Draft

Powder
Subbasin Summary

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Northwest Power Planning Council

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Powder Subbasin Summary

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General Description

Subbasin Location

Located in the northwest portion of the Middle Snake Ecological Province, the Powder subbasin encompasses an area of about 1,750 mi^2 in northeastern Oregon (Figure 1). The subbasin is defined by the Blue Mountains to the west, the Snake River to the east, the Wallowa Mountains and Grande Ronde subbasin to the north and the Burnt River subbasin to the south. Subbasin corners are approximated by the following Townships and Ranges: NW corner (T5S/R37E), NE corner (T5S/R44E), SW corner (T9S/R36E), SE corner (T11S/R45E).

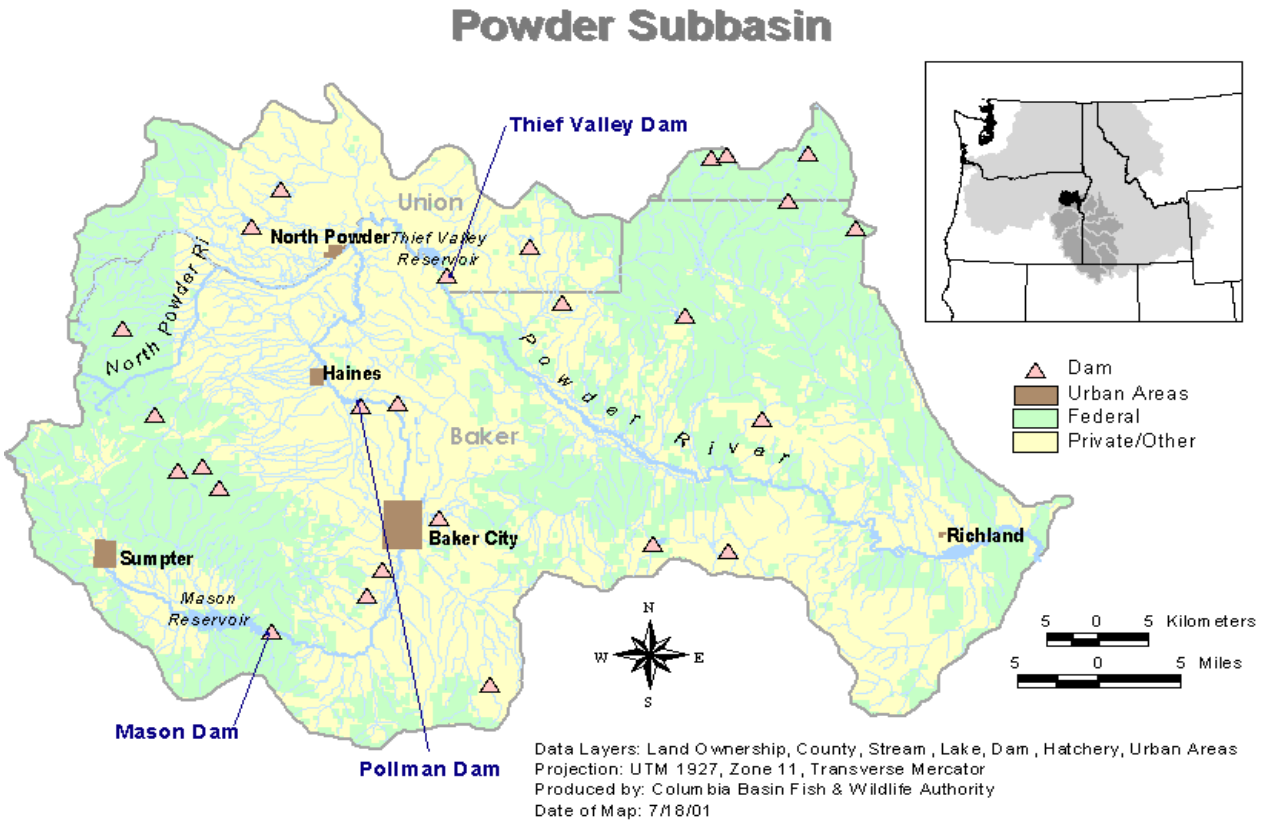

Figure 1. The Powder subbasin of the Middle Snake Province, northeast Oregon

The Powder river flows 144 miles from its source in the Blue Mountains to join the Snake River at river mile (RM) 296 about 11 mile downstream of Richland, Oregon. The Powder River begins near Sumpter, Oregon (RM 144), where the McCully Fork, Cracker Creek and several smaller tributaries join, and flows east-southeast through the tailings of past dredge mining and into Phillips Lake (RM 136). The river exits Phillips Lake at RM

131, continuing east for about 7 miles before turning north through the Bowen Valley and Baker City, Oregon (RM 113). From here the river meanders the floor of the Baker Valley and passes by the cities of Haines (RM 98) and North Powder (RM 82) where it is joined by the North Powder River. The Powder River again turns southeast (RM 78), flows through Thief Valley Reservoir (RM 71), through the Lower Powder Valley and enters the Snake River System through the Powder Arm of Brownlee Reservoir (RM 10) near Richland, Oregon. Eleven dams on the Columbia and Snake rivers separate the Powder River from the Pacific Ocean.

Major streams flowing into the Powder are Eagle, Wolf, and Rock creeks and the North Powder River. Eagle Creek originates in the Eagle Cap Wilderness Area of the Wallowa Mountains and flows generally south-southeast 38 miles to join the Powder at RM 10, just above the Powder Arm of Brownlee Reservoir. Wolf Creek begins at High Summit Spring in the Blue Mountains and flows about 20 miles to meet the Powder at RM 81 near North Powder, Oregon. Rock Creek originates along Elkhorn Ridge then flows 15 miles to its confluence with the Powder River at RM 98 near Haines. The headwaters of the North Powder River also lie along Elkhorn Ridge. The North Powder flows generally north-northeast 25 miles to meet the Powder at RM 82 near the city of North Powder.

The Powder subbasin is almost entirely contained within Baker County but includes a portion of Union County. A very small part of the subbasin, at the headwaters of Eagle Creek, is in Wallowa County.

Drainage Area

The Powder River subbasin is comprised of a single watershed, the Powder, with a drainage area of about 1,747 mi^2 and a perimeter of 222 mi. This watershed drains about two-thirds of Baker County. Notable streams in the Powder subbasin are listed in Table 1.

Table 1. Notable streams in the Powder subbasin, Oregon, and their points of confluence with the Powder River or its tributaries

Main Stream	Tributary (RM)	Tributary (RM)
Powder River		
	Daly Creek (9)	
	Eagle Creek (10)	
		Little Eagle Creek (12)
		Paddy Creek (18)
		East Eagle Creek (21.5)
		West Eagle Creek (27)
	Goose Creek (36.5)	
	Ritter Creek (41)	
	Balm Creek (43)	
	Ruckles Creek (51.5)	

Main Stream	Tributary (RM)	Tributary (RM)
Powder River		
	Big Creek (61)	
	Jimmy Creek (79)	
	Wolf Creek (81)	
		Clear Creek (9)
	North Powder River (82)	
		Anthony Creek (10)
	Rock Creek (98)	
	Baldock Slough (102)	
	Sutton Creek (114)	
	Beaver Creek (120)	
	Denny Creek (125)	
	Deer Creek (135)	
	Cracker Creek (144)	
	McCully Fork (144)	

Climate

The major influence to the regional climate is provided by the Cascade Mountains lying nearly 200 miles to the west. This mountain range forms a barrier against potential modifying effects of warm, moist fronts emanating out of the Pacific Ocean. As a result, the overall climate is Temperate Continental – cool summer phase. The relief of the Blue Mountains creates several localized climatic effects. The diversity of landscapes between mountain ranges, rolling topography and deep, dissected canyons influences local climatic patterns. Light precipitation, low relative humidity, rapid evaporation, abundant sunshine and wide temperature and precipitation fluctuations are characteristics of this climate. The mean annual temperature is 45.5°F, the daily maximum was 106°F (08/04/1961) and the daily minimum was -39°F [(12/30/1978) USBR dataweb]. Temperature extremes of -28° F (Feb.) and 104° F (Aug.) have been recorded at the Baker City Airport. The majority of annual precipitation, which averages 10.87 in., falls as snow during winter. Portions of the subbasin commonly experience rain-on-snow events, which reduce the snow pack and may cause brief, localized flooding. Late summer and early autumn provide the area with convectional storms resulting from masses of cool air crossing the Cascades and passing over the mountains at high elevation. The hot, dry surface air violently mixes with the cool, moist upper air mass to provide lightning storms.

Topography

The topography of the Powder River subbasin is varied with relatively high gradient mountain streams, deep river canyons and broad, shallow valleys. The headwaters of the Powder subbasin's streams are at elevations from 6,000 feet to nearly 8,000 feet in the Blue and Wallowa mountains. The mainstem Powder River begins near 8,000 feet, drops to about 3,300 feet in the Baker Valley and to about 1,650 feet at the confluence with the Snake River.

Stream gradients in the upper Powder River range from 20% in the high elevations of the Elkhorn Mountains to 2-4% in the lower, larger systems (Powder Basin Watershed council 2001). Gradients in the rest of the subbasin are similarly variable as high elevation headwater streams give way to low elevation, low gradient valley streams.

Geology

The earliest geologic event to shape the landscape of the upper Powder River drainage was the docking of an island arc on the edge of an earlier continent, leaving masses of metavolcanic and metasedimentary rocks about 250 million years ago. Argillites dominate these rocks, though metagabbros are also present. These exotic terrains were precursors of the Elkhorn Mountains, exposed to several million years of weathering processes.

About 20 million years ago the granitic Bald Mountain batholith was intruded below the argillites. While this did not immediately alter the shape, it resulted in gold deposits, which would alter the landscape later.

In the last 12 to 40 million years, a variety of volcanic deposits were laid down including basalts and andesitic tuffs. Block faulting was the largest force in the last 20 million years to shape the Elkhorn Mountains. This uplifting of the Elkhorns exposed the argillites and granitic rocks to water and ice erosion that are considered contemporary land sculpting processes.

The North Powder River drainage is dominated by granitic batholith rocks and metamorphic rocks both of which form soils low in clay and with high erosion potential. The northern portion of the drainage contains basalts (Wallowa Whitman National Forest 1999) of the Columbia River Basalt Group.

The Eagle Creek drainage begins high in the southern Wallowa Mountains, an area with a complex geologic history. The granitic Wallowa batholith dominates the upper Eagle Creek drainage. An estimated 3 to 7 glaciations formed numerous cirque lakes, steep ridges and craggy peaks. Some areas of the Wallowa batholith have been mineralized and contain deposits of gold, silver and copper. Erosion of these mineral bearing rocks has resulted in deposition of gold in the alluvial benches and stream gravels of Eagle Creek and its tributaries (Wallowa Whitman National Forest 1997a).

The upper and middle reaches of the Eagle Creek drainage are dominated by metamorphosed greenstones and tuffs of the Clover Creek formation, fossiliferous limestones of the Martin Bridge formation, and slates, shales and sandstones of the Hurwal formation. The three formations represent ancient seafloor sediments formed about 100

million years ago. These sedimentary rocks contain fossils of bivalves, corals and sponges. The oldest vertebrate fossil to be discovered in Oregon was also found in these rocks. Columnar jointed olivine basalts of the Columbia River Basalt Group dominate the lower reaches of the Eagle Creek drainage.

Hydrology

The headwater streams of the Powder River subbasin are located in the Blue and Wallowa mountains at elevations between 6,000 and 8,000 feet. The timing and amount of spring runoff is dependent on winter snowpack depth and condition as well as spring weather factors such as temperature and rainfall. Seasonal peak flows in streams originating in the Blue Mountains generally occur in late April and early May. Peak flows in Eagle Creek usually occur in mid May to early June (J. Rodgers, OWRD, personal communication, 2001). Diversion of water for irrigation and municipal use has a significant effect on flow conditions and connectivity in the Powder subbasin. Portions of many streams are dry during late summer due to diversions (Wallowa Whitman National Forest 1999).

The drainage area above Thief Valley Dam is about 911 mi^2 with an average annual discharge of 141,529 acre-feet. The area above Mason Dam at Phillips Lake is about 168 mi^2 and annually discharges an average of 74,385 acre-feet (USBR dataweb).

The largest reservoir in the subbasin, Phillips Lake, has active storage capacity of 90,500 acre-feet. The maximum water storage occurred in 1983 with 86,337 acre-feet stored. The primary use of the stored water is for irrigation. Releases from the reservoir are controlled to moderate the seasonal variations in stream flow. The actual release pattern depends on available water and expected runoff for any year.

The minimum recorded monthly mean flow in the Powder River near Sumpter, Oregon (above Phillips Lake) between 1968 and 1987 was 0.4 cubic feet per second (cfs) in January 1968. The maximum recorded mean flow during the same period was 324 cfs in May, 1975 (Powder Basin Watershed Council 2001). In Eagle Creek, peak flows average 20 times as high as summer low flows.

Three aquifer types are found within the Powder River subbasin although about 41% of the subbasin has no principal aquifer (Table 2).

Table 2. Principal aquifers in the Powder River subbasin, Oregon

Aquifer	Square Miles	Percent of Subbasin	Rock Type
No Principal Aquifer	695	40.6	N/A
Pacific Northwest basin-fill aquifers	496	29.0	Unconsolidated sand and gravel
Columbia Plateau aquifer system	355	20.7	Basalt and other volcanic rock
Miocene basaltic-rock aquifers	165	9.6	Basalt and other volcanic rock

Most surface and ground water use is for irrigation. There are four irrigation or water control districts in the Powder subbasin: Baker Valley Irrigation District, Lower Powder Irrigation District, Pilcher Creek Water Control District and Wolf Creek Water Control District. There are about 200 irrigation diversions managed by the Baker Valley Irrigation District and at least that many more in the other three districts combined (J. Colton, Baker Valley Irrigation District, personal communication August 2001). Precise information regarding the number of water rights holders in the subbasin is unavailable. Sales and subdivision of water rights over the years has created a situation where there are too many small water rights holders for accurate records to be kept. Despite the lack of details regarding water rights, it is known that the water in the Powder River subbasin is fully appropriated (J. Rodgers, personal communication, 2001); during the summer there is no remaining unappropriated water. In low-water years, available water may be inadequate to supply junior water rights holders.

