife Mitigation Trust (BPA No. 9205700)* The 78,679 acre Craig Mountain Wildlife Management Area (CMWMA) is located south of Lewiston, Idaho, just north and east of the confluence of the Snake and Salmon rivers. The 60,000 acre Peter T. Johnson Wildlife Mitigation Unit was purchased by Bonneville Power Administration (BPA) under terms of the 1992 Dworshak Dam Wildlife Mitigation Agreement among BPA, the State of Idaho, and the Nez Perce Tribe. Because of its size and elevational ranges the CMWMA provides a unique laboratory to study and manage wildlife and habitats on an ecosystem basis.

From 1992 to 1994, IDFG and other entities conducted an exhaustive and unprecedented survey of baseline wildlife and wildlife habitat conditions on the CMWMA. Surveys included rare plants, various habitat types, timber volumes, sensitive wildlife species, target wildlife species, wildlife communities, big game aerial surveys, undesirable plants (noxious weeds), amphibians and reptiles, aquatic macroinvertebrates and physical structures. All data has been or is currently being entered into the IDFG Geographic Information System (GIS). Cultural resource surveys have been conducted in areas where ground-breaking activities have taken place. Management of the CMWMA is directed at restoring habitats impacted by past logging and grazing activities, providing biologically diverse plant and wildlife communities, and providing for opportunities for wildlife-associated recreation and solitude. Target species of wildlife specifically identified include elk, white-tailed deer, river otter, pileated woodpecker, yellow warbler, and black-capped chickadee. A-run steelhead and spring and fall chinook occur in the major streams on the CMWMA and in the Snake and Salmon mainstems. Special management direction is provided to protect and provide habitat for these species. Under the 1992 Dworshak Wildlife Mitigation Agreement, IDFG is responsible for monitoring and evaluating the effect of management activities on wildlife and wildlife habitat on the Peter T. Johnson Wildlife Mitigation Unit (Jody Brostrom, IDFG, Personal Communication, May 14, 2001).

Table 17. Non BPA-funded Columbia River Basin Fish and Wildlife Program research, monitoring, and evaluation activities

| Project | Funding/Lead Agency | Status |
|---|---|---|
| Hells Canyon Initiative | Multiple/IDFG | ongoing |
| Creel census of steelhead trout sport fisheries are conducted during open seasons for each. The results of the surveys include estimated angler participation (hours fished) and harvest. Harvest can be cataloged by specific hatchery contribution (marked fish only). Angler use and harvest vary from year to year. | IDFG, LSRCP/WDFW | 1982-Present |
| | | |

## Statement of Fish and Wildlife Needs

### Combined Aquatic and Terrestrial Needs

12. 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).
13. Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.

14. 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.
15. 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.
16. 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.
17. Coordinate M&E efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
18. Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These M&E activities are critical to evaluating the effectiveness of projects in improving habitat, watershed health and enhancing production of target species.
19. Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
20. 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.
21. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
22. 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

#### General

4. Continue ongoing mitigation programs to provide sport and tribal fisheries.
5. Ensure natural river strategy alternative is implemented as required for recovery of listed anadromous species.
6. Improve and maintain quality control of fish marking programs.

#### Water Quality

5. Continue coordinated temperature monitoring throughout the subbasin. Identify spatial and temporal gaps, establish additional flow and temperature gauging stations and upgrade existing ones to provide real-time data, and expand longitudinal profiles. Fish distribution and habitat quality are highly influenced by water temperature. This parameter most be monitored in both wilderness and managed watersheds to provide baselines to evaluate population recovery and watershed restoration activities.
6. Reduce stream temperature, sediment and embeddedness to levels meeting appropriate standards for supporting self-sustaining populations of aquatic species. This is the core of the objectives of the TMDL process.
7. Restore and augment streamflows at critical times using (but not limited to) water right leases, transfers, or purchases, and improved irrigation efficiency.

8. Reduce impacts from agriculatural sediment, fertilizer, pesticide loading, confined animal operations, stormwater and road runoff and wastewater effluent.

#### Habitat / Passage

4. Protect and restore riparian and instream habitat structure, form and function to provide suitable holding, spawning and rearing areas for anadromous and resident fish.
5. Protect, restore and create riparian, wetland, and floodplain areas within the subbasin and establish connectivity.
6. Investigate connectivity between populations and the role of natural and artificial barriers in population isolation.

##### Aquatic Habitat Enhancement

3. Replace or remove culverts based on past or ongoing assessments.
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 when feasible
   - Reduce sediment, fertilizer and pesticide loading from agricultural practices
   - 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 where they are defined or can be shown to be a potential problem

#### Genetic Conservation

3. Continue gene conservation efforts (cryopreservation) for fall chinook salmon and steelhead in the subbasin.
4. Develop gene conservation efforts (cryopreservation) to preserve genetic diversity within the geographic population structure for bull trout and cutthroat trout.

#### Hatchery-Wild Interactions

6. Continue and expand investigations of interactions between hatchery and wild chinook, steelhead, and resident fish.
7. Quantify the types and extent (amount) of straying by chinook and steelhead occurring within subbasins, within the Blue Mountain Province, and within designated ESU's.
8. Complete a province-wide chinook salmon genetic assessment which will provide a baseline for monitoring hactchery introgression into wild populations.
9. Continue and expand genetic profiling to define steelhead sub-populations within the subbasin to determine geographic structure, gene flow, genetic similarity and hatchery introgression into wild populations.
10. 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

5. Assess the status of native species that have received little attention to date. In particular, westslope cutthroat trout, bull trout, sand roller and Pacific lamprey appear to be well below historic population levels. Collect life history, distribution, abundance by life stage, genetic and homing behavior attributes.
6. Determine habitat requirements, distribution, and limiting factors of sand roller.
7. Monitor impacts of illegal, incidental, sport and tribal harvest on resident native populations.
8. 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

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

#### Redband Trout

2. Investigate the existence, life history, genetics of redband trout in the subbasin. Include populations in allopatry and sympatry with steelhead, identifying genetic and spatial segregation and overlap using current DNA-marker and GIS technology.

#### Pacific Lamprey

3. Conduct a presence/absence surveys to determine if lampetra (spp.) occur in the subbasin.
4. Depending on survey results, develop and implement a plan to
    - Determine habitat requirements and limiting factors for Pacific lamprey production in the subbasin
    - Assess the rehabilitation potential of Pacific lamprey in the subbasin
    - Assess the rehabilitation process for Pacific lamprey in the subbasin.

#### Chinook Salmon (Includes all races unless specifically noted)

13. Gather improved population status information for wild, natural and hatchery chinook salmon including life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. A mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program within Idaho.
14. Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
15. Monitor spring chinook by examining population trends and develop modeling and monitoring tools to determine out-of-basin impacts to Middle Snake chinook
16. Continue evaluating reintroduction efforts for fall chinook salmon.
17. Complete genetic profiling within the subbasin to determine population structure, gene flow and genetic similarity to support integration of hatchery recovery/conservation and harvest augmentation goals.

18. Continue natural production monitoring (i.e. returns per spawner) in order to gauge improvements resulting from hatchery programs, habitat improvements, and smolt passage facilities at Columbia River dams. Look for ways to better integrate existing chinook monitoring with basin research projects.
19. Continue LSRCP hatchery monitoring and evaluation to determine hatchery reared chinook performance and spawning ground surveys and provide for applied adaptive management.
20. Continue and enhance gene conservation efforts through expansion of the germplasm repository.
21. Continue gene conservation efforts (cryopreservation) for spring and summer chinook salmon in the subbasin.
22. Quantify mortality rates and straying of adult chinook salmon from Lower Granite Dam to natural production areas.
23. Complete NEOH planning and implementation of facility needs in the Middle Snake subbasin to meet production changes resulting from ESA listings and to meet subbasin goals.
24. Externally mark all hatchery fish to facilitate determination of run composition at Lower Granite Dam and determination of hatchery and wild escapements and progress towards NMFS recovery standards.

