Supplement to The Snake Hells Canyon Subbasin Plan

Introduction

This document was written by Darin Saul and Anne Davidson of Ecovista to summarize and clarify information presented in the May 2004 draft *Snake Hells Canyon Subbasin Assessment* and *Snake Hells Canyon Subbasin Management Plan* prepared for the Northwest Power and Conservation Council in May of 2004. Information that provides context, additional detail, supporting data and references can be found in those documents (available at www.nwppc.org). Information in this supplement was reviewed and edited by the Hells Canyon Planning Team during the fall of 2004.

This supplement is presented in four sections that correspond to information requested by the Northwest Power and Conservation Council. Section I summarizes factors limiting aquatic and terrestrial species in the Snake Hells Canyon subbasin. Section II summarizes the prioritization of these limiting factors. The third section identifies objectives and strategies from the Snake Hells Canyon Subbasin Management Plan. Section IV describes the prioritization of strategies.

I. Key factors limiting the biological potential of selected focal species in the subbasin

During the assessment process, a number of issues emerged as having a significant impact on focal wildlife and fish species in the subbasin. These issues were identified as limiting factors in the assessment and are discussed below. Some of these limiting factors are influenced primarily by events outside of the subbasin (out of subbasin impacts), while others are influenced by activities within the subbasin (in subbasin limiting factors).

Out of subbasin impacts.

Aquatics **(See Assessment 193-195)**

Impacts from the hydropower system combined with fluctuations of ocean productivity have caused severe declines in productivity and survival rates of Snake River anadromous stocks. The overall survival decline of Snake River stocks is consistent primarily with hydrosystem impacts and poorer ocean conditions rather than with large-scale impacts within the subbasins between the 1960s and the present. Improvements within the subbasins alone are unlikely to increase survival to a level that ensures recovery of anadromous populations. The hydropower system keeps yearly effective population size low and increases genetic and demographic risk of localized extinction. The hydrosystem causes direct, indirect, or delayed mortality, mainly to emigrating juveniles. Hydropower development increases mortality in Snake River stocks of spring/summer chinook and blocks access to important spawning and rearing habitat. Hells Canyon Dam has blocked upstream passage, eliminating species use of upstream habitats. The Snake River stocks have been disproportionately impacted by the hydropower system, as compared to other areas of the Columbia River system.

Out of subbasin predation also potentially limits all anadromous fish, though only fall chinook have been the focus of studies. Substantial predation by pikeminnow throughout all or portions of the downstream migration corridor occurs. Additional predators found to consume considerable numbers of outmigrating subyearling chinook and steelhead include walleye, channel catfish, Pacific lamprey, yellow perch, smallmouth bass, northern pike, and bull trout. Several avian and marine mammal species represent additional threats to chinook and steelhead.

Out of subbasin harvest may have had substantial impacts on Hells Canyon populations. 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.

Bull trout and white sturgeon are thought to be limited by a loss of prey base due to declines in anadromous fish production in the subbasin and by loss of passage and connectivity out of the subbasin. Sturgeon is limited by the one way nature of passage outside of the subbasin. They can migrate downstream, but are unable to travel upstream through the dams.

Wildlife (see Assessment 208-209)

Many of the wildlife species of the Snake Hells Canyon subbasin spend a portion of their life cycle outside the subbasin boundaries. This can complicate and potentially reduce the effectiveness of wildlife management actions in the subbasin. Depending on the extent, location, and timing of seasonal movements, out of subbasin effects may range from limited to substantial.

Migratory birds are the species that travel the greatest distance outside of the subbasin. Two of the focal species (flammulated owl and grasshopper sparrow) in the subbasin are neotropical migrants that breed in the subbasin and winter in Mexico or Central America. Environmental toxins and habitat degradation in these species' winter habitats have the potential to negatively impact these populations.

Many other species in the subbasin move smaller distances out of the subbasin. Large game species, including bighorn sheep, mountain goat, Rocky Mountain elk, and mule deer, may migrate into and out of the subbasin. This commonly results in crossing wildlife management units, and potentially state boundaries, and can complicate the setting of appropriate hunting seasons and harvest limits. Game species may experience greater hunting pressure when they move out of the subbasin into the more populated surrounding areas. Other potential out of subbasin impacts to game species include increased contact between bighorn sheep and domestic sheep and increased potential for disease transmission.

Species may migrate out of the subbasin in search of habitat and forage, and finding high quality habitat may allow for increased populations in the subbasin, while use of unsuitable habitats may result in reduced populations. Agricultural areas are very limited in the subbasin but elk, and particularly mule deer, may migrate outside of the subbasin and forage on private agricultural lands. This results in reduced social carrying capacity and in public pressure to reduce population management objectives. The relatively high quality grassland habitats of the subbasin provide suitable breeding habitats for grasshopper sparrow. But grasshopper sparrows are also documented to use agricultural areas and hayfields. These areas are not as suitable for breeding grasshopper sparrows and may serve as population sinks.

Species with very large home ranges that occur in low densities may migrate into and out of the subbasin in search of prey and mates. Fisher, marten, lynx and wolverine are species with large home range sizes that may inhabit the Snake Hells Canyon subbasin. Maintaining and enhancing the integrity of movement corridors may prove critical to maintaining genetic diversity and healthy populations of these species.

In subbasin Limiting Factors

Aquatic (see Assessment 196-207)

Mainstem habitats (Assessment 196-202)

All aquatic focal species have been limited by factors in mainstem habitats in the Snake Hells Canyon subbasin. Mainstem habitats have been degraded by water quality, changes in base flow and flow variation, bedload, connectivity/passage, hatchery influence, predation, harassment and competition.

Hydropower impacts

Upstream hydropower development impacts all aquatic focal species in the subbasin with major impacts on species that primarily use the mainstem Snake River for much of their life history, particularly fall chinook and white sturgeon. Fall chinook, and likely white sturgeon, are limited through inundation of preferred spawning and rearing habitats and through changes in flow and thermal regimes during migration. Changes to habitat resulting from upstream hydropower development have affected spawn timing, spawning location, and outmigration success of fall chinook in the subbasin. Reduced summer temperatures have restricted fall chinook spawning areas and are suboptimal for spring/summer chinook rearing. Sediments are deficient in the Snake River below Hells Canyon Dam to the mouth of the Salmon River due to the trapping of suspended sediment and bedload by upstream dams, reducing the amount of substrate important for riparian growth and reducing availability of some suitable habitats for fish. Below the Salmon River, increased sediment deposition in the mainstem Snake River substrate may limit spawning and rearing success. Total dissolved gas has been recommended for listing and may also limit fish populations.