Efforts are underway in the subbasin to eliminate some splash diversion dams through installation of a pipeline to carry irrigation water (J. Colton, personal communication). The Baker Valley Irrigation District is currently in the planning and design stage of a 2-mile pipeline that would eliminate fish passage barriers at three dams (J. Colton, personal communication).

Water Quality

The Oregon Department of Environmental Quality (ODEQ) has identified several stream segments in the Powder River subbasin as water quality limited (Figure 2, Table 3). Water quality limited means instream water quality fails to meet established standards for certain parameters for all for a portion of the year. Oregon's 1998 303(d) List of Water Quality Limited Waterbodies identifies seven parameters of concern in the Powder subbasin. These are flow modification, habitat modification, sedimentation, temperature, turbidity, dissolved oxygen and bacteria.

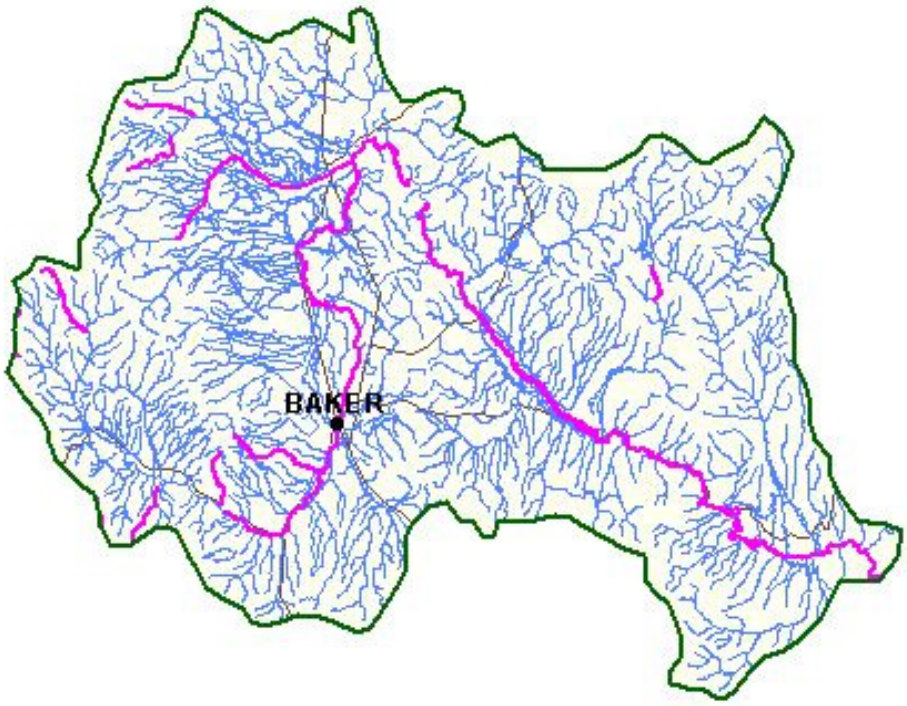

Figure 2. Powder subbasin, Oregon, 303(d) listed streams

Table 3. Powder subbasin, Oregon, 303(d) listed stream segments and parameters of concern

Stream Segment	Parameters of Concern
Anthony Fork, North Powder River	Temperature
California Gulch	Temperature
Dean Creek	Temperature
Eagle Creek	Temperature
Eagle Creek, West Fork	Temperature
Elk Creek	Temperature
Goose Creek, East Fork	Turbidity
Indian Creek	Temperature
North Powder River	Temperature
Powder River – mouth to Thief Valley Reservoir	Temperature, Flow Modification, Dissolved Oxygen, Bacteria
Powder River – Thief Valley Reservoir to Sutton Creek	Temperature, Bacteria
Powder River – Sutton Creek to National Forest Boundary	Bacteria
Silver Creek	Temperature

Source: ODEQ

Water quality parameters (and standards) of temperature (64°F/55°F, rearing/spawning), dissolved oxygen (98% sat), habitat modification (pool frequency), and flow modification (flows) relate to the beneficial use for fish life. Table 4 describes how temperature affects cold-water fish mortality. Most water quality problems in the Powder River subbasin stem from legacy forestry, grazing and mining activities as well as current improperly managed livestock grazing, cumulative effects of timber harvest and road building, water withdrawals for irrigation, and agricultural activities.

Table 4. Modes of thermally induced cold-water fish mortality

Modes of Thermally Induced Fish Mortality	**Temperature Range**	**Time to Death**
Instantaneous Lethal Limit – Denaturing of bodily enzyme systems	> 90°F > 32°C	Instantaneous
Incipient Lethal Limit – Breakdown of physiological regulation of vital bodily processes, namely: respiration and circulation	70°F to 77°F 21°C to 25°C	Hours to Days
Sub-Lethal Limit – Conditions that cause decreased or lack of metabolic energy for feeding, growth or reproductive behavior, encourage increased exposure to pathogens, decreased food supply and increased competition from warm water tolerant species	64°F to 74°F 20°C to 23°C	Weeks to Months

Reproduced from ODEQ 2000

Water temperature is a concern in the Powder River subbasin; eleven of the thirteen 303(d) listed stream segments are listed for temperature. The Powder Basin 1995/1996 Water Quality monitoring Report (Baker County Association of Conservation Districts 1996) documents water temperatures recorded at several sites in the subbasin as well as other water quality data from 1995 and 1996. Maximum daily temperatures recorded in the Powder River at First Bridge above the North Powder River from July 31 to September 5, 1995 exceeded the DEQ limit on every day of that period. Temperatures in the Powder River below Thief Valley Reservoir were similarly high during late July and August of 1995.

Federal law requires that water bodies that appear on the 303(d) list be managed to meet state water quality standards. The ODEQ's comprehensive approach for protecting water quality includes developing pollution load limits, known as Total Maximum Daily Loads (TMDLs) for both point and non-point sources. ODEQ is committed to having federally approved TMDLs on all waterbodies listed on the 1998 303(d) list by the end of the year 2007. The target date for completion of a TMDL in the Powder subbasin is 2005.

Soils

Geology is a primary factor in predicting soil properties although in some areas of the Blue Mountains, land form and vegetation can become equally or more important. Subbasin soils derived from granitic batholith rocks are very erosive due to the rounded grain shape and near absence of clay. These soils dominate the North Powder and Wolf Creek drainages.

Soils derived from metamorphic rocks are also very low in clay and have high infiltration and percolation rates but are not considered as erosive as granitic soils. Those areas of the subbasin with Columbia River Basalts have soils primarily derived from that rock. Infiltration of these soils is generally high and permeability is generally moderate.

Soils in the upper Powder River Area are influenced by the deposition of about 1.5 feet of silty volcanic ash from the eruption of Mount Mazama 6,700 years ago.

Noxious Weeds

The spread of noxious weeds has been described as a "biological emergency" (ODA 2001). Alien species in general are second only to habitat loss and degradation among threats to biodiverstiy (Wilcove et al. 2000). In Oregon, noxious weeds pose a serious economic and environmental threat. Oregon loses $83 million annually to 21 of the 99 state-listed noxious weeds (ODA 2001). These invasive, mostly non-native, plants choke out crops, destroy range and pasture lands, clog waterways, affect human and animal health and threaten native plant communities. They are considered one of the most serious natural resource and economic issues facing Baker County (Baker County 2001).

During the last 10 years, the number of state-listed noxious weeds in Oregon has increased by 40 percent. The recent detection, in Oregon, of two aggressive invasive weeds, kudzu and smooth cordgrass, has sounded a serious alarm about new invasions.

The increasing spread of established weeds is equally alarming; infestations of some invasives have expanded up to 42 fold in Oregon since 1989 (ODA 2001).

Baker County is designated as a Weed Control District, formed under ORS 570.505. Its purpose is to contain, control and eradicate noxious weeds in its jurisdiction. A total of 37 noxious weeds have been listed by the Baker County Weed District as present in the county (Table 5).

Table 5. Baker County, Oregon noxious weeds listed by the Baker County Weed District

Common Name	Scientific Name	Common Name	Scientific Name
rush skeletonweed	*Chodrilla juncea*	hoary cress (white top)	*Cardaria draba*
common bugloss	*Anchusa officianalis*	Dalmatian toadflax	*Linaria dalmatica*
yellow toadflax	*Linaria vulgaris*	purple loosestrife	*Lythrum salicaria*
chickory	*Chchorium intybus*	Scotch thistle	*Onopordum acanthium*
common tansy	*Tanacetum vulgare*	diffuse knapweed	*Centaurea diffusa*
spotted knapweed	*Centaurea maculosa*	bur buttercup	*Ranunculus testiculatus*
yellow starthistle	*Centaurea soltitalis*	tansy ragwort	*Senecio jacobaea*
medusahead rye	*Teaniatherum caput-medusa*	jointed goatgrass	*Aegilops cylindrica*
Mediterranean sage	*Salvia aethiopis*	musk thistle	*Carduus nutans*
perennial pepperweed	*Lepidium latifolium*	leafy spurge	*Euphorbia esula*
Canada thistle	*Cirsium arvense*	common teasle	*Dipsacus fullonum*
field dodder	*Custuca campestris*	puncture vine	*Tribulus terrestris*
poison hemlock	*Conium maculatum*	common mullein	*Verbascum thapsus*
St. Johnswort	*Hypericum perforatum*	moth mullein	*Verbascum blateria*
waterhemlock	*Circuta maculata*	morning glory	*Convolvulus sepium*
Russian knapweed	*Cantaurea repens*	Russian thistle	*Salsola tenuifolia*
Dyer's woad	*Isatis tinctoria*	kochia	*Kochia scoparia*
buffalo burr	*Solanum rostratum*	black henbane	*Hyoscyamus niger*
Venice mallow	*Hibiscus trionum*		

Land Uses

Long before the arrival of pioneers and settlers, the Cayuse, Umatilla and Nez Perce Indians utilized the hunting and fishing grounds along the length of the Powder River (USDI BLM 1994). Early Euro-American settlers came to the area on the Oregon Trail as it passed through Baker County. Settlement spread to the upper reaches of the watershed with the discovery of gold in the 1860's (Powder Basin Watershed Council, 2001).

Land ownership and use statistics have not been compiled for the Powder subbasin specifically. Information for Baker County and/or the Powder Basin including the Burnt River and Pine Creek drainages is presented here as representative of the subbasin. References here to the "Powder Basin" or "Basin" include the Burnt River and Pine Creek.

The federal government is the single largest land manager in the Powder Basin (Figure 1). Within Baker County, the BLM manages 367,168 acres and the Forest Service manages 604,927 acres (Powder Basin Watershed Council 1996). Approximately half of Baker County is federally owned (G. Young, Baker County Senior Planner, personal communication, September 2001).

Approximately two-thirds of the Powder Basin is rangeland with livestock grazing as the primary land use. One-sixth of the Basin is forestland where timber harvest and summer livestock grazing are the main uses. Most of the remaining area is cropland and pastureland irrigated by gravity flood or sprinkler systems. Irrigated acres produce primarily grain, hay and pasture (Powder Basin Watershed Council 1996).

Most of the private land in Baker County is zoned "exclusive farm use" (EFU). Most of the remaining private land is zoned "timber-grazing", 80% of which is used primarily for grazing. Less than 10% of the county is zoned in any other category (G. Young, personal communication).

Mineral mining is important in Baker County both historically and in the present. The effects of past dredge mining can be seen along stream courses throughout the subbasin in the form of tailings that line the riparian areas including 1,400 acres of tailings above Phillips Lake (Powder Basin Watershed Council 2001). Currently, mining continues to be a significant land use in the county. Baker County presently has more patented mine claims than all other Oregon counties combined. Additionally, there are many, "maybe thousands" of unpatented mineral claims in the county (G. Young, personal communication). Baker County is the only county in Oregon with a specific zoning category for "mineral extraction" (ME).

Impoundments and Irrigation Projects

The Powder River subbasin includes numerous ditches both active and no longer in use. These ditches were constructed for use in mining and irrigation. There is, at present, no inventory of ditches in the Powder subbasin although such an inventory is in progress (J. Rodgers, personal communication, August 2001). It is not known how many of the historic ditches are still in use or how much water they carry. The South Catherine Ditch carries water from Catherine Creek in the Grande Ronde subbasin to Big Creek at the northern edge of the Powder subbasin. This out-of-basin source provides supplemental irrigation water to the Big Creek drainage. Given the absence of anadromous fish in the subbasin, screening of diversions has been minimal and low priority. However, efforts are underway to increase screening and enforcement of screening requirements.

The Powder River subbasin contains numerous dams and impoundments. The largest of these is Phillips Lake with a storage capacity of 114,000 acre-feet (90,000 acre-feet usable storage) behind Mason Dam, completed in 1968. The OWRD lists 46 dams in the subbasin with storage capacities of 10 acre-feet or more (Table 6). Many, smaller impoundments and ponds also serve as water storage for irrigation and livestock.

There are presently no hydroelectric generating facilities in the Powder River subbasin although Symbiotics has filed preliminary permit applications to study the feasibility of installing hydropower at Thief Valley and Mason dams as well as one Burnt subbasin dam. There is a hydropower generating facility, no longer in use, on Rock Creek. This facility, operated by the Oregon Trail Electric Cooperative, is scheduled to be decommissioned within the year.