#### Summer Steelhead

9. Complete genetic profiling within the subbasin to determine population structure, gene flow and genetic similarity to support integration of hatchery recovery/conservation and harvest augmentation goals.
10. Continue Natural Production Monitoring through the implementation of the following:
    - Collect population status information for wild steelhead including adult spawner abundance, spawner to spawner ratios, spawning locations, and spawning timing
    - Validate index areas for summer steelhead to ensure they are appropriate measures of productivity
    - Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams. Consider alternative approaches to assessing population status
    - Continue and expand efforts to quantify juvenile abundance and smolt-to-adult return rates (SAR) of wild/natural and hatchery reared steelhead within the subbasin through the Smolt Monitoring Project Studies
    - Monitor adult movement to determine if and where passage impediments exist within the basin for summer steelhead
    - Investigate distribution and abundance of redds, diversity of life history traits, and genetic composition of wild steelhead
11. Continue gene conservation efforts (cryopreservation) for steelhead to preserve genetic diversity within the subbasin.
12. Redevelop hatchery broodstock as necessary to meet hatchery conservation and harvest augmentation goals.
13. Determine anadromous/resident life history relationship for O. mykiss.
14. Continue and expand monitoring of hatchery supplementation and interactions with natural fish.
15. Gather improved wild, natural, and hatchery A-run and B-run steelhead population status information including tributary specific life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult

survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. A mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program within Idaho.

16. Determine the efficacy of using dorsal fin erosion to identify un-marked hatchery steelhead.
9. Evaluate the effects of hooking mortality on wild steelhead in the Snake River.

#### Monitoring, Evaluation and Assessment

14. Develop appropriate intensity and spatial distribution of monitoring to estimate parr carrying capacity to compliment and enhance Natural Production Monitoring.
15. Refine aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts.
16. Continue Nez Perce Tribal Hatchery Monitoring and Evaluation to determine hatchery chinook performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
17. Continue Lower Snake River Compensation Hatchery Monitoring and Evaluation to determine hatchery chinook and steelhead performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
18. Establish or continue monitoring and evaluation efforts for all new or existing projects (respectively). Efforts should be consistent and repeatable between entities and coordinated at a subbasin scale so as to maximize effectiveness and minimize redundancy.
19. Continue to develop and update watershed assessments at multiple scales (i.e. transect, reach, watershed) to facilitate integrated resource management and planning efforts. Ensure that databases used for the development of assessments are sufficiently maintained and available to relevant entities.
20. Establish a centralized data repository.
21. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal and local entities.
22. Continue coordinated temperature monitoring throughout the subbasin
23. Periodically conduct longitudinal temperature profiles (such as FLIR) to better monitor temperature changes, while conducting long-term annual monitoring at point sites.
24. 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
25. Continue WDFW monitoring of LSRCP fall chinook releases and returns and evaluate direct stream releases vs acclimated releases.
26. Develop monitoring, evaluation and coordination of the Idaho Power Co. fall chinook mitigation program and returns to the subbasin. Evaluate direct stream releases and the potential need for acclimation.

#### Enforcement / Education

4. Better educate the public on issues and policies important to natural resource restoration, protection, and enhancement to encourage meaningful public participation.
5. 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.

6. 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

16. 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.
17. Research broad ecological relationships and identify limiting factors for focal and other wildlife species within the subbasin.
18. 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.
19. Address and mitigate hydropower impacts on loss of wildlife and wildlife habitat within the basin, based on species-specific habitat units.
20. Continue long-term landbird monitoring.
21. Assess predator impacts on big game and gain insight into predator/prey dynamics.
22. Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
23. 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).
24. Implement and (where applicable) continue noxious weed control programs.
25. Assist landowners with land holdings and easements for restoration and enhancement of wildlife habitat.
26. Mitigate hydropower impacts on loss of wildlife and wildlife habitats, including indirect impacts caused by the introduction of cheap power and water to the subbasin.
27. Participate in threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.
28. Monitor use of existing reference areas to assure consistency with the maintenance of ecologic values.
29. Identify candidate sites for the establishment of ecological reference areas based on current needs assessments. Periodically update ecological reference area needs assessments.
30. Establish and maintain permanent baseline monitoring systems for priority ecosystems and species.

#### Ponderosa pine communities

7. 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.
8. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine communities and for mitigation of lost wildlife habitat for

ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
9. Work with landowners and managers to restore ponderosa pine communities
10. Create and maintain large diameter snags in ponderosa pine communities.
11. Participate in a cooperative stewardship program to foster ponderosa pine protection.
12. Prepare a conservation plan for the protection of ponderosa pine-dominated old growth forest.

#### Whitebark pine communities

3. Inventory and map the distribution of whitebark pine communities within the subbasin.
4. Investigate fire disturbance and stand dynamic processes in whitebark pine-dominated forest and woodlands of the subbasin.

#### Native prairie and grassland ecosystems

7. Inventory and map the distribution of canyon grasslands within the subbasin.
8. Prepare a plan for the conservation of high quality, representative stands of native prairie and canyon grassland within the subbasin.
9. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for native prairie ecosystems and for mitigation of lost wildlife habitat for native prairie ecosystem associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
10. Work with landowners and managers to restore native prairie ecosystems
11. Support native plant nurseries and seedbanks
12. Support continued restoration of native prairie flora (i.e. sharp-tail grouse) and fauna (Spalding's catch fly).

#### Classified Wetlands

5. Continue wetland inventory in watersheds throughout the subbasin.
6. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for classified wetlands and for mitigation of lost wildlife habitat for classified wetland associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
7. Protect, restore and create wetland and riparian habitat particularly in lower elevation riparian areas.
8. Participate in a cooperative stewardship program to foster classified wetland community protection.

#### Bighorn Sheep

4. Identify factors limiting the bighorn population and implement management measures to increase population size.
5. Conduct research into survival and productivity relative to environmental and physiological factors.
6. 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

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

#### Loss of legacy resources

4. Work with landowners and managers to retain late successional habitats on state, and private lands (land exchanges, conservation easements).
5. Develop and implement active management prescriptions to restore and promote late successional habitats.
6. Develop an information and education stewardship program to foster late seral community protection

#### Roads

4. Reduce road densities through closures, obliteration, and reduced construction.
5. Support planned road closures on public land and encourage closure of other roads.
6. Improve enforcement of road closures.

#### Loss of Nutrients

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

#### Site specific needs

Additonal needs for specific tributaries or reaches have been identified by individual agencies. Refer to Asotin Creek subbasin summary (*in preparation*) for a more in depth discussion of:

##### Ten Mile Creek

- Need riparian revegetation to reduce stream temperatures (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need projects to improve steelhead habitat (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need implementation of upland BMPs to control erosion (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)

##### Couse Creek

- Need riparian revegetation to reduce stream temperatures (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need projects to improve steelhead habitat (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)
- Need implementation of upland BMPs to control erosion (Brad Johnson, Personal Communication, Asotin County Conservation District, May 9, 2001)