Historically, the mainstem Snake River served as significant rearing and migratory habitat for fall chinook, spring chinook and steelhead moving into the subbasin from upstream. Loss of seeding from upstream has eliminated this component of productivity in the subbasin. Although modified, the mainstem habitat generally remains intact. Efforts are underway to maintain some level of natural productivity based on seeding within the subbasin.

Hydropower projects have physically isolated white sturgeon populations within Snake Hells Canyon subbasin, and, by modifying flows, may limit spawning and incubation success, alter thermal regimes, and decrease the amount of nutrients flowing through the subbasin. Loss of prey may limit white sturgeon in the Snake Hells Canyon subbasin, although this has not been clearly defined. White sturgeon may be limited by reductions or losses of certain life history pathways, although the mechanism by which habitat condition is restricting the population is unclear.

Inadequate water quality and flow may jeopardize bull trout access to smaller systems reliant on the refounding capacity of fluvial fish and limit utilization of mainstem habitat. Loss of prey base may also be limiting bull trout.

Harvest

Fall chinook may be limited by incidental harvest and through incidental harassment by boaters during certain life stages (e.g., during spawning). In subbasin harvest is considered a minor threat to wild chinook salmon.

Predation

Predation in Snake Hells Canyon subbasin is a potential limiting factor to anadromous species. Predation of juvenile fall chinook by smallmouth bass was greatest near hatchery release sites, although the overall impact of smallmouth bass predation within the Snake Hells Canyon subbasin was considered low and infrequent.

Hatcheries

The wild component of the Snake River spring/summer and fall chinook ESUs are currently considered to be at some risk of extinction in part to the influence of hatcheries. The effectiveness of hatchery fish spawning in the wild has been considered to influence the growth rate of wild spring/summer and fall chinook.

Tributary habitats

Tributary habitats within the subbasin are limited in both quantity and quality. 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. Tributary habitats below the Salmon River confluence have been degraded by road construction, timber harvest, development in riparian areas and floodplains, livestock grazing, mining, recreation and water uses. These land uses have impacted water quality, water quantity, and habitat diversity and quality, thereby limiting the amount and availability of migratory, spawning, and rearing habitat for spring/summer chinook, bull trout, and steelhead. Many tributaries have elevated levels of sediment and high summer water temperatures or low summer flows. High-flow events have also resulted in habitat degradation by scouring spawning substrate, filling pool habitat and, in some cases, exporting large organic material.

Wildlife (see Assessment 209-229)

Riparian, Wetland and Spring Degradation

Riparian habitats in the Snake Hells Canyon subbasin have been altered through various human activities, most notably upstream hydropower development and livestock grazing. Riparian and wetland habitats are very important to both terrestrial and aquatic communities in the subbasin and these changes have the potential to impact numerous species. Twenty-eight concern or focal species have been identified as closely associated with the herbaceous wetland or interior riparian wetland Wildlife Habitat Types (WHTs).

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 spatial distribution of fluvial and alluvial features, including beaches, within Hells Canyon.

Heavy grazing has also impacted the health of the riparian communities in the subbasin. Poor shrub regeneration was observed in the Craig Mountain area in riparian and shrubby draw habitats heavily used by livestock, reducing the suitability of these areas for yellow warblers and other shrub nesting birds. Impacts to hackberry communities along the Snake River is particularly damaging because of the many bird and other small animals that feed on their berries. Grazing pressure has aided in the colonization of the subbasin's riparian zones by nonnative species. Conditions in riparian zones in the subbasin have generally improved in recent years and continue to exhibit an upward trend in many areas.

Loss and degradation of grassland habitats

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. Approximately 41,639 acres (7.5%) of the subbasin that once contained native grasslands have been converted to agriculture, pasture or urban environments. Most of this conversion has occurred in the northern, downstream portion of the subbasin. Much of the remaining grassland habitats in the subbasin have been altered due to livestock grazing and the introduction of invasive plant species.

Ten concern or focal wildlife species in the subbasin have been identified as being closely associated with grassland habitats, all of these species use these habitats for both feeding and breeding. Grassland habitats are inhabited by numerous rare plant species in the subbasin including two species listed as Threatened under the Endangered Species Act: MacFarlane's four o'clock and Spalding's catchfly.

Loss of Ponderosa Pine Habitats

Ponderosa pine forests have decreased across the Columbia Basin with an even more significant decrease in mature ponderosa pine. Similar reductions have occurred in the Snake Hells Canyon subbasin. Before the initiation of logging and fire suppression, ponderosa pine was maintained by regular underburning and contained relatively more shrubs than at present. Many areas of the subbasin covered by open ponderosa pine habitats are now dominated by denser stands of shade-tolerant tree species. Protecting areas of existing mature ponderosa pine and facilitating the development of additional areas of ponderosa pine habitat is an important issue for the ponderosa pine dependent wildlife in the subbasin.

Changes in disturbance regime and vegetative structure

Timber harvest, fire suppression, livestock grazing and invasive plants have altered disturbance regimes and changed the abundance and distribution of both grassland and forest structural conditions in the subbasin from what was historically present. These changes have decreased the suitability of the subbasin to many species adapted to forest and grassland habitats with natural distributions and abundances of structural conditions.

Fire suppression has resulted in increased accumulation of fuels, higher vegetation densities, and a major shift in species composition and size class distribution of trees. The accumulation of duff, as well as increased density of vegetation and fuels, has created conditions in which even light severity fires can be damaging due to the concentrated heating of the tree bole. The accumulation of ground fuels along with denser, multi storied stand conditions has also created "fuel ladders" that cart fire into the tree canopy, resulting in high intensity crown fires. Unlike the moderate severity fires that burned historically, many wildfires now have the potential to impact soil productivity and increase erosion through the consumption of organic matter. In mid elevation forests, fire exclusion and other factors (e.g., timber harvest) have resulted in a shift from young and old single layer stands to stands dominated by shade-tolerant tree species (e.g., Douglas-fir and grand fir). The development of dense, multi-layered stands has resulted in larger, more frequent stand-replacing fires and a greater susceptibility to insects and disease. Higher fuel loads also increase the potential for soil heating and higher mortality of trees and understory vegetation. The net result is wildfires that are more severe and more difficult to control.