Table 6. Powder River subbasin, Oregon dams with storage capacities of 10 acre-feet or more

Name	Stream	Dam Height (ft)	Storage (Ac-ft)
Unnamed	First Creek and springs	10	10
Unnamed	A spring	10	25
Bacher Creek Reservoir	Bacher Creek	30	120
Baker Reservoir	Crew Springs	10	20
Balm Creek Reservoir	Balm Creek and Union Spring	65	2926
Bennett Dam	East Sutton Creek	22	206
Cranston Reservoir	Clover Creek	10	50
Crater Lake	runoff from watershed	31	190
Eagle Lake	Eagle Lake	33	844
Echo Lake Reservoir	West Eagle Creek	10	300
Fisk Reservoir-Little Park	Thorn Creek	31	280
Goodrich Reservoir	Goodrich Creek	65	603
Haines-City Lagoon #2	City sewage	14	10
Haines-City Lagoon #3	City sewage	18	10
Haskell Reservoir	Elk Creek	10	100
Homesite 1	Not listed	22	46
Hovan-Johnson Reservoir	Big Houghton Creek	10	16
Jimmy Creek Reservoir	Jimmy Creek	42	675
Killamacue Reservoir	Killamacue Lake	11	798
Laird Reservoir	Sag Creek	20	69
Licklider Dam	Griffin Gulch	20	9
Looking Glass Lake Reservoir	Eagle Creek	13	527
Love Reservoir	Love Creek, Lawrence Creek	30	920
Mason Dam	Powder River	167	114,000
Nault Reservoir	W. Fork Sutton Creek	15	49

Name	Stream	Dam Height (ft)	Storage (Ac-ft)
Pilcher Creek Reservoir	Anthony and Pilcher Creeks	110	5,910
Prowell Dam	Beaver Creek	21	40
Reservoir #2	W. Fork Love Creek	10	300
Reservoir #3	W. Fork Love Creek	10	300
Rock Lake	Unnamed	28	452
Salmon Creek Reservoir	Salmon Creek	41	255
Saw Mill Gulch Reservoir	Saw Mill gulch	30	150
Shaw Reservoir	Little, Dry and Gussie creeks	48	504
Shaw South Reservoir	Juniper Gulch	18	48
Smith Lake	Powder River	26	580
Spalding-Vaughn Reservoir #2	Elk Creek-Burlap and Juniper Gulches	10	9
Spaulding-Vaughn Reservoir	Elk Creek-Burlap and Juniper Gulches	10	106
Stoddard Dam	Main Eagle Creek	10	40
Thief Valley Reservoir	Powder River	66	17,400
Turner Reservoir	Second Creek	10	50
Unnamed	First Creek and White Swan Gulch	10	100
Van Patton Lake Dam	N. Fork Dutch Flat Creek	25	583
Vogel Reservoir	Union Creek	15	30
Widman Reservoir	West Fork Love Creek	30	65
Wirth Reservoir	Big Creek	36	59
Wolf Creek Reservoir	Wolf and Anthony creeks	125	10,800

Source: OWRD

Protected Areas

US Forest Service

- *Eagle Cap Wilderness Area*. The Eagle Cap Wilderness Area lies in the heart of the Wallowa Mountains on the Wallowa-Whitman National Forest and encompasses 361,446 acres. First established as a primitive area in 1930, the Eagle Cap Wilderness became a part of the National Wilderness Preservation System with the passage of the Wilderness Act of 1964. The mainstem, West Fork and East Fork of Eagle Creek all begin in the Eagle Cap Wilderness Area.

US Bureau of Land Management

- *National Historic Oregon Trail Interpretive Center.* The National Historic Oregon Trail Interpretive Center is located at Flagstaff Hill east of Baker City and encompasses more than 500 acres. The area and interpretive center are managed to allow visitors the opportunity to view the original wagon ruts left by travelers on the Oregon Trail and the native vegetation of the area and to get an historical perspective on the trail and its users.
- *Powder River Canyon Area of Critical Environmental Concern*. Public lands encompassing 5,880 acres in the Powder River Canyon, between Thief Valley Reservoir and Highway 203 in the Keating Valley, are designated and will be managed as an ACEC. Within the ACEC, 2,385 acres of BLM managed land are included in the Powder Wild and Scenic River. The ACEC will be managed to protect raptor habitat, wildlife habitat, cultural resources, and to maintain scenic qualities while allowing for compatible recreational uses.
- *Keating Riparian Research Natural Area/Area of Critical Environmental Concern*. The Keating Riparian RNA/ACEC is comprised of approximately 2,173 acres of BLM managed land on Balm, Clover, and Sawmill Creeks. The area is managed to protect riparian values and wildlife habitat. Eighty acres within the ACEC will be managed as a Research Natural Area (RNA) to protect and maintain natural riparian ecologic systems for research and educational purposes.
- *Oregon Trail Area of Critical Environmental Concern.* Seven parcels of public lands with remnants of the Oregon National Historic Trail, encompassing approximately 1,495 acres, are designated and will be managed as an ACEC to preserve the unique historic resource and visual qualities of these areas. These lands are located within both the Burnt and Powder River subbasins.
- *Hunt Mountain Area of Critical Environmental Concern.* Approximately 2,230 acres of BLM managed land on Hunt Mountain are designated as an ACEC to protect and maintain habitat for mountain goats and big game, and to protect habitat for sensitive plant species identified by the Oregon National Heritage Program.

Oregon Department of Fish and Wildlife

- *Elkhorn Wildlife Area*. Located on the east slopes of the Elkhorn Range of the Blue Mountains in Union and Baker counties, the Elkhorn Wildlife Area consists of 8 separate tracts with a total of 9,630.22 acres. Of this total, 6,566.42 acres are owned by ODFW, 1,727.80 acres are public lands under management agreement and 1,336.0 acres are private lands under lease for management by ODFW. The Elkhorn Wildlife Area is managed primarily: 1) to mitigate the loss of traditional big game winter range,

2) to provide supplemental or subsistence feed for wintering elk and deer to alleviate damage to private lands, 3) to provide habitat for big game and other wildlife indigenous to the area, and 4) to provide hunting and other wildlife oriented recreation opportunities for the public. In addition to deer and elk, management of the Elkhorn Wildlife Area benefits a wide array of game and non-game fish and wildlife species. A complete list of species known to use the wildlife area can be found in the Long Range Management Plan (ODFW 1993a).

- *North Powder Ponds Public Access*. With 2 ponds located on the boundary between Union and Baker counties, the North Powder Ponds Public Access areas total 36 acres and are co-managed by ODFW and Oregon Department of Transportation (ODOT). They are managed primarily as habitat for aquatic birds and to provide angling opportunities for the public.
- *Red Ridge Wildlife Area*. Located in Baker County, the Red Ridge Wildlife Area is 30 acres of riparian habitat maintained by a spring in grassland. This area is co-managed by ODFW and the BLM as a watering site for mule deer and other wildlife.
- *Salisbury Wildlife Area*. The Salisbury Wildlife Area is a 6-acre tract of riparian habitat in Baker County co-managed by ODFW and ODOT for a variety of wildlife including neotropical migrant songbirds.
- *Baldock Slough*. The Baldock Slough area is 12 acres managed for a variety of non-game wildlife.
- *Haines Pond*. Haines Pond is a 4 acre site managed for public access and angling.
- *Miles Wetland*. Miles Wetland consists of 600-acres in a conservation easement located east of North Powder.

Baker County

- *Sumpter Valley Wildlife Area*. Managed by Baker County, the Sumpter Valley Wildlife Area consists of 1,587 acres of ponds and riparian habitat in the area dominated by dredge tailings from historic mining activity. The area is managed to provide nesting habitat for Canada goose and other waterfowl.

Wild and Scenic Rivers

Portions of the Powder and North Powder Rivers and Eagle Creek are designated as federal Wild and Scenic under the Omnibus Oregon Wild and Scenic Rivers Act and are sub-classified as wild, scenic or recreational. These stream segments are: the Powder River from Thief Valley Dam to the Highway 203 bridge, a distance of 11.7 miles (scenic); the North Powder River from its headwaters to the National Forest Boundary, a distance of 6.0 miles (scenic); and Eagle Creek from its headwaters below Eagle Lake to the National Forest Boundary at Skull Creek, a distance of 27 miles (wild - 4 miles; scenic - 6 miles; recreational – 17 miles). The BLM prepared a management plan for the Powder River segment, which describes the Outstanding Remarkable Values (ORVs) that made the reach eligible under the Wild and Scenic Rivers Act (BLM 1994).

Federal Cave Resources

Four caves in the Eagle Creek drainage were nominated in 1995 under the Federal Cave Resources Protection Act of 1988. One cave has been determined to qualify as "significant" under the regulations. The other three are listed under "inadequate information" and require further investigation.

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

The Powder River subbasin once supported healthy runs of anadromous fish as well as a variety of resident fish species. Thompson and Haas (1960) reported on the historical presence and later decline of anadromous fish in the Powder River:

> The Powder River was once an important salmon and steelhead stream. Reports from local residents indicate that chinook salmon spawned from the headwaters to the lower end of the North Powder Valley. While mining, logging and irrigation undoubtedly caused these runs to decline, it was not until the construction of Thief Valley Dam in 1931 that the anadromous species were completely eliminated from the upper area of the drainage.

Chapman (1940) reports that chinook continued to arrive at the base of the dam until the last cycle died off. Thompson and Haas (1960) reported that chinook salmon were still present in Eagle Creek and steelhead were in Big Creek, Goose Creek and Daly Creek. Construction of the Hells Canyon Complex of dams, beginning with Brownlee Dam in 1958, created the final barrier to anadromous fish passage and eliminated the last of the salmon and steelhead runs from the subbasin.

Although the Powder River subbasin lacks anadromous fish, it does support diverse resident fish populations and an active recreational fishery. Resident fish include both native and introduced species (Table 7).

Table 7. Fish species known to occur in the Powder subbasin

Species	Origin	Distribution
Redband trout (*Oncorhynchus mykiss gibbsi*)	N	Widespread
Rainbow trout (*Oncorhychus mykiss*)	N	Widespread
White sturgeon (*Acipenser transmontanus*)	N	Rare in Powder Arm of Brownlee Reservoir
Mountain whitefish (*Prosopium williamsoni*)	N	Mainstem
Brook trout (*Salvelinus fontinalis*)	I	Widespread
Bull trout (*Salvelinus confluentus*)	N	Elkhorn tributaries
Lake trout (*Salvelinus namaycush*)	I	Few high lakes
Mottled sculpin (*Cottus bairdi*)	N	mainstem and tributaries
Slimy sculpin (*Cottus cognatus*)	N	mainstem and tributaries
Torrent sculpin (*Cottus rhotheus*)	N	mainstem and tributaries
Shorthead sculpin (*Cottus confuses*)	N	mainstem and tributaries
Piaiute sculpin (*Cottus beldingi*)	N	mainstem and tributaries
Carp (*Cyprinus carpio*)	I	Low Gradient Streams
Northern pikeminnow (*Ptychocheilus oregonensis*)	N	Mainstem
Chiselmouth (*Acrocheilus alutaceus*)	N	Widespread
Peamouth (*Mylocheilus caurinus*)	N	Widespread
Longnose dace (*Rhinichthys cataractae dulcis*)	N	Widespread
Speckled dace (*Rhinichthys osculus*)	N	Widespread
Redside shiner (*Richardsonius balteatus balteatus*)	N	Widespread
Largescale sucker (*Catostomus macrocheilus*)	N	Widespread
Mountain sucker (*Catostomus platyrhynchus*)	N	Widespread
Bridgelip sucker (*Catostomus columbianus*)	N	Widespread
Black crappie (*Poxomis nigromaculatus*)	I	Lakes, Ponds, Low Gradient
White crappie (*Poxomis annularis*)	I	Lakes, Ponds, Low Gradient
Largemouth bass (*Micropterus salmoides*)	I	Lakes, Ponds, Low Gradient
Smallmouth bass (*Micropterus dolomieui*)	I	Lakes, Ponds, Low Gradient
Bluegill (*Lepomis macrochirus*)	I	Lakes, Ponds, Low Gradient
Pumpkinseed (*Lepomis gibbosus*)	I	Lakes, Ponds, Low Gradient
Warmouth (*Lepomis gulosis*)	I	Lakes, Ponds, Low Gradient
Yellow perch (*Perca flavescens*)	I	Lakes, Ponds, Low Gradient
Channel catfish (*Ictalurus punctatus*)	I	Lakes, Ponds, Low Gradient
Flathead catfish (*Pylodictis olivaris*)	I	Lakes, Ponds, Low Gradient
Brown bullhead (*Ameiurus nebulosus*)	I	Lakes, Ponds, Low Gradient

N = native; I = introduced

Redband Trout (*Oncorhynchus mykiss*)

Redband trout are listed as Sensitive by the USFS and the BLM. Many of the rainbow trout populations in the Snake River Basin, including the Powder River subbasin, have been identified as inland "redband" type trout. Some taxonomists suggest that the resident

form of *O. mykiss* in most of the Powder subbasin is part of the inland Columbia basin redband trout group. Distribution of redband trout is widespread throughout the Powder River subbasin (J. Zakel, District Fish Biologist, ODFW, personal communication, Sept. 2001).

Resident redband trout in some areas are known to tolerate water temperatures from 56° F to 70° F. Redband trout mature between 1 and 5 years of age with most maturing at age 3. They spawn mainly in the spring although studies of other inland populations as well as field investigations indicate that redband trout spawn throughout the year where water conditions allow (ODFW 1993b).

Rainbow Trout (*Oncorhynchus mykiss*)

Hatchery rainbow trout have been used to enhance fishery opportunities and harvest in the Powder River subbasin since the 1940's. This stocking effort supported popular trout fisheries on subbasin streams and reservoirs. Historically, releases have consisted of fry, fingerling, and legal-size (6-10 in.) fish. Legal, or "catchable", fish are presently stocked in Anthony Lake, Phillips Lake, the Powder river below Phillips Lake, Eagle Creek, West Eagle Creek and landlocked ponds in the Baker Valley. Fingerlings are released in Phillips Lake, Thief Valley, Wolf Creek, Pilcher Creek and Balm Creek reservoirs as well as high elevation Crater, Heart, Eagle, Looking Glass, Lost, Rock Creek, Twin and Van Patton lakes. Rainbow trout released in the Powder subbasin are reared outside the basin, primarily at the Oak Springs hatchery near Maupin, Oregon and the Fall River Hatchery in the Deschutes basin in Oregon.