Table 18. Subbasin Summary FY - Funding Proposal Matrix

| Project Proposal ID | 27010 | 27015 | 27016 | 199700900 | 199801003 | 199801004 | 199801005<br>199608600 |
|---|---|---|---|---|---|---|---|
| Provincial Team Funding Recommendation | | | | | | Blue Mountain | High Priority |
| 5.4.1 Combined Aquatic and Terrestrial Needs | | | | | | | |
| 5.4.1.1 | | | | | | | |
| 5.4.1.2 | | | | | | | |
| 5.4.1.3 | | | | | | | |
| 5.4.1.4 | | | | | | X | |
| 5.4.1.5 | | | | | | X | x |
| 5.4.1.6 | | | | | | | |
| 5.4.1.7 | | | | | | | |
| 5.4.1.8 | | | | X | | X | x |
| 5.4.1.9 | | | | X | | | |
| 5.4.1.10 | | | | | | | |
| 5.4.1.11 | | | | | | | |
| 5.4.1.12 | | | | | | | |
| 5.4.1.13 | | | | | | | |
| 5.4.1.14 | | | | | | | x |
| 5.4.2 Fisheries/Aquatic Needs | | | | | | | |
| 5.4.2.1 Fisheries/Aquatic Needs - General Needs | | | | | | | |
| 5.4.2.2 | | | | | | | x |
| 5.4.2.3 | | | | | | | x |
| 5.4.2.4 | | | | | | X | x |
| 5.4.2.5 | | | | | | | |
| 5.4.2.6 Fisheries/Aquatic Needs – Water Quality | | | | | | | |
| 5.4.2.7 | | | | | | | |
| 5.4.2.8 | | | | | | | |
| 5.4.2.9 | | | | | | | |
| 5.4.2.10 Fisheries/Aquatic Needs – Habitat/Passage | | | | | | | |
| 5.4.2.11 | | | | | | | |
| 5.4.2.12 | | | | | | | |
| 5.4.2.13 | | | | | | | |
| 5.4.2.14 | | | | | | | |
| 5.4.2.15 | | | | | | | |
| 5.4.2.16 | | | | | | | |
| 5.4.2.17 | | | | | | | |
| 5.4.2.18 Fisheries/Aquatic Needs – Genetic Conservation | | | | | | | x |
| 5.4.2.19. | | | | | | | |
| 5.4.2.20 | | | | | | | |
| 5.4.2.21 Fisheries/Aquatic Needs–Hatchery-Wild Interactions | | | | | | | |
| 5.4.2.22 | | | | | | X | |
| 5.4.2.23 | | | | | | | |
| 5.4.2.24 | | | | | | | |
| 5.4.2.25 Fisheries/Aquatic Needs - Resident Fish | | | | | | | |
| 5.4.2.25 | | | | | | | |
| 5.4.2.26 | | | | | | | |

| Project Proposal ID | 27010 | 27015 | 27016 | 199700900 | 199801003 | 199801004 | 199801005<br>199608600 |
|---|---|---|---|---|---|---|---|
| **5.4.2.27** | | | | | | | |
| **5.4.2.28** | | | | | | | |
| **5.4.2.29** | | | | | | | |
| **5.4.2.30** | | | | | | | |
| **5.4.2.31** | | | | | | | |
| **5.4.2.32** | | | | | | | |
| **5.4.2.33** | | | | | | | |
| **5.4.2.34** | | | | | | | |
| **5.4.2.35** | | | | | | | |
| **5.4.2.36** | | | | | | | |
| **5.4.2.37 Fisheries/Aquatic Needs – Chinook Salmon** | | | | | | X | x |
| **5.4.2.38** | | | | | | X | x |
| **5.4.2.39** | | | | | | | x |
| **5.4.2.40** | | | | | | | x |
| **5.4.2.41** | | | | | | X | x |
| **5.4.2.42** | | | | | | | x |
| **5.4.2.43 Fisheries/Aquatic Needs – Coho Salmon** | | | | | | | |
| **5.4.2.44** | | | | | | | |
| **5.4.3.45** | | | | | | | |
| **5.4.2.46** | | | | | | | |
| **5.4.2.47** | | | | | | | |
| **5.4.2.48 Fisheries/Aquatic Needs – Summer Steelhead** | | | | | | | |
| **5.4.2.49** | | | | | | | |
| **5.4.2.50** | | | | | | | |
| **5.4.2.51** | | | | | | | |
| **5.4.2.52** | | | | | | | |
| **5.4.2.53** | | | | | | | |
| **5.4.2.54** | | | | | | | |
| **5.4.2.55** | | | | | | | |
| **5.4.2.56** | | | | | | | |
| **5.4.2.57 Fisheries/Aquatic Needs – Monitoring and Evaluation** | | | | | | | |
| **5.4.2.58** | | | | | | | |
| **5.4.2.59** | | | | | | | |
| **5.4.2.60** | | | | | | | |
| **5.4.2.61** | | | | | | | |
| **5.4.2.62 Fisheries/Aquatic Needs – Enforcement Education** | | | | | | | |
| **5.4.2.63** | | | | | | | |
| **5.4.3 Wildlife/Terrestrial Needs** | | | | | | | |
| **5.4.3.1 Wildlife/Terrestrial Needs – General** | | | | | | | |
| **5.4.3.2** | | | | | | | |
| **5.4.3.3** | | | | | | | |
| **5.4.3.4** | | | | | | | |
| **5.4.3.5** | | | | | | | |
| **5.4.3.6** | | | | | | | |
| **5.4.3.7** | | | | | | | |
| **5.4.3.8 Wild./Terr. Needs – Ponderosa Pine Communities** | | | | | | | |
| **5.4.3.9** | | | | | | | |
| **5.4.3.10** | | | | | | | |
| **5.4.3.11** | | | | | | | |
| **5.4.3.12** | | | | | | | |
| **5.4.3.13 Wildlife/Terrestrial Needs – Prairie Grasslands** | | | | | | | |
| **5.4.3.14** | | | | | | | |
| **5.4.3.15** | | | | | | | |
| **5.4.3.16** | | | | | | | |

| Project Proposal ID | 27010 | 27015 | 27016 | 199700900 | 199801003 | 199801004 | 199801005 199608600 |
|---|---|---|---|---|---|---|---|
| **5.4.3.17** | | | | | | | |
| **5.4.3.18** | | | | | | | |
| **5.4.3.19** | | | | | | | |
| **5.4.3.20** | | | | | | | |
| **5.4.3.21** | | | | | | | |
| **5.4.3.22 Wildlife/Terrestrial Needs – Riparian Communities** | | | | | | | |
| **5.4.3.23** | | | | | | | |
| **5.4.3.24** | | | | | | | |
| **5.4.3.25** | | | | | | | |
| **5.4.3.26** | | | | | | | |
| **5.4.3.27 Wildlife/Terrestrial Needs – Noxious Weeds** | | | | | | | |
| **5.4.3.28** | | | | | | | |
| **5.4.3.29** | | | | | | | |
| **5.4.3.30** | | | | | | | |
| **5.4.3.31 Wildlife/Terrestrial Needs – Late Seral Communities** | | | | | | | |
| **5.4.3.32** | | | | | | | |
| **5.4.3.33** | | | | | | | |
| **5.4.3.34** | | | | | | | |
| **5.4.3.35 Wildlife/Terrestrial Needs – Early Seral Communities** | | | | | | | |
| **5.4.3.36** | | | | | | | |
| **5.4.3.37 Wildlife/Terrestrial Needs – Fragmentation** | | | | | | | |
| **5.4.3.38** | | | | | | | |
| **5.4.3.39** | | | | | | | |
| **5.4.3.40** | | | | | | | |
| **5.4.3.41** | | | | | | | |
| **5.4.3.42** | | | | | | | |

Legend to Snake Hells Canyon Subbasin Needs (from, Draft Middle Snake Subbasin Assessment, 2001)

5.4.1 ..... Combined Aquatic and Terrestrial Needs

23. 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.
24. 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.
25. 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.
26. Coordinate M&E efforts at the subbasin and provincial scale to maximize effectiveness and minimize redundancy.
27. Continue ongoing, and establish new, monitoring and evaluation programs for fish supplementation, habitat restoration and improvement, habitat baseline conditions, water quality and water quantity improvements, conditions and trends. These M&E activities are critical to evaluating the effectiveness of projects in improving habitat, watershed health and enhancing production of target species.
28. Investigate effects of potential loss or lack of nutrients due to declines in anadromous salmonid populations, and coordinate and evaluate nutrient enhancement alternatives.
29. Complete road inventories and assess impacts to aquatic and terrestrial resources. Use information to facilitate transportation planning and to reduce road densities. Support planned road closures on public land and encourage closure of other roads.
30. Continue and expand 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.