Exclusion of fire as a forest process has significantly changed wildlife habitat conditions. Lack of areas with fire-killed or weakened trees has impacted the black-backed woodpecker and other snag-dependent species in some areas. Lack of thinning effects from ground fires has allowed

shade tolerant-tree species to crowd out important forage plants and compete for moisture and nutrients, discouraging the growth of large trees and maintenance of old growth conditions.

Due to dense forest conditions, the possibility of large-stand replacing fires is now greater than it was historically. These types of fires can negatively impact wildlife species that require mature stands or associated Key Ecological Functions (KEFs). Large fires result in a more homogenous distribution of structural conditions and can reduce the diversity of species an area can support. Returning to a more natural fire regime through prescribed burning would reduce the threat of large-stand replacement fires and promote large diameter trees and snags.

Introduced plant species

The introduction of nonnative 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. Many invasive plant species are not palatable to either livestock or wildlife, nor do they provide suitable habitat for wildlife species.

Weed problems in the subbasin are most severe in the grassland habitats. The naturally open structure of the subbasin's grassland vegetation, its soils, and climate, and the transport provided by the Snake River, have predisposed grassland habitats to invasion by weeds, especially by species of Mediterranean origin. Invasive plant species are more established in the lower areas of the subbasin where disturbance has been the most intense. Invasive species in the subbasin are spreading and are becoming increasingly prevalent in the Hells Canyon National Recreation Area (HCNRA) and wilderness areas of the upper subbasin. Yellow starthistle and cheatgrass are the invasive species currently having the greatest impact on the subbasin. These plants easily invade low elevational rangelands in poor ecological condition and are widespread in the lower subbasin. Numerous other nonnative plants inhabit the subbasin, of the 650 plant species documented for Craig Mountain, about 150 (23%) are nonnative.

Nutrient Flow Reduction

The flow of nutrients into the subbasin has been altered by the construction of Hells Canyon Dam and the reduction of anadromous fish runs throughout the subbasin. The reduction of these nutrient flows has potentially impacted numerous wildlife species and the subbasin's ecosystem as a whole.

Hells Canyon Dam effectively acts as a sediment trap; the reduced deposition of sediments and gravels to the beaches and terraces of the subbasin has resulted in fewer depositional sites where riparian communities can develop and a reduction in primary productivity and associated nutrient production.

Salmonids provide a variety of Key Ecological Functions (KEF) in the subbasin and across the Columbia Basin and form an important link between marine, freshwater aquatic and terrestrial environments. 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. Sixty-seven birds, twenty-three mammals, three reptiles and one amphibian species thought to inhabit the Blue Mountain Province consume salmon during one or more of salmon's lifestages. Twenty-five of the ninety-four total species in the province with a relationship to salmon are concern or focal species.

Roads and habitat fragmentation

More than 65 species of terrestrial vertebrates in the interior Columbia River Basin have been identified as being negatively affected by road-associated factors. Road-associated factors can negatively affect habitats and populations of terrestrial vertebrates both directly and indirectly. Even though road densities in the subbasin are relatively low, the transportation system of the Snake Hells Canyon subbasin is a limiting factor to wildlife populations in some areas of the subbasin. High road densities have been identified in the downstream portion of the subbasin near Lewiston, and moderate road densities exist on areas of Craig Mountain and the Kirkwood Creek drainage. Individual roads in areas of the subbasin with lower road densities may also be impacting wildlife populations, but more data on these effects is needed.

Species or Guild Specific

Improving the habitat level limiting factors discussed above will improve conditions for most of the subbasin's wildlife species. After determining the broad habitat level factors limiting the subbasin's wildlife, the technical team reviewed the habitat requirements and threats to focal and T&E species discussed in the assessment. The group looked for important threats and limiting factors to these species that would not be corrected by addressing the habitat level limiting factors discussed above. Disease transmission between domestic sheep and bighorn sheep and disturbance of bat roost and hibernacula were the two species specific limiting factors identified.

Disease transmission between domestic sheep and bighorn sheep

Disease transmission from domestic sheep and goats has proven to be the largest threat to wild bighorn sheep populations in the tri-state region of Oregon, Washington, and Idaho. When bighorn sheep come in contact with infected domestic sheep, bighorns usually die of pneumonia within 3-7 days of contact. The transmission of disease from domestic sheep populations to bighorns is the primary factor limiting bighorn sheep populations in the subbasin.

Disturbance of bat roosts and hibernacula

Protection of bat breeding, roosting and resting sites from disturbance is a management priority for the subbasin. Disturbance to a hibernating colony may cause the bats to stir and become active, which may cost them an excessive portion of their limited energy reserves. If repeated, disturbances may result in reproductive failure, abandonment of the site, or death from starvation. Four cave gates are in place in caves on the HCNRA, but three more are needed. Caves in other areas of the subbasin may also require protection.

II. Prioritization of limiting factors (see Assessment 203-207)

After identifying the primary limiting factors in the assessment, the Project and Technical teams prioritized importance and location of impacts on the focal species. Tools used to accomplish this included existing reports, spatial databases, professional knowledge and the Qualitative Habitat Assessment model (QHA), which was populated by local fish biologists to assess the condition of tributary habitats in the subbasin.

Aquatics

Anadromous focal fish species in the Snake Hells Canyon subbasin are limited primarily by upstream and downstream out-of-subbasin factors involving hydropower development and ocean conditions (see assessment section 4.1.1). Nonetheless, substantial improvement can be gained through work in the subbasin.

Prioritization of limiting factors in the mainstem

Factors limiting focal fish species within mainstem habitats have been rated according to influence by species and life history stage within two reaches, above and below the Salmon River confluence. This rating is presented in Table 1.

Table 1. Summary of factors limiting focal fish species within mainstem habitats of the Snake Hells Canyon subbasin. Scores indicate level of influence (1—greatest influence, 3—least influence). Factors shown in bold are out-of-subbasin issues limiting to populations within the subbasin.