Brook Trout (*Salvelinus fontinalis)*

Brook trout are native to the eastern United States and were introduced into the Powder River subbasin in the 1920's. This species of trout spawns in the fall and most mature at 3 years of age. They are usually short-lived; few wild fish live beyond 5 years of age. Brook trout are also slow growing and many populations are prone to stunting, especially in small headwater streams and lakes. Brook trout prefer cool, clear headwater streams and mountain lakes with water temperatures ranging from 55° F - 68° F.

Brook trout are found throughout the Powder subbasin including Anthony Lake, the North Powder River, lakes and streams of the eastern Elkhorn face, Eagle Creek and high lakes of the Wallowa Mountains. There is currently no stocking of brook trout in subbasin streams.

Bull Trout (*Salvelinus confluentus*)

Bull trout are federally listed as Threatened under the ESA. Bull trout presently occur as several remnant, highly fragmented populations in headwater streams of the upper Powder and North Powder drainages of the Powder subbasin (Table 8).

Table 8. Current bull trout populations in the Powder River, Oregon core area

Drainage	Local Populations
Powder River	Upper Powder River(Silver and Little Cracker Creeks
	Lake Creek
	Pine Creek
	Salmon Creek
	Rock/Big Muddy Creek[a]
North Powder River	North Powder River
	Anthony Creek (North Fork Anthony and Anthony Creeks)
	Indian Creek (tributary To Anthony Creek)
	Wolf Creek

[a]Are separate now, but could become one local population in the future.

There is no known historic documentation of bull trout in the Powder subbasin prior to the 1960s; historic distribution of bull trout in the Powder is unknown. It is suspected that they were widespread in the upper Powder drainage and seasonally connected to the Snake River. Passage above RM 70 on the Powder River was blocked in 1932 by construction of Thief Valley Dam, which has no upstream fish passage (ODFW 1993b). Mason Dam, constructed in 1968, isolated bull trout in the upper Powder River from bull trout in the North Powder River. Construction of Brownlee Dam in 1959 limited access of any fluvial bull trout in Eagle Creek to the pool above Brownlee Dam on the Snake River. According to a December 1965 ODFW District monthly report, a twelve inch bull trout was caught in a net set in Brownlee Reservoir in 1959, after the reservoir had filled.

Bull trout were documented in Eagle Creek and West Fork Eagle Creek in creel reports in 1965. Angler reports indicate bull trout were caught in the Martin Bridge section of Eagle Creek during July, August, and September in the mid-1980s (ODFW 1993b). Oral histories taken from longtime residents indicate Dolly Varden "bull trout" were common in Eagle Creek in the 1940s and 1950s (Gildemeister 1989).

Extensive snorkeling surveys conducted between 1991 and 1994 failed to find bull trout in Eagle Creek (ODFW 1995). The status of Eagle Creek bull trout remains unknown. If bull trout are present, their distribution and number are extremely limited (ODFW 1995).

Two populations in the North Powder drainage, in Anthony/Indian creeks and in the upper mainstem North Powder River were identified by spot sampling during the summer of 1992 (ODFW 1993c). Several streams that drain the eastern face of the Elkhorn Mountains, including Pine, Salmon, Big Muddy, Rock, and Wolf creeks, have been found recently to contain bull trout. Full distribution for these populations has not been determined.

Habitat degradation, as a result of streamflow diversions, upstream passage barriers at dams and downstream losses at unscreened diversions, are suspected limiting factors to the upper Powder River and North Powder River bull trout populations. These factors also

affect Eagle Creek bull trout, if they have not been extirpated. Impacts from elevated water temperature, riparian habitat loss, channel alterations, and siltation of spawning gravel are believed to also limit bull trout production in the upper Powder River subbasin (ODFW 1993c).

The Hells Canyon Complex Recovery Unit (HCCRU) is comprised of the Snake River mainstem and tributaries in Oregon and Washington that drain to the Snake River within the Hells Canyon Hydroelectric Project (Hells Canyon, Oxbow, and Brownlee Dams and associated reservoirs). Two core areas were identified in the HCCRU, the Pine/Indian/Wildhorse Core Area consisting of the Pine Creek subbasin in Oregon and Indian and Wildhorse subbasins in Idaho. Chapter 1 of the Draft Bull Trout Recovery Plan (In Press) defines core areas as follows: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (i.e., bull trout inhabiting core habitat) of bull trout. There are currently at least 7 local bull trout populations identified in this core area. The Powder Core Area encompasses the streams draining the Powder River and contains 10 or more local bull trout populations. Bull trout to date have not been identified in the Burnt River Basin, although they may have existed there historically. The Burnt River Basin is included in delineation of the recovery unit and identified as a research need. Additional studies are needed to determine status of any remnant bull trout populations in the Burnt River Basin and it's habitat potential to recover and support bull trout.

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

The following draft language has been developed by the HCCRU Team for inclusion in HCCRU chapter, although it may be subject to further revision by the Team. The goal for recovery of bull trout in the Hells Canyon Complex Recovery Unit is to have a sustained, healthy population complex in which the local populations attain full productivity, genetic interaction, and opportunity to re-populate available habitat as environmental conditions improve to meet their needs.

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

1. Current distribution of bull trout within the core area is maintained and expanded in the future to all habitats that are, or become suitable within the Hells Canyon Complex Recovery Unit. Re-establishment of a bull trout population into their historic range in Eagle Creek, a tributary to the Powder River, and other streams yet to be identified would be expected in a recovered state.
2. Increasing trends in abundance of bull trout in the Hells Canyon Complex Recovery Unit are sustained.
3. Suitable habitat conditions for all bull trout life history stages and strategies are restored and maintained.

4. Genetically diverse populations of bull trout populations within the Hells Canyon Complex Recovery Unit are conserved by providing opportunities for genetic exchange between the local populations within the Pine/Indian/Wildhorse Core Area including Hells Canyon and Oxbow reservoirs; and between the local populations within the Powder Core including connectivity with Brownlee Reservoir to facilitate connectivity between core areas in the future.

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

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

Yellow Perch (*Perca flavescens)*

In 1991 ODFW biologists documented the illegal introduction of yellow perch to Phillips Lake. Since 1994, biologists have documented a severe decline in productivity of black crappie and smallmouth bass and a shift in the species composition and size of zooplankton in the lake. However, during the period 1994 to 1999 yellow perch density increased 245% (Shrader 2000). The disruption of the food web in Phillips Lake by this invasive species may have a negative impact on upper Powder River bull trout that may utilize the lake (T. Walters, ODFW, personal communication, August 2001).

Creel surveys and anecdotal reports indicate yellow perch are spreading to other areas of the subbasin; there have been reports of observations in and below Thief Valley Reservoir (T. Walters, personal communication, 2001).

Wildlife

A variety of wildlife species are found in the riverine, wetland and upland habitats of the Powder River subbasin. Nearly two-thirds of the wildlife species statewide are adaptable and thrive in both natural and human-impacted environments (e.g., coyote raccoon, red-tailed hawk, great horned owl, American robin, Brewer's blackbird, dark-eyed junco). One third of the state's wildlife species depend on natural or undisturbed environments. Over 20 federally listed species or species of concern can be found in the subbasin (Table 9).

Various populations of wildlife species are managed by federal and state wildlife managers throughout the subbasin including big game, furbearers, upland birds, and

waterfowl. Many raptor species (e.g., golden eagle, American kestrel, northern goshawk) inhabit the subbasin including several seasonal migrants (e.g., bald eagle, Swainson's hawk).

The Powder subbasin includes portions of the Sumpter, Lookout Mountain and Keating Wildlife Management Units (WMUs) and very small portions of the Catherine Creek and Starkey WMUs.

Table 9. Federally listed wildlife species and species of concern in the Powder River subbasin, Oregon. A * denotes species extirpated from the area or whose population status is unknown

Common Name	*Scientific Name*	Common Name	*Scientific Name*
tailed frog	*Ascaphus truei*	pygmy rabbit*	*Brachylagus idahoensis*
Columbia spotted frog	*Rana luteiventris*	gray wolf*	*Canis lupus*
northern sagebrush lizard	*Sceloporus graciosus*	pale western big-eared bat	*Corynorhinus townsendii*
northern goshawk	*Accipiter gentilis*	California wolverine*	*Gulo gulo*
western burrowing owl	*Athene cunicularia*	silver-haired bat	*Lasionycteris noctivagans*
ferruginous hawk	*Buteo regalis*	Canada lynx*	*Lynx canadensis*
western greater sage-grouse	*Centrocercus urophasianus*	Pacific fisher*	*Martes pennanti*
yellow-billed cuckoo	*Coccyzus americanus*	western small-footed myotis	*Myotis ciliolabrum*
eastern Oregon willow flycatcher	*Empidonax trailii*	long-eared myotis	*Myotis evotis*
Lewis's woodpecker	*Melanerpes lewis*	fringed myotis	*Myotis thysanodes*
mountain quail	*Oreortyx pictus*	long-legged myotis	*Myotis volans*
white-headed woodpecker	*Picoides albolarvatus*	Yuma myotis	*Myotis yumanensis*
Columbian sharp-tailed grouse*	*Tympanuchus phasianellus*	Preble's shrew	*Sorex preblei*

Rocky Mountain Bighorn Sheep (*Ovis canadensis*)

Bighorn sheep were extirpated from Oregon by the mid-1940's. Historical information suggests that bighorns in the Powder River subbasin were eliminated by a combination of disease and overhunting. Rocky Mountain bighorn sheep were reintroduced to the Powder River subbasin beginning in 1990. About 95 rocky Mountain bighorn sheep currently occupy habitats along the Snake River south of the Powder Arm of Brownlee Reservoir (55 animals) and near Oxbow (40 animals). Current management of Oregon's bighorn sheep is described in the Bighorn Sheep Plan (ODFW 1992a).

Rocky Mountain Goats (*Oreamnos americanus)*

Evidence indicates that mountain goats were indigenous to northeast Oregon but were extirpated at, or prior to European settlement. Present populations occur in the Wallowa Mountains, Hells Canyon and the Elkhorn Mountains and are the result of reintroductions. The Elkhorn Mountain goat herd originated from 3 separate releases beginning in 1983. Kid to adult ratios were high in this herd, resulting in a rapidly expanding population. Sixteen animals were removed from the Elkhorn herd in 2000 and transplanted to Hat Point above the Snake River. The 2000 population estimate, after capture and transplant,

was 100 goats. Individuals continue to pioneer vacant habitat including Vinegar Hill, Mount Ireland and the Strawberry Mountains. Habitat is available for an estimated 300 mountain goats in the Elkhorn Mountains (G. Keister, ODFW, Baker District Wildlife Biologist, personal communication, Aug. 2001). Additional potential mountain goat habitat exists in the subbasin, particularly in the Eagle Creek drainage. Mountain goat management in the subbasin is guided by Oregon's Interim Mountain Goat Management Plan (ODFW 2000b).

Rocky Mountain Elk (Cervus elaphus nelsoni)

Rocky Mountain elk are found throughout the subbasin wherever forage and cover can be found. Rocky Mountain elk have historically been more abundant in the Blue and Wallowa mountains than elsewhere in Oregon. Routine surveys have shown a slow decline in calf recruitment in the area over the past several years but to a much lesser degree than that experienced in Wallowa and, more recently, Union counties (G. Keister, ODFW, personal communication, August 2001).

Quality, quantity and arrangement of several habitat components affect the distribution of elk. Availability and juxtaposition of food, water, shelter, space and harassment due to human activities ultimately determine the number of elk an area can sustain and the amount of recreation that can be provided. Migratory herds need high quality forage on transitional winter and summer ranges. Resident herds must find sources of quality forage within their herd range.

During summer, elk prefer damp sites such as meadows and riparian areas, which offer nutritious forage and moist, cool places for escaping summer heat and insects. Winter survival is primarily dependent on fat stores. Thus, quality summer forage is at least as important as adequate winter food for over-winter survival. Elk require a mosaic of early forage-producing stages and later cover-forming stages of forest development; both in close proximity. In the Powder subbasin, most summer ranges for elk are on public land in the upper drainages although some elk have adapted to summer use of agricultural lands at lower elevation. Winter ranges are largely on, or adjacent to, private lands. During the late summer (August and September) as natural elk forage dries and becomes less palatable, irrigated alfalfa fields attract herds of foraging elk. The resulting movement onto private lands creates significant conflict with landowners who may suffer serious financial losses.

Loss of winter range to human development and agriculture in the Baker and Bowen valleys, in the Sumpter WMU, caused major conflict with wintering elk herds. The ODFW began purchasing land along the public/private land interface on the low elevation eastern slopes of the Elkhorn Mountains in the 1960s to create feeding sites for deer and elk to mitigate for the lost habitat. Most elk that summer in the Keating WMU, probably winter in Wallowa County along the Snake, Imnaha and Minam Rivers, but some winter above Eagle Creek near Richland or above the Keating Valley.

Elk breed in the fall, generally in September and October. Adult cows in good condition will typically produce a calf each year. Most young are born in June. Management of elk in eastern Oregon is guided by the Rocky Mountain Elk Plan (ODFW 1992b). The plan was developed through a public review process and identifies

management objectives for population numbers and bull ratios with management options for each wildlife management unit.

Mule Deer (*Odocoileus hemionus*)

Rocky Mountain mule deer are native to eastern Oregon and are distributed throughout the Powder River subbasin. Mule deer populations in the subbasin experienced dramatic declines in the early 1980's after a series of harsh winters. Extreme drought 1986-1992 with hard winters 1988/89 and 1992/93 also reduced populations. Since then, slow, moderate increases have been noted due to a series of easy winters (G. Keister, personal communication, August 2001). Some areas of the subbasin, such as those along the lower Powder and Snake rivers, have high concentrations of wintering mule deer. Oregon management strategies regarding mule deer were developed through a public review process and are identified in the Mule Deer Plan (ODFW 1990).