31. 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).
32. Protect existing pristine and key fish and wildlife habitats directly threatened by subdivision, recreation, or extractive resource uses.
33. Complete detailed 6th code subwatershed assessments to ground-truth existing regional databases
34. Support timely updates and resource inventories related to local land use plans to further prevent degradation of floodplains, wetlands, riparian and other sensitive areas.
35. Continue to develop watershed assessments at multiple scales to facilitate integrated resource management and planning efforts.
36. Develop Federal Recovery Plans for threatened and endangered species to provide recovery guidance for state, tribal and local entities as required by law.

5.4.2 .....Fisheries / Aquatic Needs

**General**

7. Develop catchable fish ponds in the subbasin to provide fishing opportunities. Catchable fish ponds are needed to provide opportunity as more restrictive regulations are implemented to protect native fish species. They are also needed as resident fish substitution to partially mitigate for loss of anadromous fish caused by the permanent blockage at Dworshak Dam harvest .
8. Continue ongoing mitigation programs to provide sport and tribal fisheries
9. Ensure natural river strategy alternative is implemented as required for recovery of listed anadromous species.
10. Improve and maintain quality control of fish marking programs.
11. Re-establish a smolt trap facility on the lower Clearwater River to determine migration characteristics and timing, hatchery:wild ratio, and to implant and recover tags for in-basin and out-of-basin monitoring.

**Water Quality**

12. Continue coordinated temperature monitoring throughout the subbasin. Identify spatial and temporal gaps, establish additional flow and temperature gauging stations and upgrade existing to provide real-time data, and expand longitudinal profiles. Fish distribution and habitat quality are highly influenced by water temperature. This parameter most be monitored in both wilderness and managed watersheds to provide baselines to evaluate population recovery and watershed restoration activities.
13. Reduce stream temperature, sediment and embeddedness to levels meeting appropriate standards for supporting self sustaining populations of aquatic species.
14. Restore and augment streamflows at critical times using (but not limited to) water right leases, transfers, or purchases, and improved irrigation efficiency.
15. Reduce impacts from agricultural sediment, fertilizer, pesticide loading, confined animals operations, stormwater and road runoff, wastewater effluent, mining and logging.

**Habitat / Passage**

10 Protect and restore riparian and instream habitat structure, form and function to provide suitable holding, spawning and rearing areas for anadromous and resident fish.
11. Protect, restore and create riparian, wetland, and floodplain areas within the subbasin and establish connectivity.
12. Develop regional curves based on existing stream gauge data and specific to individual hydro-physiographic provinces within the basin for use as aids in channel morphology monitoring and in channel stream course modification/restoration. Where existing stream gauge data is not sufficient to develop regional curves, expand this network.
13. Restore a more normal hydrograph to altered watersheds by addressing land use activities through implementation of BMPs and other restoration strategies.
14. Inventory natural and artificial passage barriers within the subbasin and evaluate if removal or modification is warranted.
15. Investigate connectivity between populations and the role of natural and artificial barriers in population isolation. Remove or modify identified natural or artificial passage barriers where aquatic considerations have been met.
16. Complete culvert inventory and assess associated passage and flow issues. Evaluate whether removal or modifications are warranted.
17. Renovate the Selway Falls Fish tunnel to restore upstream passage for adult chinook, steelhead and Pacific lamprey into pristine habitat in the upper Selway River drainage.

**Genetic Conservation**

18. Continue gene conservation efforts (cryopreservation) for fall chinook salmon and steelhead in the subbasin.
19. Develop gene conservation efforts (cryopreservation) to preserve genetic diversity within the geographic population structure for bull trout and cutthroat trout. .....
20. Develop conservation hatcheries with native steelhead broodstock. .....

**Hatchery-Wild Interactions**

21. Continue and expand investigations of interactions between hatchery and wild chinook, steelhead, and resident fish. .....
22. Quantify the types and extent (amount) of straying by chinook and steelhead occurring within subbasins, within the Mountain Snake Province, and within designated ESUs. .....
23. Complete a province-wide chinook salmon genetic assessment which will provide a baseline for monitoring hatchery introgression into wild populations. .....
24. Continue and expand genetic profiling to define steelhead sub-populations within the subbasin to determine geographic structure, gene flow, genetic similarity and hatchery introgression into wild populations. .....

**Resident Fish**

25. Enhance and diversify the fishery within Dworshak Reservoir
26. Assess the status of native species that have received little attention to date. In particular, westslope cutthroat trout, bull trout, sand roller and Pacific lamprey appear to be well below historic population levels. Collect life history, distribution, abundance by life stage, genetic and homing behavior attributes. .....
27. Determine habitat requirements and limiting factors for Pacific lamprey production in the subbasin and assess the rehabilitation potential and process in the subbasin.
28. Determine habitat requirements, distribution, and limiting factors of sand roller.
29. Monitor impacts of illegal, incidental, sport and Tribal harvest on resident native populations.
30. 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.
31. Investigate the existence, life history, genetics of redband trout in the subbasin. Include populations in allopatry and sympatry with steelhead, identifying genetic and spatial segregation and overlap using current DNA-marker and GIS technology.
32. Determine how flow augmentation effects bull trout in the North Fork and Lower Clearwater Rivers.
33. Determine the extent and magnitude of entrainment of resident fish including bull trout and kokanee from Dworshak Dam and develop and implement methods to minimize entrainment as appropriate.
34. Monitor bull trout and westslope cutthroat trout population size in Dworshak Reservoir.
35. Determine and implement ways to increase the productivity of Dworshak Reservoir.
36. Develop more “fish friendly” operations at Dworshak Dam.

**Chinook Salmon (Includes all races unless specifically noted)**

37. Gather improved population status information for wild, natural and hatchery chinook salmon including life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. Mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program.
38. Calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
39. Monitor spring chinook by examining population trends and develop modeling and monitoring tools to determine out-of-basin impacts to Clearwater subbasin chinook.
40. Continue to monitor and evaluate impacts of Dworshak dam on spawning and rearing of fall chinook salmon in the Lower North Fork and mainstem Clearwater Rivers.
41. Continue evaluating reintroduction efforts for fall chinook salmon.
42. Determine the extent of natural production from outplanting hatchery adults

**Coho Salmon**

43. Continue to determine smolt-to-adult survival, survival factors, life history characteristics, and extent of natural production of hatchery origin coho salmon.
44. Continue to develop coho salmon adult spawner escapement and spawner numbers, spawner to spawner ratios, locations, and timing.
45. Determine the spatial distribution within streams and throughout the subbasin of adult coho salmon.
46. Monitor the inter-species specific interactions of coho salmon juveniles.

47. Examine the genetic stock structure of Clearwater River subbasin coho salmon in relation to initial broodstock.

**Summer Steelhead**

48. Determine smolt-to-adult return rates (SAR) for hatchery steelhead in the Clearwater River.
49. Gather improved wild, natural, and hatchery A-run and B-run steelhead population status information including tributary specific life history characteristics, juvenile and adult migration patterns, juvenile rearing areas, adult holding areas, survival factors, smolt-to-adult survival, adult spawner abundance, distribution, timing and parentage, spawning success, and spawner to spawner ratios. Improvements should include maximizing the use of spatial technology (GIS) in data collection. Mechanism is through continued and expanded Idaho Supplementation Studies and Idaho Natural Production Monitoring Program.
50. Validate index areas for summer steelhead to ensure they are appropriate measures of productivity.
51. Need to calculate returns per spawner from index surveys to determine if this relationship is improving as smolt passage facilities are modified at Columbia River dams.
52. Monitor adult movement to determine if and where passage impediments exist within the basin for summer steelhead.
53. Develop an evaluation program to determine the effectiveness of releasing unmarked hatchery steelhead to re-build runs in Clearwater River tributaries
54. Determine the efficacy of using dorsal fin erosion to identify un-marked hatchery steelhead.
55. Determine the extent of natural production from outplanting hatchery adults
56. Expand supplementation evaluation studies in the South Fork Clearwater River to address effectiveness of juvenile and adult steelhead outplants.