		Low Temperature	High Temperature	Base Flow	Flow Variation	Bedload	Connectivity/ Passage	Hatchery Influence	Harvest/Fishing	Predation	Harassment	Competitors
Upper Mainstem Snake River (above Salmon River confluence)												
White Sturgeon	Egg-Larval				3					3		
	Juvenile						**1**		3	3		3
	Adult		3				**1**		3			
Bull Trout	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile											
	Adult						**1**		3			
Pacific Lamprey	Egg-Larval											
	Juvenile						**1**					
	Adult						**1**					
Redband/ Steelhead	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile						**1**			3		
	Adult						**1**					
Spring Chinook	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile						**1**			2		
	Adult						**1**					
Fall Chinook	Egg-Larval	3	3									
	Juvenile	3	1	2			**1***	3		1		
	Adult		**3**			3	**1**	3	**1**			
Lower Mainstem Snake River (below Salmon River confluence)												
White Sturgeon	Egg-Larval									2		
	Juvenile						**1**		3			3
	Adult		3				**1**		3			
Bull Trout	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile											
	Adult						**1**		3			
Pacific Lamprey	Egg-Larval											
	Juvenile						**1**					
	Adult						**1**					
Redband/ Steelhead	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile						**1**			3		
	Adult						**1**					
Spring Chinook	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile						**1**			2		
	Adult						**1**					
Fall Chinook	Egg-Larval	1			3							
	Juvenile	1	1	1			**1***	3		1		
	Adult		**3**				**1**	3	**1**		3	
Sockeye	Egg-Larval	—	—	—	—	—	—	—	—	—	—	—
	Juvenile						**1**					
	Adult						**1**					

* not in original Table in Assessment--added after further review by the Technical Team on November 8, 2004.

Prioritization of limiting factors in tributaries (see Assessment 199-200)

The Qualitative Habitat Assessment Model (QHA) was used to prioritize activities in the tributaries. This model defined riparian condition, excess fine sediment and reduced channel stability as primary limiting factors for fish populations throughout most tributary habitats in the subbasin (see assessment section 4.1.4). Additional factors with localized impacts in some tributaries include alteration of high and low flows, channel form, high and low temperatures, and pollutants (cattle waste).

QHA was run for steelhead trout because that species has the most abundant information, is more widely distributed than other focal species in the subbasin, and its distribution overlaps bull trout and spring chinook in tributary habitats. Comparison of protection versus (adjusted) restoration ranks for each reach evaluated indicates that most reaches clearly delineate themselves for either protection or restoration as the primary objective (Table 38 of the Assessment). Seven stream reaches fall into the "middle ground" with respect to both priorities and are therefore prioritized for both protection and restoration activities: these include Saddle Creek, Salt Creek, Sand Creek, Sluice Creek, Battle Creek, Somers Creek, and Two Corral Creek.

In tributaries prioritized for restoration, the factors of greatest concern are riparian condition, fine sediment, and channel stability (Table 2). In tributaries prioritized for protection, priority issues include fine sediment, riparian condition, channel stability and high flow (Table 3). A number of tributaries were prioritized for both restoration and protection.

Table 2. Restoration ranks[1] for streams and habitat variables within each, for streams prioritized primarily for restoration within the Snake Hells Canyon subbasin.

Restoration Rank	Stream Name[2]	State	Length[3]	Watershed Protection[4, 5]	Riparian Condition	Channel form	Channel Stability	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants[6]	Obstructions
1	Captain John Creek	ID	8.8	Craig Mtn	1	—	2	2	2	2	—	—	—	—	—
2	Getta Creek	ID	4.8	None	2	—	2	2	2	2	—	—	2	1	—
3	Dry Creek	ID	4.8	None	1	—	1	1	1	1	—	—	—	—	—
4	Divide Creek	ID	2.8	None	1	—	1	1	2	2	—	—	—	2	—
5	Cave Gulch	ID	4.6	Craig Mtn	1	2	1	1	2	—	2	2	2	2	—
6	Redbird Creek	ID	3.2	Craig Mtn	1	—	2	2	2	—	—	—	—	—	—
7	Kirkwood Creek	ID	3.9	NRA	1	—	2	2	—	—	—	—	—	1	—
8	Corral Creek (N)	ID	1.8	Craig Mtn	2	—	1	2	—	—	—	—	—	—	—
9	Wolf Creek	ID	0.6	None	2	—	2	1	—	—	—	—	—	—	—
10	Big Canyon Creek	ID	1.5	NRA	1	—	—	1	—	—	—	—	—	—	—
11	Cottonwood Creek	ID	0.9	Craig Mtn	2	—	2	1	2	—	—	—	—	—	—
12	Saddle Creek *	OR	5.7	Wild.	1	—	—	—	—	—	—	—	—	—	—
13	Salt Creek *	OR	2.8	Wild.	1	—	—	1	—	—	—	—	—	—	—
14	Corral Creek (S)	ID	0.7	NRA	1	2	1	1	—	2	2	2	—	2	—
14	Sand Creek *	OR	2.1	Wild.	1	—	—	—	—	—	—	—	—	—	—

Restoration Rank	Stream Name[2]	State	Length [3]	Watershed Protection[4, 5]	Riparian Condition	Channel form	Channel Stability	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants [6]	Obstructions
16	Jones Creek	ID	0.7	NRA	—	—	—	1	—	—	—	—	—	—	—
17	Sluice Creek *	OR	2.2	Wild.	1	—	—	—	—	—	—	—	—	—	—
18	Battle Creek *	OR	1.5	Wild.	1	—	—	—	—	—	—	—	—	—	—
18	Somers Creek *	OR	1.4	Wild.	—	—	—	1	—	—	—	—	—	—	—
20	Kirby Creek	ID	1.0	NRA	—	—	—	1	—	—	—	—	—	1	—
20	Two Corral Creek *	OR	0.5	Wild.	1	—	—	1	—	—	—	—	—	—	—

[1] Uses "adjusted" reach ranks (previously described) to give weight to amount of usable habitat (stream length). When two variable ranks are presented, scores of 1 and 2 are used to illustrate relative priority; original ranks from the QHA model may differ, dependent on tie scores, and are presented in Appendix H of the Assessment.

[2] Streams prioritized as "protect and restore" in Table 38 of the Assessment are included in both Table 2 and Table 3 and are marked with an asterisk (*).

[3] Measurement is an estimate of the length of channel utilized by steelhead rather than the overall channel length.

[4] Signifies the dominant protection status of the contributing watershed: Wild. = Wilderness Area; NRA = National Recreation Area; Craig Mtn.= Craig Mountain wildlife mitigation or study area. See section 1.5.2 of the Assessment for descriptions of protected status of these areas.

[5] Approximately the lower 0.25 mile of most streams is within the Snake Wild/Scenic River corridor and not afforded the greater protection often associated with the majority of the watershed. Exceptions are Redbird, Captain John, Corral (N) creeks and Cave Gulch, which do not have portions contained within the WSR corridor.