Mule deer occupy a wide range of habitat types including desert shrub, woodland, conifer forest and alpine areas. In general, however, mule deer occupy more open, rugged areas. Although mule deer are commonly thought to be browsers, they consume a wide variety of plant material and in some seasons, graze extensively. Winter weather and deep snow drive mule deer to lower elevation wintering grounds. During this critical period for survival, mule deer typically browse the new growth of trees and shrubs. During spring, mule deer depend on succulent forbs and grasses that appear after snowmelt.

White-tailed Deer (Odocoileus virginianus ochrourus)

Northeast Oregon harbors the highest densities in the state of this subspecies, often called the Idaho white-tail. In the Powder River subbasin, white-tail population numbers are low but increasing. White-tailed deer utilize heavy shrub patches and thick riparian vegetation and are gradually extending their range as these features become more available. Because of their preference for heavy cover and their more limited distribution, white-tailed deer are seen less often than mule deer by both wildlife watchers and hunters.

Cougar (Puma concolor)

Cougars were classified in Oregon as an unprotected predator until 1978. Under that classification, and with the encouragement of bounties, the population reached an estimated low of 200 animals statewide. Following their classification as a game mammal in 1978, populations have increased steadily. In 1992, ODFW estimated the statewide population to be growing at a rate of 4-5% per year, a trend that likely continues today (ODFW 1993c) given their high reproductive potential. Oregon cougar populations are managed through the Cougar Plan (ODFW 1993d).

In the Powder River subbasin, anecdotal evidence, significant increases in cougar harvest and increasing cougar damage complaints indicate an increase in cougar populations since 1995.

Cougars may breed at any time of the year and give birth to an average of 3 young. The young stay with the female for 12-18 months before becoming independent. Female young may remain close to their natal home range while males generally disperse relatively long distances. Adult females typically breed again shortly after their young disperse although they may breed prior to that time.

Cougars are a significant predator of deer and elk and may also prey on domestic animals. Cougar predation can impact small, isolated ungulate populations (Ross et al. 1997) and limit recruitment in larger populations. This may have an impact on achievement of management objectives for big game herds.

Canada Lynx (*Lynx canadensis*)

The Canada lynx was federally listed as threatened in 2000. Potentially suitable habitat in the Powder subbasin includes those plant communities above 4,500 feet in elevation that support vegetation capable of providing denning, foraging or travel habitat for lynx. Lower elevations are not considered potentially suitable for lynx denning and foraging because the primary prey species (snowshoe hare) does not inhabit those elevations in sufficient numbers. Lynx require stands with structural diversity and large woody debris in close proximity to foraging areas for denning. Hair-snag surveys for Canada lynx were conducted by the USFWS and the USFS in the subbasin in 1999 and 2000. These surveys failed to detect lynx in the area.

American Marten (*Martes americana*)

American marten are native to the mountainous regions of Oregon. They are closely associated with late-successional conifer forests and riparian habitats over a broad range of elevations (Buskirk and Ruggiero 1994, Csuti et al. 1997, Wisdom et al. 2000, Sallabanks et al. 2001). Marten populations may be declining due to loss of preferred late successional forest habitat (Csuti et al. 1997). Martens are sensitive to patch size and generally avoid clearcuts, preferring habitats with woody structural diversity including large diameter snags and logs (Wisdom et al. (2000). American marten are classified as a furbearer in Oregon and thus, can be legally harvested by trappers although harvest numbers are low (56 taken statewide in 2000).

Black Bear (*Ursus americanus*)

The black bear is an important part of the ecosystem and has been considered an indicator of ecosystem health (ODFW 1993e). Black bear populations in the subbasin are steadily increasing and bears can be found in most forested habitats. Recent rules restricting the use of baiting and pursuit hounds have reduced hunting pressure; harvest is mostly opportunistic during other big game seasons. Bailey (1936a) estimated Oregon's 1930-1933 bear population at approximately 9,000 animals. The 1993 population was estimated at 25,000 based on an estimated density of 0.3 bears per mi^2 of suitable habitat in eastern Oregon (ODFW 1993e). Black bears are managed through the Black Bear Management Plan (ODFW 1993e).

Black bear diets are very diverse but, because of winter hibernation, forage availability in spring and fall is critical to survival. Bears can be a significant predator of deer fawns and elk calves. Black bear reproductive potential is relatively high with 2 cubs per litter most common. Young generally remain with the female for more than one year and disperse as yearlings in the spring when females breed again. Bears are long-lived animals; individuals older than 20 years have been documented in Oregon (ODFW 2000a).

Furbearers

Wetland/Riparian furbearers: Several species of wetland/riparian dependant furbearers including beaver (*Castor canadensis*), river otter (*Lutra canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and raccoon (*Procyon lotor*) are found in the Powder subbasin.

Beavers were historically abundant throughout Oregon (Bailey 1936b) so that early trappers returned with a wealth of pelts. Beavers perform an important function in creating wetland habitat. Over time, their labors result in a mosaic of wetland successional stages from open-water ponds to seasonal wet meadows. Beavers' efficiency at aquatic engineering has resulted in conflicts with humans when irrigation projects are rerouted, fields are flooded, fences are damaged by falling trees or other damage is done to human developments. Beaver populations are relatively low on many National Forest lands of the Powder subbasin due primarily to poor riparian condition. In the Powder subbasin, beaver damage is common in basins and streams near agricultural lands where irrigation ditches are often blocked. Beavers are classified as furbearers in Oregon and are subject to trapping.

River otters are relatively common along the mainstem rivers and tributaries of the Powder River subbasin. Otters consume many aquatic organisms including fish, frogs, and turtles as well as small mammals, birds and carrion.

Mink are also common in the subbasin's wetland and riparian areas. They are semi-aquatic animals with partially webbed feet for swimming. Mink prey primarily on muskrats but will also consume fish, frogs, crawfish, small mammals and birds found near water.

Muskrats are found in or near water throughout the Powder River subbasin. In appropriate habitats, population densities can reach 1-4 per acre of surface water (Csuti et al. 1997). Muskrats eat primarily aquatic and wetland vegetation but will also prey on small aquatic animals. Muskrats build large nests of vegetation and mud but generally do not create the kind of alterations that put beavers in conflict with humans.

Raccoons are versatile omnivores that occur in a wide variety of habitats. When food is abundant, raccoons are selective in their diet, but when food becomes scarce, they will eat almost anything (Csuti et al. 1997). Their adaptability and catholic diet often put raccoons in conflict with humans as they forage among domestic pets, fowl, and pet food. Raccoons are largely nocturnal and spend the daylight hours in trees.

Furbearers of Conservation Concern: The fisher (*Martes pennanti*) and wolverine (*Gulo gulo*) are furbearers classified by the Natural Heritage system as sensitive in Oregon (Bull and Wales in press).

Fishers are very rare in Oregon with most sightings in the Coast and Cascade Mountains. The species is being considered for listing by the U.S. Fish and Wildlife Service because populations are very low. A few individuals may reside in the Elkhorn Mountains of the Powder River subbasin although their abundance and distribution is unknown. Fishers primarily use mature, closed-canopy forests with some deciduous component, frequently along riparian corridors. Although fishers will cross openings

between forested areas (Arthur et al. 1989), a negative association with clearcuts has been documented.

Wolverines were historically found throughout Oregon in appropriate habitats. The species is very rare and is considered a Species of Concern by the U.S. Fish and Wildlife Service. Wolverine sightings are occasionally reported in the Blue Mountains but their abundance and distribution in the area is unknown. Wolverines are typically found in open forests at higher elevations and in alpine areas. They avoid young, dense, regenerating forests and brushy areas (Csuti et al. 1997).

Wading and Shore Birds

A number of wading and shore birds are found in the Powder subbasin (e.g.: spotted sandpiper, killdeer, American avocet, long-billed curlew), but 2 species merit special note: the great blue heron (*Ardea herodias*) and the sandhill crane (*Grus canadensis*).

Great blue herons are colony-nesting birds that forage in shallow wetlands, irrigated fields or moving waters. They can be found throughout the subbasin along lower elevation streams and wetlands. Most heron rookeries are found in mature cottonwood galleries along riparian areas. Human induced changes to rivers and wetlands (dredging, diking, stream channelization, mining, cattle grazing) have substantially reduced riparian associated wetlands historically created by beaver dams and seasonal flooding. This loss of riparian wetland has resulted in the loss of some of the old cottonwood galleries and limited their replacement. Loss of roosting and foraging habitat likely has a negative effect on great blue heron populations.

Sandhill cranes are listed as "vulnerable" in Oregon. There are estimated to be about 1,000 nesting pairs in the state (Csuti et al. 1997). A few nesting pairs may be found in the Powder River subbasin. Sandhill cranes typically nest in marshes and wet meadows or in drier grasslands and pastures. The young of dry land nesters are vulnerable when hayfields and pastures are mowed early in the season. The loss of wetland and wet meadow habitats to agriculture and development has resulted in a decrease in safe nesting areas for sandhill cranes.

Waterfowl

Twenty species of ducks, four species of geese, and two species of swans occur in the Powder River subbasin during migration and nesting seasons (Table 10). Historically, beaver dams and seasonal flooding provided more ponds and open, slow moving waters for waterfowl resting, nesting, and feeding. Diking and channelization for flood control and intensive agriculture have eliminated many wetlands. However, small ponds within the area of the dredge tailings above Phillips Lake provide habitat for waterfowl.

Table 10. List of common waterfowl species in the Powder River subbasin

Common Name	Scientific Name	Common Name	Scientific Name
Tundra swan	*Cygnus columbianus*	Ruddy duck	*Oxyura jamaicensis*
Trumpeter swan	*Cygnus buccinator*	Cinnamon teal	*Anas cyanptera*
Greater white-fronted goose	*Anser albifrons*	Northern shoveler	*Anas clypeata*
Snow goose	*Chen caerulescens*	Gadwall	*Anas strpera*
Ross' goose	*Chen rossii*	Eurasian wigeon	*Anas Penelope*
Canada goose	*Branta canadensis*	American wigeon	*Anas americana*
Wood duck	*Aix sponsa*	Canvasback	*Aythya valisineria*
Green-winged teal	*Anas crecca*	Redhead	*Aythya americana*
Mallard	*Anas platyrhynchos*	Ring-necked duck	*Aythya collaris*
Northern pintail	*Anas acuta*	Lesser scaup	*Aythya affinis*
Blue-winged teal	*Anas doscors*	Common goldeneye	*Bucephala cllangula*
Hooded merganser	*Lophodytes cucullatus*	Barrow's goldeneye	*Bucephala islandica*
Common merganser	*Mergus merganser*	Bufflehead	*Bucephala albeola*

Upland Game Birds

Chukar, pheasant, Hungarian partridge, and wild turkey are not native to the Powder subbasin but they are some of the most popular species among bird hunters (Table 11).

In general, mountain quail have declined throughout most of their range and valley quail have increased in suitable habitats. Mountain quail in eastern Oregon are dependent on brushy and diverse riparian habitat and populations have disappeared as these habitats have deteriorated (ODFW 1998). Increased sightings in northeast Oregon in recent years suggest a slight recovery in response to moderate winters, riparian improvements and the end of an extensive drought cycle.

Table 11. Upland birds in the Powder River subbasin, Oregon

Common Name	Scientific Name	Common Name	Scientific Name
Chukar partridge	*Alectoris chukar*	Wild turkey	*Meleagris galopavo*
Mountain quail	***Oreortyx pictus***	Ruffed grouse	*Bonasa umbellus*
Blue grouse	*Dendragopus obscurus*	Ring-necked pheasant	*Phasianus colchius*
Hungarian partridge	*Perdix perdix*	**Sage grouse**	***Centrocercus urophasianus***
California valley quail	*Calipepla californica*	**Columbian sharp-tailed grouse**	***Tympanuchus phasianellus columbianus***

bold = federal species of concern

Mountain Quail

Mountain quail are native to the Blue Mountains and prefer open forests and woodlands with a shrub understory (Csuti et al. 1997). They will also utilize riparian woodlands. The

population in northeast Oregon has declined recently; they are now considered "very uncommon" in the area (M. Henjum, ODFW, personal communication). The loss of low-elevation, open Ponderosa pine forests and riparian habitats has likely contributed to the decline of this species.

Sage Grouse

Sage Grouse are native to the arid regions of eastern Oregon. The species is found only in areas dominated by big sagebrush and prefers those areas where habitat is 60% or more sagebrush with cover of 15% to 25% (Csuti et al. 1997; G. Keister, personal communication). Males congregate in large numbers in more open areas (leks) for courtship display. Throughout the range, loss of habitat to wildfires and conversion to agriculture has been the primary factor contributing to the decline of this species since the early 1900's (Willis et al. 1952).

There are more than 50 sage grouse leks in Baker County. One of the oldest known lek areas occurs on Virtue Flat near the old Oregon Trail, but there is a continued threat of loss of habitat to wildfire, development and agriculture.

Bald Eagle (*Haliaeetus leucocephalus*)

Bald eagles are generally winter visitors to the Powder River subbasin although two nests have been documented in the Powder subbasin. Roost trees are primarily cottonwoods in agricultural areas or large conifers in forested areas and near ponds and lakes. Loss and degradation of deciduous riparian habitats may severely limit opportunities for roosting and nesting by bald eagles although some forested roost habitat is relatively close to food sources. Bald eagles are federally listed as Threatened, but are proposed for de-listing. They are protected by the Migratory Bird Treaty Act.

Threatened, Endangered, and Sensitive Species

Although the status of wildlife species and populations varies throughout the subbasin, several wildlife species within the subbasin are listed as federal and/or state Threatened, Endangered, and Sensitive or Species of Concern (Table 9).