**Monitoring and Evaluation**

57. Develop appropriate intensity and spatial distribution of monitoring to estimate parr carrying capacity to compliment and enhance Natural Production Monitoring..
58. Refinement of aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts.
59. Develop a comprehensive M&E plan for Dworshak Dam operations.
60. Continue Nez Perce Tribal Hatchery Monitoring and Evaluation to determine hatchery chinook performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.
61. Continue Lower Snake River Compensation Hatchery Monitoring and Evaluation to determine hatchery chinook and steelhead performance, natural production responses, competitive interactions, harvest management and provide for applied adaptive management.

**Enforcement / Education**

62. Better educate the public on issues and policies important to natural resource restoration, protection, and enhancement to encourage meaningful public participation.
63. Continue and improve enforcement of laws and codes related to protection of fish, wildlife and their habitats, through coordinated conservation enforcement activities by the Nez Perce Tribe, state and Federal agencies.

### 5.4.3 ..... Wildlife / Terrestrial Needs

**General**

1. 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.
2. Research broad ecological relationships and identify limiting factors for focal and other wildlife species within the subbasin.
3. 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 assessment.
4. Address and mitigate hydropower impacts on loss of wildlife and wildlife habitat within the basin, based on species-specific habitat units.
5. Continue long-term landbird monitoring.
6. Assess predator impacts on big game and gain insight into predator/prey dynamics.
7. Cooperate on threatened, endangered, and sensitive species recovery or conservation strategy efforts in the subbasin.

**Ponderosa Pine Communities**

Due to the documented loss of ponderosa pine communities and associated terrestrial species as a result of logging and fire suppression, the following needs are identified

8. Inventory, map, and assess the distribution of ponderosa pine communities and associated wildlife and plant species.
9. Acquire lands on breaklands when opportunities arise for improved habitat protection, restoration, and connectivity for ponderosa pine communities and for mitigation of lost wildlife habitat for ponderosa pine associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
10. Restore ponderosa pine communities.
11. Create and maintain large diameter snags in ponderosa pine communities.
12. Develop an information and education stewardship program to foster ponderosa pine protection.

**Prairie Grasslands**

Due to the documented loss of prairie grasslands and associated terrestrial species as a result of agricultural activities and exotic weed invasions, the following needs are identified

13. Inventory, map and assess the distribution of prairie grasslands and associated wildlife and plant species.
14. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for prairie grasslands and for mitigation of lost wildlife habitat for prairie grassland associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
15. Restore prairie grasslands.
16. Investigate and develop appropriate and practical restoration techniques for prairie grasslands
17. Develop native plant nurseries for propagation and restoration
18. Seed-bank native prairie species.
19. Plan and develop for potential reintroduction of native prairie fauna.
20. Develop conservation plans for Jessica's aster and Palouse goldenweed.
21. Develop an information and education stewardship program to foster prairie grassland protection.

**Riparian Communities**

Due to the extensive degradation and loss of riparian and wetland communities, the following needs are identified

22. Inventory, map, and assess the distribution of riparian communities and associated wildlife and plant species.
23. Acquire lands when opportunities arise for improved habitat protection, restoration, and connectivity for riparian communities and for mitigation of lost wildlife habitat for riparian associated species (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
24. Protect, restore, and create wetland and riparian habitat in areas of greatest need.
25. Develop an information and education stewardship program to foster riparian community protection.
26. Develop riparian plant nursery for propagation and restoration of native communities.

**Noxious Weeds**

Due to the increase of noxious weeds and the resultant loss of productivity and biodiversity, the following needs are identified

27. Inventory and map the distribution of noxious weeds.
28. Develop and use restoration techniques for noxious weed infested communities.
29. Continue control programs for noxious weeds to restore natural habitat conditions and communities for wildlife species and improve watershed function.
30. Develop an information and education stewardship program for noxious weeds.

**Late Seral Communities**

Due to a significant reduction of late seral forest communities and associated terrestrial species, the following needs are identified

31. Inventory and map the distribution of all late successional habitats in the subbasin.
32. Investigate techniques and methods to retain late successional habitats on state and private lands (land exchanges, conservation easements).
33. Develop and implement management prescriptions to restore and promote late successional habitats.
34. Develop an information and education stewardship program to foster late seral community protection.

### Early Seral Communities

Due to a significant reduction of early seral forest communities and associated terrestrial species, the following needs are identified

35. Inventory and map the distribution of early seral communities.
36. Create and restore early seral habitats where fire suppression has resulted in heavy fuel loads using a variety of methods and techniques.

### Fragmentation

Habitat fragmentation from human activities have effected wildlife populations within the Clearwater subbasin, leading to the following needs being identified

37. Identify by county critical wildlife areas and plant communities.
38. Acquire critical habitats threatened by development when opportunities arise for improved habitat protection, restoration, and connectivity (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
39. Work with counties to support timely updates and resource inventories related to local land use plans to further prevent degradations of floodplains, wetlands, riparian, and other sensitive areas.
40. Reduce road densities through closures, obliteration, and reduced construction.
41. Improve enforcement of road closures.
42. Evaluate and mitigate fragmentation impacts from Dworshak Dam and Reservoir

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# Appendices

**Amphibians and Reptiles**

| | |
|---|---|
| Long-toed salamander | *Ambystoma macrodactylum* |
| Tiger salamander | *Ambystoma tigrinum* |
| Tailed frog | *Ascaphus truei* |
| Western toad | *Bufo boreas* |
| Rubber boa | *Charina bottae* |
| Painted turtle | *Chrisemys picta* |
| Racer | *Coluber constrictor* |
| Western rattlesnake | *Crotalus viridis* |
| Ringneck snake | *Diadophis punctatus* |
| Idaho giant salamander | *Dicamptodon aterrimus* |
| Northern alligator lizard | *Elgaria coerulea* |
| Western skink | *Eumeces skiltonianus* |
| Night snake | *Hypsiglena torquata* |
| Short-horned lizard | *Phrynosoma douglassi* |
| Gopher snake | *Pituophis catenifer* |
| Pacific tree frog | *Pseudacti regilla* |
| Bullfrog | *Rana catesbeiana* |
| Northern leopard frog | *Rana pipiens* |
| Spotted frog | *Rana pretiosa* |
| Sagebrush lizard | *Sceloporus graciosus* |
| Western fence lizard | *Sceloporus occidentalis* |
| Great Basin spadefoot toad | *Spea intermontana* |
| Western terrestrial garter snake | *Thamnophis elegans* |
| Common garter snake | *Thamnophis sirtalis* |

**Birds**

| | |
|---|---|
| Cooper's Hawk | *Accipiter cooperii* |
| Northern Goshawk | *Accipiter gentilis* |
| Sharp-shinned hawk | *Accipiter striatus* |
| Northern Saw-whet Owl | *Aegolius acadicus* |
| White-throated Swift | *Aeronautes saxatilis* |
| Chukar | *Akctoris chukar* |
| Grasshopper Sparrow | *Ammodramus savannarum* |
| American wigeon | *Anas americana* |
| Green-winged teal | *Anas crecca* |
| Mallard | *Anus platyrhynchos* |
| Golden Eagle | *Aquila chrysaetos* |
| Great Blue Heron | *Ardea herodias* |
| Short-eared Owl | *Asio flammeus* |