[6] For this exercise, pollutants include inputs related to grazing activities.

Table 3. Protection ranks[1] for streams and habitat variables within each, for streams prioritized primarily for protection within the Snake Hells Canyon subbasin.

Protection Rank	Stream Name[2]	State	Length [3]	Current Protection[4,5]	Riparian Condition	Channel form	Channel Stability	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
1	Granite Creek	ID	14.9	Wild.	1	—	1	1	1	—	—	—	—	—	—
1	Little Granite Creek	ID	1.3	Wild.	1	—	1	1	1	—	—	—	—	—	—
1	Sheep Creek	ID	2.3	Wild.	1	—	1	1	1	—	—	—	—	—	—
4	Bull Creek	OR	0.3	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Cook Creek	OR	0.6	NRA	1	—	2	1	2	—	—	—	—	—	—
4	Deep Creek	OR	0.5	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Lookout Creek	OR	0.3	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Rattlesnake Creek	OR	0.4	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Rough Creek	OR	0.3	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Rush Creek	OR	2.0	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Temperance Creek	OR	2.5	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Tryon Creek	OR	0.3	Wild.	1	—	2	1	2	—	—	—	—	—	—
4	Wild Sheep Creek	OR	0.3	Wild.	1	—	2	1	2	—	—	—	—	—	—
14	Battle Creek *	OR	1.5	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	Durham Creek	OR	0.1	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	Hells Canyon Creek	OR	0.2	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	N.Fk. Battle Creek	OR	0.3	Wild.	2	—	2	1	2	—	—	—	—	—	—

Protection Rank	Stream Name[2]	State	Length [3]	Current Protection[4,5]	Riparian Condition	Channel form	Channel Stability	Fine sediment	High Flow	Low Flow	Oxygen	Low Temperature	High Temperature	Pollutants	Obstructions
14	Pleasant Valley Cr.	OR	0.3	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	Saddle Creek *	OR	5.7	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	Sluice Creek *	OR	2.2	Wild.	2	—	2	1	2	—	—	—	—	—	—
14	Somers Creek *	OR	1.4	Wild.	1	—	2	2	2	—	—	—	—	—	—
14	Stud Creek	OR	0.3	Wild.	2	—	2	1	2	—	—	—	—	—	—
23	Bernard Creek	ID	1.5	Wild.	2	—	2	1	2	—	—	—	—	—	—
23	Salt Creek *	OR	2.8	Wild.	1	2	1	1	1	—	2	2	2	2	—
23	Sand Creek *	OR	2.1	Wild.	—	—	2	1	2	—	—	—	—	—	—
23	Three Creeks	ID	Unk	Wild.	2	—	2	1	2	—	—	—	—	—	—
23	Two Corral Creek *	OR	0.5	Wild.	1	2	1	1	1	—	2	2	2	2	—

[1] Uses "adjusted" reach ranks (previously described) to give weight to amount of usable habitat (stream length). When two variable ranks are presented, scores of 1 and 2 are used to illustrate relative priority; original ranks from the QHA model may differ, dependent on tie scores, and are presented in Appendix H of the Assessment.

[2] Streams prioritized as "protect and restore" in Table 38 in the Assessment are included in both Table 2 and Table 3 and are marked with an asterisk (*).

[3] Measurement is an estimate of the length of channel utilized by steelhead rather than the overall channel length.

[4] Signifies the dominant protection status of the contributing watershed: Wild. = Wilderness Area; NRA = National Recreation Area; Craig Mtn.= Craig Mountain wildlife mitigation or study area.

[5] Approximately the lower 0.25 mile of most streams is within the Snake Wild/Scenic River corridor and not afforded the greater protection often associated with the majority of the watershed. Exceptions are Redbird, Captain John, Corral (N) creeks and Cave Gulch, which do not have portions contained within the WSR corridor.

Terrestrial

Comprehensive information of the spatial distribution and intensity of terrestrial limiting factors, and the species and lifestages they were impacting was not available across the subbasin. This led the terrestrial team to identify additional data and research as a need to improve management of the wildlife resources of the subbasin. For each of the previously identified limiting factors, priority factors contributing to the limiting factor were identified to help guide the development of the Objectives and Strategies in the Management Plan.

Priority factors contributing to limiting factor

Riparian, wetland and spring degradation

Invasive plants and noxious weeds, historic overgrazing, altered fire regimes, land use conversion, reductions in rare plant populations

Loss and degradation of grassland habitats

Invasive plants and noxious weeds, historic overgrazing, altered fire regimes, land use conversion, damage to biological soil crusts, reduction in rare plant populations

Loss of Ponderosa Pine Habitats

Altered fire regimes, timber harvest

Changes in disturbance regime and vegetative structure

Altered fire regimes, timber harvest

Introduced plant species

Livestock grazing, recreation

Nutrient Flow Reduction

Hells Canyon Dam, reductions in anadromous fish runs

Roads and habitat fragmentation

High road densities, poorly located roads

Species or Guild Specific

Insufficient data on wildlife populations and habitat use in the subbasin, negative interactions between wildlife and domestic animals or people.

III. Identification of objectives and strategies (See Management Plan 11-49)

Problem statements were developed from the factors limiting focal species and habitats in the subbasin and from conditions that inhibit natural ecological processes as described in the subbasin assessment. These problems statements, along with associated discussions, provided linkage between limiting factors and objectives and strategies. For each problem statement, objectives describing the physical and biological changes needed to correct the problem and reduce or eliminate the impact of the limiting factor on the subbasin were developed. The strategies found under each objective provide specific steps necessary to accomplish the objectives.

The information in this section draws from more comprehensive information in the *Snake Hells Canyon Subbasin Management Plan* (See Management Plan Section 5).

Objective 1A: Ameliorate negative impacts from operations of the Hells Canyon Dam and Complex.

Strategies 1A1-1A3 address the limiting factors such as flow quantity and variability, high and low temperatures, connectivity and passage, and bedload alterations resulting from upstream management. Strategy 1A1 investigates new potential improvements to the upstream hydropower system. Strategy 1A2 utilizes the Federal Energy Regulatory Commission's (FERC) process to modify hydropower system operations to address factors that limit fish species in Hells Canyon. Strategy 1A3 monitors these efforts and further researches the impacts of upstream hydrosystem operations on the Hells Canyon subbasin. Until upstream limiting factors are eliminated, artificial production will continue to serve as a mitigation strategy to offset upstream portions of out of subbasin impacts.