Some species have naturally low, localized populations such as the bobolink. Swainson's hawks have declined in much of their range largely due to environmental problems in their southern hemisphere wintering grounds although numbers of this species may be increasing in the Powder subbasin (G. Keister, personal communication). Habitat alteration and conversion are believed responsible for the sensitive status of many species.

The ferruginous hawk, burrowing owl, white-tailed jackrabbit, and grasshopper sparrow are dependent on grassland and shrub communities, which have been extensively converted to agriculture and altered by grazing.

Many forest-dependent species can be affected by timber harvest and management practices (Bull and Wales, in press). Removal of standing and down dead trees may eliminate foraging and nesting sites for some woodpeckers. The loss of nest or roost trees could be detrimental to bald eagles, goshawks or ferruginous hawks, while the loss of canopy cover may be detrimental to goshawks or to the prey of some raptors (Bull and Wales, in press). The more open canopies created by thinning may benefit some species and harm others.

Several target species have been selected for use in Habitat Evaluation Procedures (HEP) through the loss assessment and mitigation crediting process [(Rasmussen and Wright 1990a, b, c, d) Table 12]. These target species and their habitats are considered for habitat mitigation throughout the Columbia Basin.

Table 12. Target species selected for the Lower Snake River Project and used in Habitat Evaluation Procedures

Target Species Selected for the Lower Snake River Project HEP and the Rationale for Their Selection (Sather-Blair et al. 1991)	
EVALUATION SPECIES	RATIONALE FOR SELECTION
Downy woodpecker (*Picoides pubescens*)	Indicator species for riparian forest
Yellow warbler (*Dendroica petechia*)	Indicator species for scrub-shrub wetlands
Marsh wren (*Cistothorus palustris*)	Indicator species for emergent wetlands
Song sparrow (*Melospiza melodia*)	Indicator species for mesic shrubland and riparian forest shrub understory
Western meadowlark (*Stumella neglecta*)	Indicator species for grass / shrub-steppe
River otter (*Lutra canadensis*)	Indicator furbearer species
Mule deer (*Odocoileus hemionus*)	Important big game species
California quail (*Callipepla californica*)	Important upland game bird
Ring-necked pheasant (*Phasianus colchicus*)	Important upland game bird
Chukar (*Alectoris chukar*)	Important upland game bird
Mallard (*Anas platyrhynchos*)	Indicator species for waterfowl habitat associated with backwater / ponded areas
Canada goose (*Branta canadensis*)	Indicator waterfowl species for river and reservoir system

Habitat Areas and Quality

Habitat degradation and destruction are ranked as the most pervasive threat to biodiversity in the United States (Wilcove et al. 2000). Biodiversity in the Powder River subbasin is similarly threatened by loss and alteration of habitats. Wisdom et al. (2000) concluded that low-elevation old-forest habitats in the interior Columbia Basin had suffered the greatest decline over time. Low-elevation late seral forests serve as the interface between forested and non-forested habitats. Riparian areas in the Powder subbasin have suffered major, lasting degradation due to the effects of mining and overgrazing. Riparian habitats serve as the interface between aquatic and terrestrial species and have a direct effect on in-stream habitat features such as temperature, stability, and sediment. Riparian areas also serve as a source of woody debris in streams and other water bodies as well as food and nutrient input (e.g., insect and leaf litter drop). Thus, the condition of terrestrial habitats is tied to the health of aquatic ecosystems. Likewise, the condition of aquatic habitats is tied to the health of terrestrial ecosystems through the "food web that knits the water and land together" (Cederholm et al. 2001).

Extensive vegetation removal and disturbance associated with rural development, forestry, transportation corridors, flood control, mining and agriculture has occurred and continues in the Powder River subbasin (Oregon Progress Board 2000). This has resulted in habitats that are very different in both quantity and quality from those present before European settlement.

The Powder Basin Watershed Council (1996, p.12) described some of the habitat effects of past development activity in the Powder River Basin:

> Major watershed problems began to appear in some areas in the late 1800's when riparian and upland ranges were overgrazed, when considerable flow amounts were diverted from streams for irrigated agriculture, and when stream channels and floodplains were placer mined. Serious runoff/erosion problems and flooding developed in main areas. Stream channels in many areas severely down cut, with loss of water table and conversion of riparian vegetation to dryland species. Overgrazing of riparian areas led to severe reduction of riparian vegetation and increased streambank erosion, with adverse effects on fish and wildlife. Stream diversions and placer mining further impacted anadromous and resident fish migrations and habitat.
>
> A new round of watershed impacts began in the 1890's with the advent of railroads and clear-cut logging of floodplains and uplands. This was followed by large-scale placer mining with boat-like dredges in the upper Powder River watershed. From the 1890's to the 1970's, several large reservoirs were constructed throughout the basin, and additional stream diversions were made for irrigated agriculture. From the 1950's into the 1990's, many roads were constructed into public and private forestlands, and large volumes of timber were harvested. During this same time period, many streams were placer mined for the second or third time.

Fish

The most dramatic and visible habitat alteration from past land use practices is the transformation of riparian areas and stream channels to expanses of dredge tailings. In the area above Phillips Lake, worked by Sumpter Valley Dredges #1 and #3 (1913-1924 and 1935-1954 respectively), 6 miles (1,400 acres) of tailings remain. Sumpter Valley Dredge #2 worked in Cracker Creek and McCully Forks 1913-1924. The Powder Basin Watershed Council (2001) reported that nearly all the streams in the upper Powder River Basin show evidence of past mining activity. In the upper Powder River drainage, Cracker Creek and the Powder River have had the greatest impact from mining activities. Both streams have been placer mined, resulting in the destruction of meadow and riparian vegetation as well as the loss of topsoil, resulting in straight channels with higher gradients (Powder Basin Watershed Council 2001).

In addition to loss of riparian vegetation and natural stream structure, mining has left a legacy of increased sediment in area streams. This has resulted in the filling of pool habitat and the overall aggradation of stream channels, resulting in less salmonid rearing and spawning habitat. In the North Fork Powder drainage, for example, 61% of stream reaches surveyed had cobble embeddedness levels exceeding 35% (Wallowa Whitman National Forest 1999).

Some sediment discharge is a natural and beneficial function of streams, providing for channel maintenance and floodplain productivity. Reservoirs constructed in the stream channel serve as settling ponds, removing sediments from the stream system and disrupting these functions in stream reaches downstream of the reservoirs (Powder Basin Watershed Council 2001, C. Fagan, ODFW Northeast Region Hydropower Coordinator, personal communication, Sept. 2001).

Fish passage barriers at large reservoirs and smaller irrigation diversions limit access to habitats for seasonal migration or dispersal. Passage barriers created by low flows and high temperatures also limit available habitat and movement of fish to alternate habitat areas and refugia.

Hutchison and Fortune (1967) compiled a list of stream areas of greatest importance in the Powder River Basin for fish production and angling. In the Powder River subbasin, these include:

- Eagle Creek drainage above Little Eagle Creek
- North Powder River and Anthony Creek drainage above the confluence of these two streams
- Powder River upstream from Baker City including Cracker Creek, Deer Creek and McCully Forks
- Wolf Creek and Clear Creek drainages
- Upper Pine Creek and Rock Creek drainage

"Other stream areas have substantial habitat potential," according to the report, "but the present lack of acceptable flows prevent existence of desirable fish life" (p. 8).

Wildlife

With the loss of riparian vegetation, habitat for many species of wildlife for foraging, breeding and cover was lost. However, ponds left behind in some areas of the mine tailings have become important wetlands habitat for waterfowl (Wallowa Whitman National Forest 1997b). The dredge tailings above Phillips Lake receive little use by humans and thus provide a refuge from disturbance. The Sumpter Valley Wildlife Area, located in this area, is managed to provide nesting habitat for Canada goose and other waterfowl.

Humphreys and West (1980) discuss sensitive habitats for a variety of wildlife species in Baker County. Although noting that habitats for upland game birds are difficult to identify due to the diversity of habitat requirements among this group of species, they offer the following sensitive habitats:

- Riparian zone along all water courses
- Brushy cover associated with wet meadows or woodlots
- Sagebrush land in draws that are untillable for farming
- Cover associated with irrigation ditches
- Brushy roadside cover and fencerow cover

Forest and agricultural areas can offer quality habitats for upland birds, especially when edge and border areas are left uncleared. Urban and industrial development and road construction that take these areas out of production can negatively affect upland bird populations and habitats (Humphreys and West 1980).

The most sensitive habitat areas for big game are those areas used as winter range by deer and elk. These are gentle, south-facing slopes in forested areas and grassy low elevation areas such as the Powder River Valley below Thief Valley Dam (Humphreys and West 1980). Much of the Powder subbasin serves as either summer or winter range for deer and elk (Figure 3). Low elevation winter range is often in close proximity to agricultural areas, which can create conflicts with landowners.

The Powder River subbasin includes a variety of habitat categories. The ODFW has compiled data on the area of given habitat types by county and WMU. Table 13 illustrates the availability of those habitat categories in Baker County.

Table 13. Habitat categories and area in Baker County, Oregon (ODFW unpublished data)

Habitat Category	Area in Acres	Area in Square Miles	Percent of County
Riparian	19,218	30	1%
Wetlands	2,625	4	0%
Grassland	301,137	471	16%
Juniper	35,840	56	2%
Sagebrush Steppe	598,390	935	33%
Mixed Conifer	413,920	647	23%
Pine	242,108	378	13%
Hardwoods	22,998	36	1%
Agriculture	196,140	306	11%

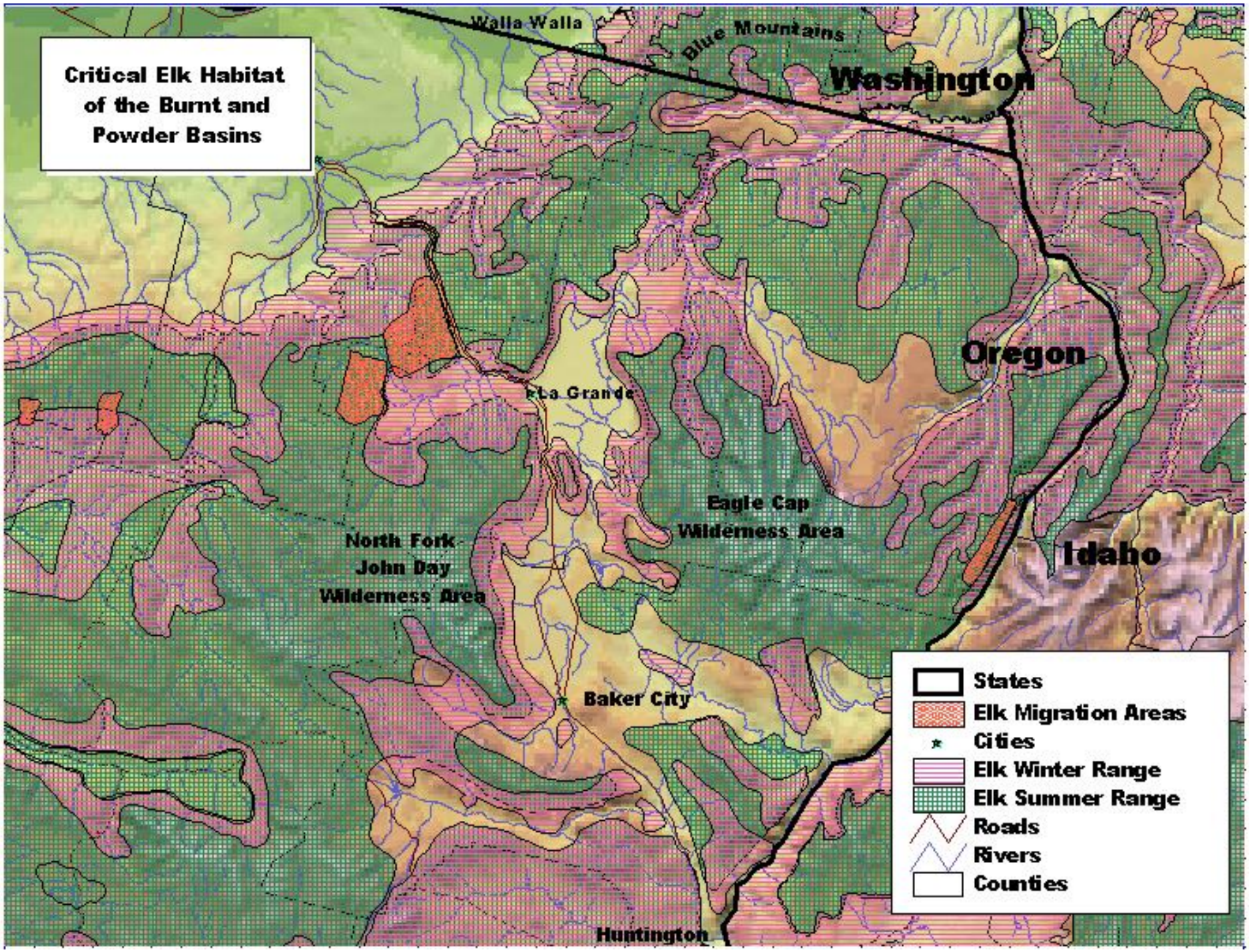

Figure 3. Critical elk habitat in northeastern Oregon including the Powder River subbasin (Rocky Mountain Elk Foundation)

Watershed Assessment

- Streamflow Restoration Prioritization – ODFW and OWRD have established priorities for restoration of streamflow from consumptive users, as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). ODFW has identified the "need" for streamflow restoration through ranking of biological and physical factors, water use patterns and the extent to which water is a primary limiting factor (Figure 4). OWRD ranked the opportunities and likelihood for achieving meaningful streamflow restoration. Rankings were performed for subwatersheds at approximately the fifth field hydrologic units (HUCs). OWRD Watermasters will incorporate the priorities into their field work activities as a means to implement flow restoration measures. The "needs" priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information determining high priority restoration projects.