| | |
|---|---|
| Long-eared Owl | *Asio otus* |
| Ruffed Grouse | *Bonasa umbellus* |
| Canada Goose | *Branta canadensis* |
| Bufflehead | *Bucephala albeola* |
| Common goldeneye | *Bucephala clangula* |
| Red-tailed Hawk | *Buteo jamaicensis* |
| Rough-legged Hawk | *Buteo lagopus* |
| Ferruginous Hawk | *Buteo regalis* |
| Swainson's Hawk | *Buteo swainsoni* |
| Pine Siskin | *Cardeuelis pinus* |
| American Goldfinch | *Cardeuelis tristis* |
| Common Redpoll | *Carduelis flammea* |
| Cassin's Finch | *Carpodacus cassinii* |
| House Finch | *Carpodacus mexicanus* |
| Purple Finch | *Carpodacus pupureus* |
| Brown Creeper | *Certhia americana* |
| Vaux'sSwift | *Chaetura vauxi* |
| Lark Sparrow | *Chondestes grammacus* |
| Common Nighthawk | *Chordeiles minor* |
| Northern Harrier | *Circus cyaneus* |
| Northern Flicker | *Colaptes auratus* |
| Olive-sided Flycatcher | *Contopus borealis* |
| Western Wood-Pewee | *Contopus sordidulus* |
| American Crow | *Corvus brachyrhnchos* |
| Common Raven | *Corvus corax* |
| Blue Jay | *Cyanocita cristata* |
| Blue Grouse | *Dendrogapus obscurus* |
| Bobolink | *Dolichonyx oryzivorus* |
| Pileated Woodpecker | *Dryocopus pileatus* |
| Hammond's Flycatcher | *Empidonax hammondii* |
| Dusky Flycatcher | *Empidonax oberholseri* |
| Cordilleran Flycatcher | *Empidonax occidentalis* |
| Willow Flycatcher | *Empidonax traillii* |
| Homed Lark | *Eremophilia alpestris* |
| Brewer's Blackbird | *Euphagus cyanocephalus* |
| Merlin | *Falco columbus* |
| Prairie Falcon | *Falco mexicanus* |
| American Kestrel | *Falco sparverius* |
| Common Snipe | *Gallinago gallinago* |
| Northern Pygmy-Owl | *Glaucidium gnoma* |
| Bald Eagle | *Haliaeetus leucocephalus* |

| | |
|---|---|
| Barn Swallow | *Hirundo rustica* |
| Yellow-breasted Chat | *Icteria virens* |
| Northern Oriole | *Icterus galbula* |
| Dark-eyed Junco | *Junco hyemalis* |
| Ring-billed Gull | *Larus delawarensis* |
| Rosy Finch | *Leucosticte arctoa* |
| Red Crossbill | *Loxia curvirostra* |
| White-winged Crossbill | *Loxia leucoptera* |
| Wild Turkey | *Meleagris gallopavo* |
| Lincoln's Sparrow | *Melospiza lincolnii* |
| Song Sparrow | *Melospiza melodia* |
| Common merganser | *Mergus merganser* |
| Brown-headed Cowbird | *Molothrus ater* |
| Clark's Nutcracker | *Nucifraga columbiana* |
| Mountain Quail | *Oreortyx pictus* |
| Osprey | *Pandion haliaetus* |
| Black-capped Chickadee | *Parus atricaphillus* |
| Mountain Chickadee | *Parus gambeli* |
| Chestnut-backed Chickadee | *Parus rufescens* |
| Savannah Sparrow | *Passerculus sandwichensis* |
| Fox Sparrow | *Passerella iliaca* |
| Lazuli Bunting | *Passerina amoena* |
| Gray Jay | *Perisoeus canadensis* |
| Common Poorwill | *Phalenoptilus nuttallii* |
| Ring-necked Pheasant | *Phasianus colchicus* |
| Black-headed Grosbeak | *Pheuticus melanocephalus* |
| Black-billed Magpie | *Pica pica* |
| White-headed Woodpecker | *Picoides albolarvatus* |
| Black-backed Woodpecker | *Picoides arcticus* |
| Pine Grosbeak | *Pinicola enucleator* |
| Rufous-sided Towhee | *Pipilo erythrophthalmus* |
| Western Tanager | *Piranga ludoviciana* |
| Snow Bunting | *Plectrophenax nivalis* |
| Vesper Sparrow | *Pooecetes gramineus* |
| Bank Swallow | *Riparia riparia* |
| Rock Wren | *Salpinctes obsoletus* |
| Say's Pheobe | *Sayornis saya* |
| Red-breasted Nuthatch | *Sitta canadensis* |
| White-breasted Nuthatch | *Sitta carolinensis* |
| Pygmy Nuthatch | *Sitta pygmue* |
| Burrowing Owl | *Speotyto canicularia* |

| | |
|---|---|
| American Tree Sparrow | *Spizella arborea* |
| Brewer's Sparrow | *Spizella breweri* |
| Chipping Sparrow | *Spizella passerina* |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* |
| Great Gray Owl | *Strix nebulosa* |
| Bard Owl | *Strix varia* |
| Western Meadowlark | *Stumella neglecta* |
| Tree Swallow | *Tachycineta bicolor* |
| Violet-green Swallow | *Tachycineta thalassina* |
| Greater Yellowlegs | *Totanus melanoleucus* |
| Barn Owl | *Tyto alba* |
| Yellow-headed Blackbird | *Xanthocephalus xanthocephalus* |
| Mourning Dove | *Zenaida macmum* |
| White-crowned Sparrow | *Zonotrichia leucophrys* |
| Harris' Sparrow | *Zonotrichia querula* |
| Spotted Sandpiper | *Actitus macularia* |
| Red-winged Blackbird | *Agelaius phoeniceus* |
| Northern pintail | *Anas acuta* |
| American Pipit | *Anthus spincletta* |
| Black-chinned Hummingbird | *Archilochus alexandri* |
| Cedar waxwing | *Bombycilla cedorum* |
| Bohemian Waxwing | *Bombycilla garrulus* |
| Great-homed Owl | *Bubo virginianus* |
| Lapland Longspur | *Calcarius lapponicus* |
| California Quail | *Callipepla californica* |
| Turkey Vulture | *Cathartes aura* |
| Veery | *Catharus fuscescens* |
| Hermit Thrush | *Catharus guttatus* |
| Swainson’s Thrush | *Catharus ustulatus* |
| Canyon Wren | *Catherpes mexicanus* |
| Belted Kingfisher | *Ceryle alcyon* |
| Killdeer | *Charadrius vociferus* |
| American Dipper | *Cinclus mexicana* |
| Evening Grosbeak | *Coccothrastes vespertinus* |
| Yellow-billed cuckoo | *Coccyzus americanus* |
| Black-billed cuckoo | *Coccyzus erythropthalmus* |
| Rock Dove | *Columba livia* |
| Steller's Jay | *Cyanocita stelleri* |
| Black Swift | *Cypseloides niger* |
| Yellow-rumped Warbler | *Dendroica coronata* |
| Yellow Warbler | *Dendroica petechia* |

| | |
|---|---|
| Townsend's Warbler | *Dendroica townsendi* |
| Gray Catbird | *Dumetella carolinenis* |
| Peregrine Falcon | *Falco peregrinus* |
| Common Yellowthroat | *Geothylpis trichas* |
| Cliff Swallow | *Hirundo pyrrhonota* |
| Varied Thrush | *Ixoreus naevius* |
| Northern Shrike | *Lanius excubitor* |
| Loggerhead Shrike | *Lanius ludovicianus* |
| Herring Gull | *Larus argentatus* |
| California Gull | *Larus californicus* |
| Lewis' Woodpecker | *Melanerpes lewis* |
| Northern Mockingbird | *Mimus polyglottos* |
| Townsend's Solitaire | *Myadestes townsendi* |
| MacGillivray's Warbler | *Oporomis tolmiei* |
| Sage Thrasher | *Oreoscoptes montanus* |
| Flammulated Owl | *Otus flammeolus* |
| Western Screech Owl | *Otus kenniwtti* |
| House Sparrow | *Passer domesticus* |
| Gray Partridge | *Perdix perdix* |
| Downy Woodpecker | *Picoides pubescens* |
| Hairy Woodpecker | *Picoides villosus* |
| Ruby-crowned Ringlet | *Regulus calendula* |
| Golden-crowned Ringlet | *Regulus satrapa* |
| Broad-tailed Hummingbird | *Selasophomus platycercus* |
| Rufous Hummingbird | *Selasphorus rufus* |
| American Redstart | *Setophaga ruticilla* |
| Mountain Bluebird | *Sialia currucoides* |
| Western Bluebird | *Sialia mexicana* |
| Williamson's Sapsucker | *Sphyrapicus thyroideus* |
| Calliope Hummingbird | *Stellula calliope* |
| European Starling | *Sturnus vulgaris* |
| Red-naped Sapsucker | *Syhympicus nuchalis* |
| House Wren | *Troglodytes aedon* |
| Winter Wren | *Troglodytes troglodytes* |
| American Robin | *Turdus migratorius* |
| Eastern Kingbird | *Tyrannus tyrannus* |
| Western Kingbird | *Tyrannus verticalis* |
| Nashville Warbler | *Venniwra ruficapilla* |
| Orange-Crowned Warbler | *Vermivora celata* |
| Warbling Vireo | *Vireo gilvus* |
| Red-eyed Vireo | *Vireo olivaceus* |