Objective 2A: Increase SARs of naturally produced spawning adults to at least 4 to 6% for spring chinook, 3% for fall chinook, and 4% for steelhead, as measured at Lower Granite Dam, to increase natural production and harvest of fish populations.

Strategies 2A1-2A10 address the suite of downstream, out of subbasin factors that limit natural productivity, making it difficult or impossible to meet restoration and harvest goals for spring and fall chinook, steelhead, and Pacific lamprey. Strategies 2A1 and 2A2 enable the coordination between local and regional efforts to maximize the efficiency and effectiveness of activities.

Strategies 2A3-2A5 address critical data gaps needed to begin or improve existing efforts, including interactions between wild and hatchery fish, and life history, abundance and productivity data on lamprey. Strategy 2A6 attempts to refine the overall effort through additional prioritization and integration activities. Strategy 2A7 implements activities in the subbasin to reduce out of subbasin impacts. Strategies 2A8 and 2A9 outline monitoring and evaluation activities to monitor effectiveness of the effort to reduce downstream, out of subbasin impacts on anadromous species. This information is necessary for adaptive management of the effort. Until downstream limiting factors are eliminated, artificial production will continue to serve as a mitigation strategy to offset downstream portions of out of subbasin impacts.

Objective 3A: Increase migratory fish productivity and production, as well as life stage-specific survival, through in-subbasin habitat improvement.

Strategies 3A1-3A7 address limitations to migratory and resident fish production resulting from limited habitat quantity, quality and connectivity through in subbasin projects. Strategies 3A1-3A5 research migratory species and limiting factors, and further prioritize restoration and protection activities in the subbasin. Strategy 3A6 implements projects in coordination with activities implemented under Objective 8. Strategy 3A7 provides monitoring and evaluation and adaptive management to the effort.

Objective 3B: Evaluate needs and opportunities to increase native resident populations (redband and bull trout) throughout the subbasin. Implement appropriate actions to address defined needs and opportunities.

Strategies 3B1-3B6 aim to increase native resident populations by implementing prioritized habitat improvement projects. 3B1-3B6 evaluate limiting factors, opportunities, barriers, and other research needs to address key data gaps limiting the ability to plan and prioritize activities. 3B5 implements projects in coordination with strategies under Objective 8.

Objective 4A: Increase understanding of the composition, population trends, interspecies interactions, habitat requirements, ecosystem processes, and impacts of management activities on terrestrial communities of the Snake Hells Canyon subbasin.

Strategies 4A1-4A3 address data gaps of the biology, populations and habitat use of the wildlife species in the subbasin. 4A4-4A5 strive to expand understanding of ecosystem processes and community dynamics in the subbasin. 4A6 provides a mechanism for reevaluating data collection and research efforts over time and applying collected information to management.

Objective 5A: Maintain and enhance populations of focal, sensitive, and threatened and endangered species in the subbasin.

Strategies 5A1-5A7 address species specific factors not adequately addressed through the habitat level approach employed in most of the plan. Strategy 5A1 acknowledges that the most important step to preserving focal, sensitive, threatened and endangered species in the subbasin is habitat protection and restoration (outlined in problem statements 8-15). 5A2 reemphasizes the need for increased data collection efforts. 5A3-5A7 address species specific needs that would not be adequately addressed by the implementation of the habitat level objectives outlined in strategies under objectives 8-15.

Objective 6A: Mitigate the negative impacts of Hells Canyon Dam on terrestrial species and habitats.

Strategies 6A1, and 6A3 utilize the Federal Energy Regulatory Commission's (FERC) and BPA/NPCC process to protect wildlife populations and habitat. 6A2 reduces the impact of the hydrosystem on the subbasin by addressing riparian, wetland, and spring degradation and nutrient flow reduction. 6A4 monitors these efforts and further researches the impacts of upstream hydrosystem operations on the Snake Hells Canyon subbasin.

Objective 7A: Reduce conflicts between livestock and native wildlife and plant populations through the development of a comprehensive basinwide and site-specific grazing management plan for the subbasin.

Strategies 7A1-7A5 seek to reduce the contribution of cattle to factors limiting terrestrial species in the subbasin, including the role of cattle in the establishment and spread of invasive plants, and in riparian and grassland habitat degradation.

Objective 7B: Eliminate domestic sheep and goat grazing within bighorn sheep habitat.

Strategies 7B1-7B4 strive to eliminate domestic sheep grazing in the subbasin. Transmission of disease from domestic sheep populations to bighorns has been identified as the primary limiting factor to bighorns in the subbasin.

Objective 8A: Restore natural flow regime that supports and meets the life history needs of aquatic species in the subbasin.

Strategies 8A1-8A5 address flow as a limiting factor to fish and aquatic wildlife in the mainstem and tributaries. 8A1, 8A2 and 8A4 research flow, habitat and flow related limiting factors. 8A3 uses the FERC process to modify operations to provide adequate improved flows for fish and aquatic wildlife. 8A5 implements activities to protect and improve flow, including acquiring water rights, and provides monitoring and evaluation of the effort.

Objective 8B: Provide temperature regimes that meet the life stage specific needs of aquatic focal species.

Strategies 8B1-8B10 address water temperature as a limiting factor to aquatic focal species. 8B1, 8B2, 8B5 and 8B6 research and prioritize sources and causes of temperature as a limiting factor, prioritize projects and monitor and evaluate results for the tributaries. 8B3 and 8B4 restores riparian functions and upland areas to improve water temperature and habitat in tributaries. 8B7 researches new ways to improve mainstem temperatures. 8B8 works in regional forums to address temperature impacts in the mainstem. 8B9 implements the existing TMDL for the mainstem to improve temperature conditions. 8B10 monitors and evaluates the effort.

Objective 8C: Reduce sediment and sedimentation in tributaries to levels that can support life history requirements of focal species.

Strategies 8C1-8C5 address sediment as a limiting factor to aquatic species in tributaries. 8C1-8C3 research sediment, limiting factors and potential solutions. 8C1 and 8C4 implement projects or programs to reduce sediment impacts on aquatic species, these include implementing the activities identified in existing TMDLs. 8C5 evaluates the effort.

Objective 9A: Protect the existing quality, quantity and diversity of native plant communities providing habitat to native wildlife species by preventing the introduction of noxious weeds and invasive exotic plants into native habitats.