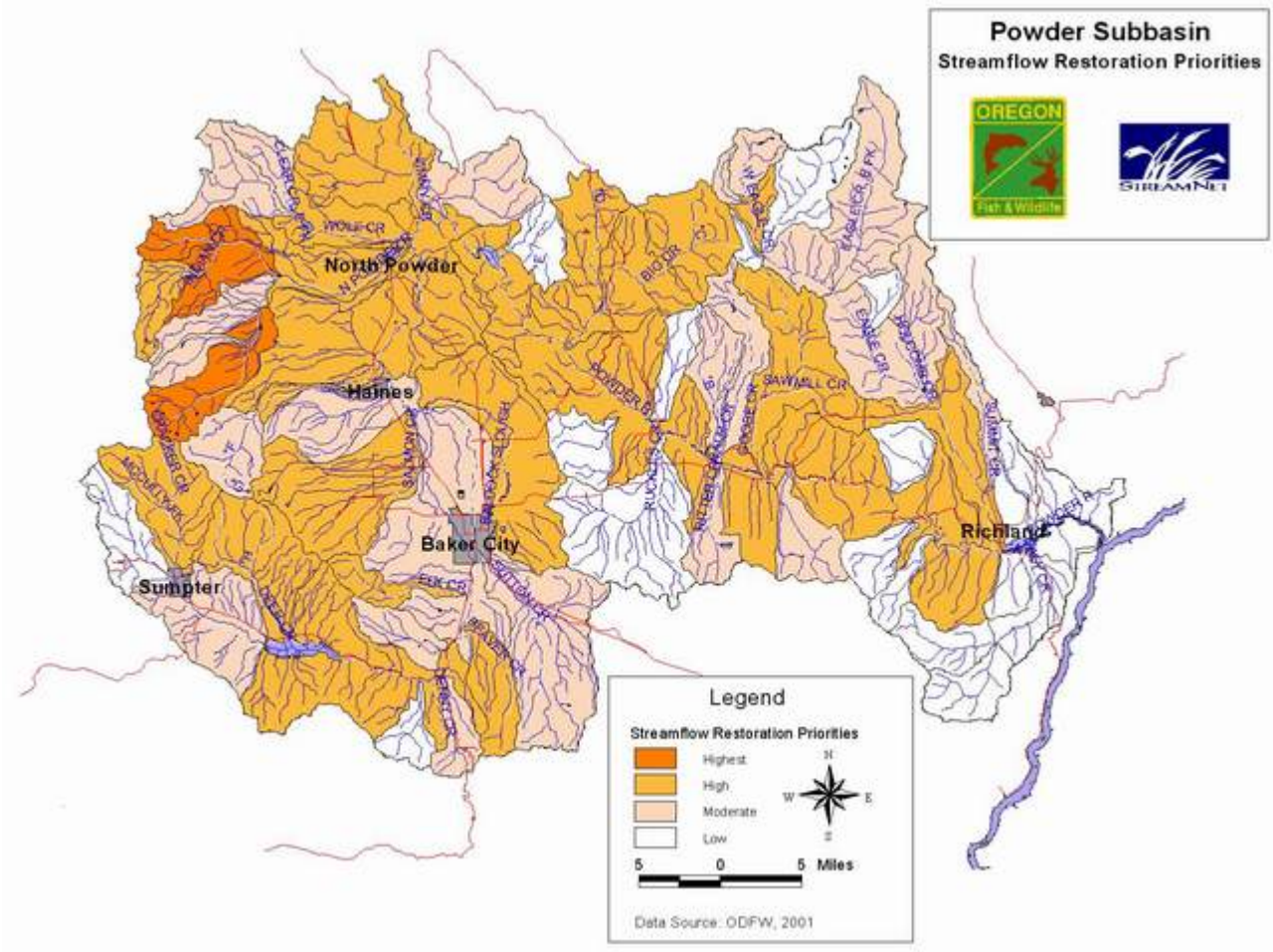

Figure 4. Streamflow restoration priorities in the Powder River subbasin, Oregon

- The US Forest Service has conducted watershed analyses in the Powder and North Powder rivers and Wolf and Eagle creeks:

Upper Powder River Watershed Analysis. Wallowa Whitman National Forest 1997. This analysis provides a description of the dominant physical, biological, and human dimension features, characteristics and uses of the upper Powder River watershed that assess ecosystem function and condition. The assessment also provides a framework to manage upland and riparian landscapes, analyze cumulative effects, and guide planning, management, restoration, and monitoring activities.

Powder River / Haines, North Powder River / Wolf Creek Watershed Analysis. Wallowa Whitman National Forest 1999. This analysis provides a description of the dominant physical, biological, and human dimension features, characteristics and uses of two sub-watershed areas that assess ecosystem function and condition. The assessment also provides a framework to manage upland and riparian landscapes, analyze cumulative effects, and guide planning, management, restoration, and monitoring activities

Eagle Creek Watershed Analysis. Wallowa Whitman National Forest 1997. This analysis provides a description of the dominant physical, biological, and human dimension features, characteristics and uses of the Eagle Creek watershed that assess ecosystem function and condition. The assessment also provides a framework to manage upland and riparian landscapes, analyze cumulative effects, and guide planning, management, restoration, and monitoring activities

- **Preliminary Watershed Assessment for the Powder Basin Drainage**. Powder Basin Watershed Council 1996. This assessment provides information on the physical, biological and political characteristics of the Powder River Basin including the Burnt River and Pine Creek.
- **Powder Basin 1995/ 1996 Water Quality Monitoring – Baseline Data, Preliminary Results.** Baker County Association of Conservation Districts 1996. This document reports water quality monitoring results in the Powder River Basin including the Burnt River and Pine Creek.
- **Basin Investigations – Powder Basin.** Oregon State Game Commission (Hutchison and Fortune 1967). This document provides an assessment of the fish and wildlife resources of the Powder River Basin, including the Burnt River and Pine Creek, and their water requirements.
- **Powder River Final Management Plan / Environmental Assessment**. Bureau of Land Management 1994. In addition to management actions and alternatives, this document provides information on the physical, biological and recreational resources of the Powder River Wild and Scenic River below Thief Valley Reservoir.
- **Upper Powder River Watershed Assessment.** Draft. Powder Basin Watershed Council 2001. This analysis provides a description of the dominant physical, biological, and human dimension features, characteristics and uses of the upper Powder River watershed that assess ecosystem function and condition. The assessment also provides a framework to manage upland and riparian landscapes, analyze cumulative effects, and guide planning, management, restoration, and monitoring activities.
- The **Oregon Natural Heritage Program** maintains a database on habitats and species occurrences throughout the State of Oregon (ONHP 2001).
- **Streamflow Restoration Prioritization** – ODFW and OWRD have established priorities for restoration of streamflow from consumptive uses as part of the Oregon Plan for Salmon and Watersheds (Measure IV.A.8). ODFW has identified the "need" for streamflow restoration through ranking of biological and physical factors, water use patterns and the extent to which flow is a primary limiting factor. The OWRD ranked the opportunities and likelihood for achieving meaningful streamflow restoration. Rankings were performed for subwatersheds at approximately the fifth field hydrologic units (HUCs). OWRD Watermasters will incorporate the priorities into their fieldwork

activities as a means to implement flow restoration measures. The "needs" priorities will be used by the Oregon Watershed Enhancement Board as one criterion in determining funding priorities for enhancement and restoration projects. Watershed councils and other entities may also use the needs priorities as one piece of information determining high priority restoration projects.

- **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.
- The Northwest Power Planning Council documented changed conditions within the Columbia Basin hydropower system in its ***Return to the River*** report (NWPPC 1996).
- The Oregon Department of Environmental Quality and the Natural Resource Conservation Service initiated a process to develop a **Unified Watershed Assessment** (UWA) as part of the federal Clean Water Action Plan (CWAP) put forth by the USDA and EPA. Using existing assessment information, public input, and Tribal, Federal, and State participation, the 1998 Unified Watershed Assessment and Restoration Priorities for Oregon assessed the condition of water resources and prioritized watersheds for restoration. (www.deq.state.or.us). The Assessment is intended to identify potential opportunities to link the Oregon Plan, Tribal restoration plans, Federal plans, and other collaborative watershed assessment and restoration efforts.
- In association with the UWA effort, the Division of State Lands (DSL) produced a **Watershed Assessment Report** (ODSL 1998) that prioritized subbasins based on the greatest natural resource value, the least impact to condition, and the greatest risk to condition. These three categories of criteria were used to establish priority rankings for

subbasins that could benefit most from a watershed management or restoration approach.

- The DEQ has also inventoried state waters for listing through the Oregon DEQ's Clean Water Act **Section 303(d).**
- The Inter-tribal **Wy-Kan-Ush Mi-Wa-Kish-Wit** (Spirit of the Salmon) restoration plan (CRITFC 1995) provides a foundation for meeting Tribal treaty and trust obligations in the Columbia River basin. The long-term plan also addresses the causes of anadromous fish declines, provides information on fish stock status and habitat, and makes recommendations to protect and restore declining fish populations.
- **Thompson and Haas** (1960) surveyed watersheds in the Powder Subbasin for habitat condition, quantity, and quality for salmon and steelhead. They also reviewed potential hatchery sites.
- **Parkhurst** (1950) surveyed watersheds in the Powder Subbasin and reported on habitat conditions for salmon and steelhead.
- **Chapman** (1940) reported on the presence of salmon and steelhead in various streams in the Powder Subbasin.

Limiting Factors

As discussed elsewhere in this document, anadromous fish are presently absent from the Powder River subbasin. However, they were present historically and, through the relicensing process for the Hells Canyon Complex dams, discussions are underway to determine the feasibility of reintroduction of salmon and steelhead to historic habitats above those dams. Therefore, the discussion that follows includes limiting factors that affect both resident species currently in the subbasin and anadromous species that may, in the future, be reintroduced.

The Powder River subbasin is an example of the sensitivity of watersheds in the interior Columbia Basin to human activity. Loss of quality habitat and a loss of connectedness are the over-riding limiting factors to fish and wildlife production in the Powder subbasin (NWPPC 1994, Wisdom et al. 2000). Because salmon, steelhead and some trout are migratory fish to varying degrees, intact and healthy habitat is required throughout their life cycle range for healthy populations to exist. For wildlife, habitat loss has restricted the range of many species through fragmentation and isolation, and altered species communities. Furthermore, both migratory fish and wildlife have limiting factors outside the subbasin. For example, neotropical birds need good overwintering habitat; anadromous fish need good passage conditions and estuary rearing habitat.

Two key physical concerns form the context for the analysis of habitat conditions, the limiting factors for fish and wildlife resources, and ultimately the restoration recommendations for the Powder subbasin. First, historic, recent and current land use practices have altered the hydrologic cycle – the storage, movement, and character of the water resource over entire areas of the Powder subbasin. Generally, changes in the hydrologic cycle are demonstrated by excessive runoff, altered peak flow regimes, lack of ground water recharge, reduction in soil moisture storage, and low late-season flow. Second, historic and current land uses, in combination with hydrologic changes, have

resulted in some portions of the Powder subbasin reflecting marked stream channel instability (i.e., channel widening, downcutting, vertical cut banks, and excessive gully development). Each of the limiting factors specifically within the subbasin and highlighted in this report is related in part to the broad-scale problems of hydrology and stream channel instability. The actual causes of these conditions in the Powder subbasin are multiple; therefore, the restoration of stream flows and stream channel stability will require combined action across many land uses and geographic areas in the basin (K. Vandemoer, NMFS, personal communication 2001).

Hydropower System Development and Operations - FCRPS

Development and operation of the Federal Columbia River Power System (FCRPS), which includes 13 mainstem dams used for hydropower, navigation, flood control, and irrigation in the Columbia River basin, resulted in widespread changes in riparian, riverine, and upland habitats. Because of the significant loss of mainstem habitat and habitat function associated with the FCRPS, tributary habitat such as that found in the Powder River subbasin, has become more critical to the survival and recovery of Endangered Species Act listed species throughout the Columbia basin. A wildlife loss assessment was conducted to document losses associated with the Lower Snake River Project (Sather-Blair et al. 1991, Table 14).

Table 14. Estimated losses, in habitat units, for each target species due to construction and operation of the Lower Snake River Project dams (NWPPC 2000)

Target Species	Habitat Units Lost
Downy woodpecker	-364.9
Song sparrow	-287.6
Yellow warbler	-927.0
California quail	-20,508.0
Ring-necked pheasant	-2,646.8
Canada goose	-2,039.8

Because of direct and indirect effects of the FCRPS on fish and wildlife habitat, tributary habitat improvements are required as part of off-site mitigation activities of the U.S. Army Corps of Engineers, the Bureau of Reclamation, and the Bonneville Power Administration for continued operation of the system under the Endangered Species Act. These habitat improvement activities were specified in a Biological Opinion issued by the National Marine Fisheries Service in December, 2000, entitled, "Reinitiation of Consultation on Operation of the Federal Columbia River Power System, Including Juvenile Fish transportation program, and 19 Bureau of Reclamation Projects in the Columbia Basin".

Hydropower System Development and Operations – Hells Canyon Complex

Construction and operation of the Hells Canyon Complex of dams by Idaho Power for hydropower generation created an insurmountable barrier to fish passage in the Snake River, cutting off, and eventually eliminating, upstream populations of anadromous fish from the ocean. The three dams of the complex, Brownlee, Oxbow and Hells Canyon were

completed in 1958, 1961 and 1967, respectively. This three-fold passage barrier is a major obstacle to recovery of anadromous fish stocks in the Powder subbasin.

Fish Habitat and Production

Limiting factors occur at two levels, regional and local. These are discussed separately below.

Regional Scale: While clearly acknowledged as a problem in the subbasin, regional scale (out-of-subbasin) limiting factors are often difficult to precisely link to a given fish population; they are not discussed in detail in this document but are addressed briefly here. Anadromous fish recovery in the Powder River subbasin is limited by a single primary factor: no fish passage past the Hells Canyon Complex dams.

Local Scale: Local scale, in-subbasin, limiting factors are generally easier to link to specific fish populations. It is important to acknowledge that factors limiting local fish production or survival may differ from those defined across broader scales, and that limiting factors in a given location may vary between species.