| | |
|---|---|
| Solitary Vireo | *Vireo solitatius* |
| Wilson's Warbler | *Wilsonia pusilla* |
| **Mammals** | |
| Moose | *Alces alces* |
| Pallid bat | *Antrowus pallidus* |
| Coyote | *Canis latrans* |
| Beaver | *Castor canadensis* |
| Elk | *Cervus elaphus* |
| Southern red-backed vole | *Clethrionomys gapperi* |
| Big brown bat | *Eptesicu fuscus* |
| Porcupine | *Erethizon dorsatum* |
| Spotted bat | *Euderma maculata* |
| Yellow-pine chipmunk | *Eutamias anwenus* |
| Red-tailed chipmunk | *Eutamius ruficaudus* |
| Mountain lion | *Felis concolor* |
| Lynx | *Felis lynx* |
| Bobcat | *Felis rufus* |
| Northern flying squirrel | *Glaucomys sabrinus* |
| Little brown myotis | *Iuyotis lucifugus* |
| Silver-haired bat | *Lasionycteris noctivagans* |
| Hoary bat | *Lasiurus cinereus* |
| Snowshoe hare | *Lepus americanus* |
| White-tailed jackrabbit | *Lepus townsendii* |
| River otter | *Lutra canadensis* |
| Yellow-bellied marmot | *Marmota flaviventris* |
| Marten | *Martes americana* |
| Striped skunk | *Mephitis mephitis* |
| Pygmy shrew | *Microsorex hoyi* |
| Long-tailed vole | *Microtus longicaudus* |
| Montane vole | *Microtus montanus* |
| House mouse | *Mus musculus* |
| Ermine | *Mustela erminea* |
| Long-tailed weasel | *Mustela frenata* |
| Mink | *Mustela vision* |
| California myotis | *Myotis californicus* |
| Small-footed myotis | *Myotis ciliolabrum* |
| Long-eared myotis | *Myotis evotis* |
| Fringed myotis | *Myotis thysanodes* |
| Long-legged myotis | *Myotis volans* |
| Yuma myotis | *Myotis yumanensis* |
| Bushy-tailed woodrat | *Neotoma cinerea* |

| | |
|---|---|
| Mule deer | *Odocoileus hemionus* |
| White-tailed deer | *Odocoileus virginianus* |
| Muskrat | *Ondatra zibethicus* |
| Bighorn sheep | *Ovis canadensis* |
| Great basin pocket mouse | *Perognathus parvus* |
| Deer mouse | *Peromyscur maniculatus* |
| Western pipistrelle | *Pipstrellus hesperus* |
| Townsend's big-eared bat | *Plecotus townsendii* |
| Raccoon | *Procyon lotor* |
| Western harvest mouse | *Reithrodontomys megalotis* |
| Coast mole | *Sapanus orarius* |
| Masked shrew | *Sorex cinereus* |
| Dusky shrew | *Sorex monticolus* |
| Water shrew | *Sorex palustris* |
| Preble's shrew | *Sorex preblii* |
| Vagrant shrew | *Sorex vagrans* |
| Merriam's shrew | *Sortx merriami* |
| Columbian ground squirrel | *Spermophilus columbianus* |
| Golden-mantled ground squirrel | *Spermophilus lateralis* |
| Spotted sunk | *Spilogale gracilis* |
| Mountain cottontail | *Sylvilagus nuttallii* |
| Red squirrel | *Tamiasciurus hudsonicus* |
| Badger | *Taxidea taxus* |
| Northern pocket gopher | *Thomomys talpoides* |
| Black bear | *Ursus americanus* |
| Red fox | *Vulpes vulpes* |
| Western jumping mouse | *Zapus princeps* |

Appendix B - Attributes of Idaho subwatersheds as they relate to bull trout threats (lower Snake Hells Canyon subbasin) (reproduced from Idaho Department of Environmental Quality 1998)

| **Sub-Watershed Name** ($5^{th}$, $6^{th}$, and $7^{th}$ code HUC) | **HUC Code** | **Area of Sub-Watershed** (Acres) a=approx. | **Ownership** list in order of most ownership<br>1=USFS<br>2=BLM<br>3=COE<br>4=IDL<br>5=IDFG<br>6=Plum Creek<br>7=Potlatch<br>8=Other | **Bull Trout Distribution** | | **Threats to Bull Trout** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Current** (Since 1985) | **Historic** (Prior to 1985)<br>SER=Spawning / Early Rearing<br>SAR=Sub Adult and Adult Rearing<br>SNF=Surveyed Not Found<br>DNP=Documented Not Present<br>SSR=Suspected Spawning/Rearing<br>SNP=Suspected Not Present<br>UKN=Unknown | **Passage Barrier**<br>C=Culvert<br>D=Dam<br>I=Irrigation Diversion<br>(include number that occur) | **Illegal Harvest**<br>H=Hi impact<br>L=Low impact<br>N=No impact | **Brook Trout**<br>Y=Yes<br>N=No<br>U=Unknown | **Roads**<br>Miles/Sq Mile | **Timber Harvest**<br>Percent Cut<br>0-15%<br>15-25%<br>25-50%<br>50-75%<br>75-100% |
| Snake River | 0000 | 455,040 | 8,1,5,2,4 | SAR | SAR | | L | Y | 1-3/m2 | <5% |
| Tammany Creek | 0101 | 20,500 a | 8<br>Private | SNF | SNF | | N | N | >3/m2 | 0% |
| Tenmile | 0202 | 8,320 a | 8 | SNF | SNF | | N | N | 1-3/m2 | 0% |
| Redbird Creek | 0201 | 5,760 a | 8,5 | SNF | SNF | | N | N | <1/m2 | 0% |
| Captain John Creek | 0302 | 16,720 | 5,2,4,8 | SNF | SNF | | N | N | 1-3/m2 | 0-15%% |
| Corral Creek | 0403 | 5,120 a | 2,5,8 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Cottonwood Creek | 0501 | 5,760 a | 1,2,4,5,8 | SNF | SNF | | N | N | <1/m2 | 0% |

Appendix C - Attributes of Idaho subwatersheds as they relate to bull trout threats (upper Snake Hells Canyon subbasin) (reproduced from Idaho Department of Environmental Quality 1998)