Strategies 9A1-9A7 attempt to prevent or reduce the spread of invasive species into high quality habitats in the subbasin. 9A1 addresses data gaps concerning the location of intact native plant communities and rare plants within the subbasin. 9A2 and 9A3 reduce the spread of weeds by reducing seed dispersal and ground disturbing activities. 9A4-9A6 seek to improve the effectiveness of existing weed control programs, and develop new education, early detection and eradication programs. 9A7 evaluates the effort.

Objective 9B: Reduce the extent and density of established noxious weeds and invasive exotics.

Strategies 9B1-9B4 attempt to reduce the prominence of invasive species in the subbasin. 9B1 seeks to direct efforts to areas in the subbasin where they can have the greatest biological benefit and chance of success. 9B2 reduces the extent of weed infestations through the use of integrated pest management tools. 9B3 is aimed at developing new techniques for eradicating noxious weeds and training users in their implementation. 9B4 evaluates the effort.

Objective 10A: Protect existing good condition grasslands.

Strategies 10A1 and 10A2 address data gaps associated with location and condition of grassland communities and associated rare species in the subbasin. Information collected through these two strategies will be used to further prioritize restoration and protection efforts. 10A3-10A4 strive to protect high quality grassland areas in the subbasin. 10A5 evaluates the effort.

Objective 10B: Restore degraded grasslands to good condition. Increase the coverage of native perennials, including bluebunch wheatgrass and/or Idaho fescue.

Strategies 10B1 and 10B2 address the need to continue research into methods for restoring degraded grassland habitats and the role of fire in these communities. 10B3-10B6 restore degraded grassland communities in the subbasin. 10B7 evaluates the effort.

Objective 11A: Protect and restore riparian habitats.

Strategies 11A1 restores and protects riparian areas supporting anadromous or resident salmonids or providing current or potential habitat for mountain quail. 11A2-11A3 identify programs and grazing management practices to reduce grazing impacts on riparian areas. 11A4-11A6 focus efforts on tributary habitats where restoration potential is higher than the mainstem, considering the current hydropower system, and where the majority of mountain quail habitat in the subbasin occurs. 11A7 increases education efforts on the importance of riparian habitats. 11A8 evaluates the effort.

Objective 11B: Protect all currently functioning wetland habitats (including seep, spring, wet meadow and other wetland areas). Restore degraded wetland habitats that provide or have the potential to provide important fish and wildlife habitats.

Strategies 11B1 and 11B2 address data gaps weakening the effort to restore wetland and spring habitats in the subbasin. 11B3 and 11B4 restore and protect wetland habitats in the subbasin. 11B5 evaluates the effort.

Objective 12A: Protect mature ponderosa pine habitats.

Strategies 12A1 and 12A2 address data gaps limiting restoration and protection efforts in the subbasin. 12A3 and12A4 protect and restore mature ponderosa pine habitats in the subbasin. 12A5 evaluates the effort.

Objective 12B: Use management practices to develop or restore ponderosa pine communities in areas where this species was historically present.

Strategies 12B1 and 12B3 address data gaps limiting efforts to achieve this objective. 12B2 restores ponderosa pine communities. 12B4 evaluates the effort.

Objective 13A: Restore the composition and structure of forests to within the historic range of variability (HRV).

Strategies 13A1-13A3 address data gaps. 13A4-13A5 restore the Historic Range of Variability to the forested areas of the subbasin. 13A6 evaluates the effort.

Objective 14A: Reduce the impact of the transportation system on wildlife and fish populations and habitats.

Strategies 14A1 reduces road related impacts through cooperation between the agencies managing roads in the subbasin. 14A2 addresses data gaps related to roads and big game. 14A3 increases the effectiveness of enforcement of road closures to reduce road impacts on wildlife. 14A4 monitors the effort.

Objective 15A: Restore natural nutrient cycles or mitigate for damages to aquatic and terrestrial populations due to the loss of these nutrients.

Strategies 15A1-15A3 research data gaps on the causes of nutrients as limiting factors in the subbasin. Strategy 15A4 evaluates the effort.

Objective 16A: Improve coordination of activities in the subbasin to promote stewardship of natural resources and increase long-term implementation success.

Strategies 16A1-16A5 increase the effectiveness of implementation of strategies in this plan and avoid problems through improved coordination, outreach and involvement at all levels.

Objective 17A: Consider benefits and negative impacts to surrounding communities, their economies, and fish and wildlife.

Strategies 17A1-17A5 increase the social and economic benefits of implementing this plan.

Objective 18A: Protect and foster both Indian and non-Indian cultural uses of natural resources in the Snake Hells Canyon subbasin.

Strategies 18A1-18A2 integrates cultural information into planning and provides information and education to land managers, regulatory agencies and policy makers to maximize the cultural benefits of implementing this plan.

IV. Prioritization of strategies and prioritization framework

The scale of the limiting factors impacting species and habitats in the Snake Hells Canyon subbasin dwarfs the financial resources available over the short-term for protection and restoration efforts. Clearly, as not all problems can be fixed immediately with existing resources, the resources available must be used as efficiently and effectively as possible. The number of issues and diversity of species and habitats impacted make prioritization a major task that must be periodically repeated and fine-tuned based on new information. Filling key data gaps (as outlined in the Management Plan) will further improve the accuracy of prioritization processes.

These prioritized strategies often require simultaneous implementation of a suite of other strategies, such as planning or monitoring and evaluation strategies as described in the Management Plan. Research, monitoring and evaluation strategies are examples of strategies that need to be implemented before, during and after implementation strategies to guide success, increase efficiency and to learn from implementation activities. In general, these types of strategies were not prioritized because their value is dependent upon the actual implementation of restoration or protection strategies. In the Management Plan, these strategies are generally included as part of a suite of strategies, including implementation strategies, and many of them would have little value as stand alone activities. The social economic strategies (Strategies 16A1-16A5, 17A1-17A5, 18A1-18A2) provide an operational framework for successfully implementing programs and projects in the subbasin and are not meant to be optional. They are integral to implementing aquatic and terrestrial strategies in the subbasin and the successful management of fish and wildlife in the subbasin is partially dependent on simultaneous implementation of the social and economic strategies.

Priority Aquatic Strategies

Prioritized strategies addressing aquatic limiting factors have been divided into two groups, out of subbasin priorities and in subbasin priorities. Out of subbasin priorities include both upstream and downstream factors impacting the subbasin. While these strategies are important, no one believes that implementing them in isolation will have much impact on the limiting factors, for the Snake Hells Canyon subbasin in only one of many areas impacted by these factors, and representatives for Snake Hells Canyon subbasin will only be a few among the many who will need to agree and coordinate efforts. These factors also impact wide geographic areas (such as the Pacific Ocean) and addressing them will involve an intensive, long-term political effort in which representatives for the Snake Hells Canyon need to participate, but have little ability to lead. As a result of this dilemma, artificial production of anadromous species has served and will continue to serve to mitigate for these out of subbasin impacts, including the expected continued shortfalls in achieving the SARs called for in Objective 2 and for the cultural needs and treaty rights outlined in Objective 18. In general, strategies that address passage and connectivity issues, both up and downstream of the subbasin are the highest priorities for out of subbasin impacts because they affect all anadromous and migratory species in the subbasin, and they affect a number of ecosystem processes which have associated effects on species in the subbasin (see Table 1). These include strategies 1A1-1A3 and 8A1-8A4, 8A5d, and 8B7-8B10, which address the impacts of Hells Canyon Dam and Complex, and strategies 2A1-2A10 which address downstream limiting factors. Strategies 1A1-1A3 and 8A1-8A4, 8A5d, and 8B7-8B10 are also prioritized to address problems associated with low temperatures, high temperatures, base flow, flow variation and bedload resulting from upstream hydropower, irrigation and other water management activities, which impact specific life stages of focal species, as identified in Table 1. Strategies 2A1-2A10 are also prioritized to address problems associated with predation, harvest,

hatchery influence, competitors and harassment impacting specific focal species life history stages identified in Table 1. The relative emphasis placed on addressing each of these out of subbasin limiting factors during the implementation of these strategies should mirror the importance of the limiting factor as delineated in Table 1.

The prioritization of strategies addressing in subbasin limiting factors mirrors the ranking of the limiting factors they address in Table 2 and Table 3. These tables provide specific importance and spatial ranking of problems, which provides an adequate basis for directing the relative emphasis of implementation of strategies. These highest priority aquatic strategies include 8A1-8A2, 8A4 and 8A5a-8A5c which address flow issues in tributaries, 8B1-8B6 which address temperature issues in tributaries, and 8C1-8C5 which address sediment problems in tributaries.

Priority Terrestrial Areas and Actions (See Management Plan 84-88)

Prioritization for the terrestrial components of the *Snake Hells Canyon Subbasin Plan* was carried out collaboratively by the Terrestrial Technical Team. The Technical Team developed three groups of prioritized strategies. The first group of priorities addresses habitat level limiting factors caused by the loss or degradation of important habitats. The second group of priorities addresses habitat level limiting factors related to land use in the subbasin. The final group of priorities is developed at the species level. Actions were prioritized within groups, but not between groups. Actions that occur in non-numbered lists are of roughly equal priority.

The Terrestrial Technical Team determined that implementing strategies in riparian areas and herbaceous wetlands will provide the greatest benefit to the fish and wildlife populations of the subbasin. Secondary priorities include native grassland, ponderosa pine, and old-growth habitats.

Strategies that apply to an entire priority are listed following the statement of priority. Strategies that more narrowly match a particular item in a list follow that item. Several of the strategies listed in this prioritization are further refinements of strategies in the Management Plan, and therefore are not followed by matching strategy references.

Group 1—Loss and Degradation of Habitat Limiting Factors

Priority 1—Protect and restore riparian and wetland habitats (Strategies 11A1-11A8, 11B1-11B5). The Technical Team developed additional rules to further refine this priority.

- Protect and restore areas of current and historic mountain quail use.
- Protect and restore areas of anadromous fish use.
- Protect and restore areas containing rare plant or animal species.
- Protect and restore areas containing rare or unique plant communities.
- Protect and restore areas supporting amphibian populations.

Priority 2—Protect intact grassland habitats (Strategies 10A1-10A5). Additional levels of prioritization within grassland habitats were developed by the Technical Team.

- Protect high-quality grasslands.
- Protect rare plant habitats within grassland habitats.

Priority 3—Protect mature ponderosa pine habitats (Strategies 12A1-12A5). The Technical Team developed an additional refinement to the prioritization of these strategies.

- Protect areas of mature ponderosa pine without established protection and prioritize larger areas, those that enhance habitat connectivity, and those that support focal and concern species.

Priority 3—Protect late seral structural condition (Strategies 13A1, 13A3). The Technical Team further refined this prioritization.

- Protect areas of late seral structural condition without established protection and prioritize larger areas, those that enhance habitat connectivity, and those that support focal and concern species.

Group 2—Land Use-Related Limiting Factors

Priority 1—Noxious weeds and invasive plants

- Prevent the spread of noxious weeds and invasive plants into relatively intact habitats found particularly in upstream portions of the subbasin (Strategy 9A2, 9A6).
- Eradicate small populations of noxious weeds and invasive plants before they have a chance to establish (Strategy 9A2).
- Improve outreach education programs in cooperation with established noxious weed groups (Strategy 9A5).

Priority 1—Livestock grazing

- Eliminate disease transmission between bighorn sheep and domestic sheep by stopping domestic sheep and goat grazing in the subbasin; focus on public lands first and then private lands. (Strategy 7B3).
- Focus on developing grazing practices that are sustainable both biologically and economically (Strategies 7A1- 7A4).

Priority 2—Roads

Reduce the impact of roads on fish and wildlife (Strategies 14A1-14A4). The Technical Team refined this prioritization by identifying that the highest priority impacts should be addressed by reducing road densities in the following areas:

- high sediment-producing watersheds with anadromous fish;
- areas of large big game winter range concentration;
- areas where roads are dramatically reducing security areas or habitat connectivity.

Group 3—Species-Specific Priorities

The Technical Team prioritized a number of species specific strategies. The following activities further refine the strategies in the Management Plan.

- Implement Spalding's silene surveys (Strategy 4A1).
- Implement mountain quail surveys, habitat restoration, and reintroduction (Strategies 4A1, 5A7).
- Add additional bat gates to protect important bat habitat threatened by vandalism (Strategy 5A3).

- Protect the vegetative composition and structure of the habitat corridor linking the Blue Mountains with the Rocky Mountains located in the narrow area of the upper subbasin (Strategies 5A5 and 5A6).
- Establish additional transect or trend monitoring for Neotropical migrants (Strategy 4A1).
- Establish comprehensive trend monitoring for unique or declining species groups, particularly Neotropical migrants, amphibians, bats, and concern or focal species (Strategy 4A1).