| **Sub-Watershed Name** (5th, 6th and 7th code HUC) | **HUC Code** | **Area of Sub-Watershed** (Acres) a=approx. | **Ownership** list in order of most ownership 1=USFS 2=BLM 3=COE 4=IDL 5=IDFG 6=Plum Creek 7=Potlatch 8=Other | **Bull Trout Distribution** | | **Threats to Bull Trout** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **Current** (Since 1985) | **Historic** (Prior to 1985) | **Passage Barrier** C=Culvert D=Dam I=Irrigation Diversion (include number that occur) | **Illegal Harvest** H=Hi impact L=Low impact N=No impact | **Brook Trout** Y=Yes N=No U=Unknown | **Roads** Miles/Sq Mile | **Timber Harvest** Percent Cut <15% 15-25% 25-50% 50-75% 75-100% |
| | | | | SER=Spawning / Early Rearing SAR=Sub Adult and Adult Rearing SNF=Surveyed Not Found DNP=Documented Not Present SSR=Suspected Spawning/Rearing SNP=Suspected Not Present UKN=Unknown | | | | | | |
| Snake River | 0000 | 348,800 | 1,8,4,2 | SAR | SAR | Dam | L | Y | 1-3/m2 | <5% |
| Divide Creek | 0201 | 19,738 | 8,4,2,1 | SNF | SNF | | N | N | 1-3/m2 | <10% |
| Dry Creek | 0103 | 7,040 a | 8,2 | SNF | SNF | | N | N | <1/m2 | 0 |
| Wolf Creek | 0301 | 26,740 | 8,4,2 | SNF | SNF | | N | N | 1-3/m2 | <15% |
| Getta Creek | 0402 | 11,520 a | 8,2,4,1 | SNF | SNF | | N | N | 1-3/m2 | <15% |
| Highrange Creek | 0401 | 3,840 a | 8,2,1 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Big Canyon Creek | 0501 | 6,600 a | 1,8 | SNF | SNF | | N | N | <1/m2 | <5% |
| Kurry Creek | 0502 | 5,440 a | 1 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Klopton Creek | 0503 | 4,350 a | 1 | SNF | SNF | | N | N | <1/m2 | <5% |
| Kirkwood Creek | 0602 | 9,280 a | 1,8 | SNF | SNF | | N | N | 1-3/m2 | <5% |
| Sheep Creek | 0702 | 24,580 a | 1,8 | SER | SER | | L | N | <0.5/m2 | <5% |
| Bernard Creek | 0801 | 5,060 a | 1 | SNF | SNF | | N | N | 0/m2 | 0 |
| Granite Creek | 0901 | 20,800 a | 1 | SER | SER | | L | N | 0/m2 | 0 |

Appendix D - Noxious weed species occurrence in the counties partially contained by the Snake Hells Canyon subbasin .

| Genus | Species | Common Name | Noxious In | Asotin | Adams | Idaho | Nezperce | Wallowa |
|---|---|---|---|---|---|---|---|---|
| Abutilon | theophrasti | velvetleaf | OR,WA | | | X | | |
| Agropyron | repens | quackgrass | OR | X | | X | X | |
| Ambrosia | artemisiifolia | common ragweed | OR | | | X | X | |
| Anchusa | officinalis | common bugloss | WA | | | | | X |
| Arctium | minus | common burdock | WY | | | X | X | |
| Artemisia | absinthium | absinth woodworm | WA | X | | X | | X |
| Bryonia | alba | white bryony | WA | | | | X | |
| Cardaria | draba | hoary cress | ID,OR,WA | X | X | X | X | X |
| Carduus | pycnocephalus | Italian thistle | OR,WA | | | X | | |
| Carduus | nutans | musk thistle | ID,OR,WA, | | | X | X | X |
| Carduus | acanthoides | plumeless thistle | WA | | | X | X | |
| Cenchrus | longispinus | longspine sandbur | WA | X | | X | X | X |
| Centaurea | macrocephala | bighead knapweed | OR,WA | | | X | | |
| Centaurea | nigra | black knapweed | WA | | | X | | |
| Centaurea | diffusa | diffuse knapweed | ID,OR,WA | X | X | X | X | X |
| Centaurea | calcitrapa | purple starthistle | OR,WA | X | | | | |
| Centaurea | repens | Russian knapweed | ID,OR,WA, | X | X | X | X | |
| Centaurea | maculosa | spotted knapweed | ID,OR,WA, | X | X | X | X | X |
| Centaurea | solstitialis | yellow starthistle | ID,OR,WA | X | X | X | X | X |
| Chaenorrhinum | minus | dwarf snapdragon | WA | | | X | X | |
| Chondrilla | juncea | rush skeletonweed | ID,OR,WA | X | X | X | X | X |
| Chrysanthemum | leucanthemum | oxeye daisy | WA | X | X | X | X | X |
| Cirsium | | bull thistle | OR,WA | X | X | X | X | X |
| Cirsium | arvense | Canada thistle | ID,OR,WA | X | X | X | X | X |
| Conium | maculatum | poison hemlock | ID,OR,WA × | X | | X | X | X |
| Convolvulus | arvensis | field bindweed | ID,OR,WA | | | X | X | X |
| Crupina | vulgaris | common crupina | ID,OR,WA | | | X | X | |
| Cynoglossum | officinale | houndstongue | OR,WA | X | | X | X | X |
| Cytisus | scoparius | Scotch broom | ID,OR,WA | | | X | | |
| Daucus | carota | wild carrot | WA | | X | X | | X |
| Echium | vulgare | blueweed | WA | | | X | | |
| Equisetum | arvense | field horsetail | OR | X | | X | | X |
| Equisetum | telmateia | giant horsetail | OR | | | X | | |
| Euphorbia | esula | leafy spurge | ID,OR,WA | X | X | X | X | X |
| Euphorbia | dentata | toothed spurge | ID | | | X | | |
| Hieracium | aurantiacum | orange hawkweed | ID,WA | | X | X | | |
| Hyoscyamus | niger | black henbane | ID,WA | | | | X | X |
| Hypericum | perforatum | St. Johnswort | OR,WA | X | X | X | X | X |
| Hypochaeris | radicata | spotted cats ear | WA | | | X | | |
| Isatis | tinctoria | dyer's woad | ID,OR,WA | | X | X | | |
| Kochia | scoparia | kochia | OR,WA | X | | | | X |
| Lepidium | latifolium | perennial pepperweed | ID,OR,WA | X | X | | X | |
| Lepyrodiclis | holosteoides | lepyrodiclis | OR,WA | | | | X | |
| Linaria | dalmatica | dalmatian toadflex | ID,OR,WA | X | X | X | X | X |

| Genus | Species | Common Name | Noxious In | Asotin | Adams | Idaho | Nezperce | Wallowa |
|---|---|---|---|---|---|---|---|---|
| Linaria | vulgaris | yellow toadflax | ID,OR,WA | | X | X | X | X |
| Lythrum | salicaria | purple loosestrife | ID,OR,WA, | | X | X | | |
| Matricaria | maritima | scentless chamomile | WA | | | | X | |
| Milium | vernale | spring millet grass | ID | | | X | | |
| Mirabilis | nyctaginea | wild four o'clock | WA | | | | X | |
| Myriophyllum | brasiliense | parrotfeather | WA | | | | X | |
| Onopordum | acanthium | Scotch thistle | ID,OR,WA | X | X | X | X | X |
| Panicum | miliaceum | wild proso millet | OR | | | X | X | |
| Phalaris | arundinacea | reed canary grass | WA | X | X | X | X | |
| Polygonum | sachalinense | giant knotweed | OR,WA | | | X | | X |
| Polygonum | cuspidatum | Japanese knotweed | OR,WA | | | X | X | |
| Potentilla | recta | sulfur cinquefoil | OR,WA | | | X | X | |
| Rubus | discolor | Himalaya blackberry | OR | X | | X | X | X |
| Salvia | sclarea | clary sage | WA | | X | X | | |
| Salvia | pratensis | meadow sage | WA | | X | X | | |
| Salvia | aethiopis | Mediterranean sage | OR,WA | | X | X | | |
| Secale | cereale | cultivated rye | WA | | | X | X | |
| Senecio | jacobaea | tansy ragwort | ID,OR,WA | | | | | X |
| Silene | latifolia | white catchfly | WA | X | | X | X | X |
| Solanum | rostratum | buffalobur | ID,OR,WA | X | | X | X | X |
| Solanum | elaeagnifolium | silverleaf nightshade | ID,OR,WA | X | | X | | |
| Sonchus | arvensis | perennial sowthistle | ID,WA | | | | | X |
| Sorghum | halepense | Johnsongrass | ID,OR,WA × | X | | X | | |
| Taeniatherum | caput-medusae | medusahead | OR | X | | | X | X |
| Tamarix | spp. | tamarix complex | WA | X | | | | |
| Tanacetum | vulgare | common tansy | WA | X | | X | | |
| Torilis | arvensis | field hedge-parsley | WA | | | X | | |
| Tribulus | terrestris | puncturevine | ID,OR,WA × | X | | X | X | X |
| Xanthium | spinosum | spiny cocklebur | OR,WA | X | X | X | X | |