Aquatic habitats in the subbasin have undergone both chronic and acute destabilization throughout recent history. Historic improperly managed grazing, mining, logging, stream channelization, riparian clearing, wetlands filling and other developments have all contributed to reduced riparian and stream habitat productivity. Ongoing effects from agricultural and urban development, improperly managed livestock grazing, irrigation withdrawals, road-related activities, and catastrophic floods are responsible for many negative effects to resident fish habitat (Bottom et al. 1985). Table 15 lists some general, negative effects of various land use activities. Land use activities may not only detrimentally affect habitats for fish, but also water quality and quantity, and trophic organization. These activities act to destabilize natural hydrologic processes and amplify the impacts of natural events such as storms. Riparian habitat degradation is the most serious habitat problem in the subbasin for fish (Wissmar et al 1994, ICBEMP 2000). This loss leads to secondary effects that are equally harmful and limiting, including increased water temperature, low summer flows, excessive winter runoff, and sedimentation (Bottom et al. 1985). Additionally, water withdrawals and channel modification have had serious negative impacts on in-stream and riparian habitats and contribute to problems with temperature and flow.

Table 15. Detrimental effects of land use activities on fish habitat and water quality (CRITFC 1995)

Detrimental Effects	Land Use Activity
Channel cross sectioning (*increase*)	Grazing, Logging
Surface fines (*increase*)	Grazing, Logging, Road building, Mining, Agriculture
Cobble embededness (*increase*)	Grazing, Logging, Road building, Mining, Agriculture
Water temperature (*increase*)	Grazing, Logging, Road building, Agriculture
Organic pollution (*increase*)	Grazing, Agriculture
Inorganic pollution (*increase*)	Mining, Agriculture
Runoff (*increase*)	Grazing, Logging, Agriculture, Urban development
Wetland destruction (*increase*)	Grazing, Agriculture
Migration problems (*increase*)	Agriculture
Migration blockages (*increase*)	Road building
Peak flow (*increase*)	Road building
Mass failure and surface erosion (*increase*)	Road building
Bank stability (*decrease*)	Grazing
Riparian vegetation (*decrease*)	Grazing, Logging, Agriculture
Pool volume (*decrease*)	Grazing, Logging, Road building, Mining, Agriculture
Groundwater base flow (*decrease*)	Grazing, Logging, Road building, Agriculture
Large woody debris (*decrease*)	Logging
Summer low flow (*decrease*)	Agriculture

Riparian Habitat Loss

Plentiful riparian cover along streambanks is a vital part of a healthy watershed, providing multiple benefits in the form of nutrient cycling, shading and cover, bank stability, water storage, and filtration and retention (Bottom et al. 1985, Wissmar et al. 1994). Riparian vegetation also hosts various insect species for the aquatic food chain. Loss of riparian cover leads to accelerated surface runoff and erosion, which in turn leads to siltation of spawning beds and rearing habitats. Loss of riparian areas increases solar insolation, elevating water temperatures in summer, or reducing the tempering of water temperature in winter. Loss of riparian cover potentially exposes spawning adults and rearing juveniles to predation and disturbance (Federal Caucus 2000). When riparian vegetation is lost, channel structure becomes more simple as inputs of large woody debris and its influence on channel structure are diminished, affecting instream habitat (Li et al.1994).

Sedimentation

Sedimentation increases temperature and reduces dissolved oxygen concentrations (Federal Caucus 2000) and is abrasive to gill tissue. High turbidity can delay adult migration and interferes with foraging by fish that rely on sight, including salmonids (Bottom et al. 1985).

Flows

Low summer streamflows occur in many of the streams in the Powder subbasin. Although many streams naturally experience low flows in the summer, withdrawals for irrigation and degraded stream channels exacerbate the problem. Lack of flow interferes with movement, spawning, and rearing of trout and significantly impairs habitat productivity (Bottom et al. 1985). Lack of adequate water depth reduces the connectivity between aquatic systems, impacting all life stages of redband trout, bull trout and other fish species. Low summer flows also have the effect of concentrating pollutants (phosphates, nitrogen), which can be hazardous to aquatic health.

Temperature

Low flows, reduced riparian cover, and sedimentation also elevate water temperature, considered one of the most important habitat factors in the subbasin endangering salmonids and the top impairment to water quality (Li et al. 2000). Overgrazing on riparian vegetation increases the amount of insolation reaching streams, resulting in cumulative increases in stream temperatures downstream (ODEQ 2000). Water quality problems related to temperature are found throughout the subbasin. The preferred temperature range for salmonids is between 45° - 60° F, with bull trout preferring colder temperatures (Oregon Plan, Monitoring Protocol). Elevated temperature increases metabolic rate, increases the risk of disease, reduces dissolved oxygen, and affects behavior patterns (Oregon Plan, Monitoring Protocol), all of which impose high metabolic costs and impair survival (ODEQ 2000, Table 4). High water temperatures limit salmonid production and force salmonids to limited cold-water refugia.

Instream Habitat Loss

Loss of instream habitat and habitat diversity limits salmonid production. Loss of riparian vegetation from human activities has led to entrenchment of streams or wider and shallower channels, reducing or destroying in-stream habitat. Human-caused channelization has eliminated floodplains and wetlands and reduced channel complexity, disconnecting floodplains with the stream. A reduction in beaver populations has also limited their contribution to forming wetland and riparian habitat (Wissmar et al 1994). Reduced riparian areas also limit woody debris in streams, diminishing pool quality and frequency. Instream habitat was destroyed in portions of the Powder River, especially the area above Phillips Lake, by past gold dredging operations; channel hydrology was altered, preferred gravels displaced, and riparian vegetation eliminated. Loss of instream habitat also increases vulnerability to predation (Federal Caucus 2000).

Passage Barriers and Irrigation

Common irrigation practices can present passage barriers to fish within the Powder subbasin (OWRD 1993). Push-up dams, less common now than historically, greatly restrict passage, both for upstream and downstream migrations if not properly constructed. There is little screening in the subbasin. Thief Valley and Mason dams are significant barriers to fish passage and pre-date the Hells Canyon Complex. Numerous other dams in the

subbasin also prevent fish passage. Other passage barriers include thermal or flow barriers, and impassable culverts, which restrict or limit movement of fish. Irrigation withdrawals can "dewater" sections of streams precluding passage and impairing water quality. Overland return flows from irrigation systems can warm streams, contribute to high levels of fecal coliform, and in some instances load them with silt.

Introduced Species

The Powder River system hosts a complex of non-native species (Table 7). Although the impacts of these species on native communities are largely undocumented, they likely have some negative effects. Direct impacts may be through predation, competition, disease vector, or interbreeding. Brook trout, a species introduced to many lakes and streams, may interbreed with bull trout, a Threatened species and produce sterile offspring.

Since the introduction of yellow perch to Phillips Lake, biologists have documented a decline in productivity of black crappie and smallmouth bass and a shift in the species composition and size of zooplankton in the lake. The disruption of the food web in the lake by this invasive species may have a negative impact on upper Powder River bull trout that may utilize the lake (T. Walters, personal communication).

Wildlife Habitat and Production

In support of the Interior Columbia Basin Ecosystem Management Project (ICBEMP), Wisdom et al. (1994) analyzed habitat change and road associated affects on selected terrestrial vertebrate species in the Interior Columbia Basin. They concluded that changes in terrestrial habitats and disturbances since European settlement have had the most significant effects on terrestrial vertebrates. The most important changes are dramatic shifts in fire regimes; reductions in area of native grassland, shrublands and wetlands; declines in early and late seral stages of forest development; degradation of riparian habitats and increases in road density (Hann et al. 1997, Quigley et al. 1996, USDA Forest Service 1996).

Loss and degradation of terrestrial habitats limits wildlife abundance and diversity in a variety of ways. Habitat conversion and/or invasion by noxious weeds may reduce quality and availability of forage, thus affecting the nutritional condition of wildlife. In addition, large scale conversion of traditional winter range (valley floors) to alfalfa production has 1) removed large areas from winter range and 2) encouraged elk and deer to remain in the valleys during summer causing damage to alfalfa and other crops. Changes in forest successional stage availability may have a negative impact on wildlife breeding, denning, and thermal cover. Increasing road density may result in direct mortality (collisions, hunting), indirect disturbance, and interruption of migration routes all of which limit survival and reproduction. Limiting factors for terrestrial and semi-aquatic wildlife include:

Loss of Classified Wetland Function

Functioning wetlands of all kinds are important to the natural hydrology of an area. They store and release water in ways that dampen the effects of flooding and reduce erosion. Wetlands also support diverse communities of plants and terrestrial wildlife as well as contributing to the quality of aquatic habitats. Classified wetlands can be divided into three categories:

Wet Meadows: Wet meadows and emergent wetlands were once relatively common in the Keating, Baker, Bowen and Eagle valleys. These wetland areas served an important function in the hydrology of the area by collecting and filtering water for slow release into the system. Beavers were an integral part of these wetland systems; beaver dams created a succession of wetland types from open water ponds to wet meadows. Wetlands are also home to large and diverse populations of wildlife including shorebirds, waterfowl, raptors, mustelids and amphibians. Wet meadows and emergent wetlands were lost or degraded by conversion to agriculture, mining, road building, livestock introduction and removal of beavers.

Deciduous Riparian Areas: Deciduous riparian areas were once common along portions of all streams in the subbasin. Deciduous riparian areas perform a water storage function, allowing for slow release and dampening the affect of heavy rains and snow melt. This habitat type also serves a variety of wildlife functions including winter range for large ungulates and nesting for resident and neotropical land birds. This wetland type has been drained and cleared for agricultural use, primarily pasture.

Riverine Deciduous: Riverine deciduous wetland and riparian areas were historically found adjacent to all major stream courses in the subbasin. The Powder River in the Baker and Bowen valleys and the lower Powder River and Eagle Creek near Richland, historically contained large cottonwood galleries. Only remnants of this habitat remain along Eagle Creek and in the Bowen Valley. These areas store water, dampen the effects of high water and help prevent erosion. Their functions for terrestrial wildlife include winter range for large ungulates; breeding areas for neotropical migrant birds; habitat for all life stages of resident land birds; waterfowl nesting; and food, cover and reproduction for a wide array of mammals, reptiles and amphibians. Riverine wetland and riparian areas also provide habitat for resident fish by shading streams and serving as sources of woody debris and other structural components as well as insects for the aquatic food chain. These areas have been lost or degraded through conversion to agriculture, grazing, flood control efforts and construction of large transportation corridors.

Loss of Low Elevation Ponderosa Pine Habitat

Low-elevation Ponderosa Pine (*Pinus ponderosa*) forests were once common on dry sites. These forests are the interface between forested and non-forested areas and are home to many species that utilize the grass- and shrub-lands downslope or the forested habitats at higher elevation. These areas are often important winter range for large mammals. Species associated with this habitat type by Wisdom et al. (2000) include the white-headed woodpecker, white-breasted nuthatch, pygmy nuthatch and migratory populations of Lewis' woodpecker. The primary causes for decline in old-forest habitats were intensive timber harvest and large-scale fire exclusion (Hann et al. 1997). Development increasingly encroaches on remaining low-elevation forests, as well.

Factors Associated with Roads

Wisdom et al. (2000) identified 13 factors associated with roads that have a negative impact on terrestrial wildlife. The effect of roads may be direct, such as habitat loss or

fragmentation (Miller et al. 1996), or indirect, such as population displacement or avoidance of areas near roads (Mader 1984). The road-associated factors identified in Wisdom et al. (2000) are: snag reduction; down log reduction; habitat loss and fragmentation; negative edge effects; over-hunting; over-trapping; poaching; collection; harassment or disturbance at specific use sites; collisions; movement barrier; displacement or avoidance and chronic, negative interactions with humans. Over-hunting may not be an issue in the subbasin due to efforts by ODFW to significantly reduce hunting opportunities through controlled hunts (G. Keister, personal communication, Oct. 2001). The effects of these factors and references are given in Wisdom et al. (2000, p113). The same authors suggest that mitigating the negative effects of road-associated factors may be more challenging than restoring habitats degraded in other ways.

Loss of Marine Biomass and Trace Elements

Cederholm et al. (2001) present the many diverse relationships between Pacific salmon and terrestrial wildlife. Many species, such as bald eagles and black bears, directly consume salmon carcasses. Others may benefit from concentrations of invertebrates consuming carcasses. The entire system benefits in some way from the influx of biomass and trace elements in salmon carcasses as they become incorporated into both aquatic and terrestrial plants and animals. This once significant source of biomass and trace elements from outside the subbasin has been lost with the loss of anadromous fish runs. This reduction in biomass in general, and the loss of marine trace elements in particular, likely limit productivity in many areas of the subbasin.

Introduced Species

As described in *Subbasin Description-Noxious Weeds*, invasive species in general are considered number two among threats to biodiversity. Noxious weeds present one of the greatest present threats in the Powder subbasin. Their spread in some areas is exponential with new areas of infestation discovered frequently (D. Clemens, Tri-County Weed Board, personal communication). Further, funding for weed control programs has fallen during the last decade (ODA 2001) creating a situation where decreasing resources are fighting an increasing invasion. Noxious weeds limit the productivity of rangelands and reduce forage available to wildlife (Sheley and Petroff 1999).

Introduced fauna also threaten biodiversity in the subbasin. Livestock compete with native wildlife for forage and cover and, especially in the case of domestic sheep, can be a vector for devastating diseases.

Loss of Other Old-Growth Forested Habitats

Old-growth was estimated as 35-40% of historic eastside forests but now accounts for less than 5% of the Wallowa Whitman National Forest (Henjum et al. 1994). Old-growth forests, other than low-elevation Ponderosa Pine, provide structurally complex habitats important to a broad range of species including northern goshawk, American marten, fisher, blue grouse, great gray owl and winter wren (Henjum et al 1994). The primary causes for decline in old-forest habitats are intensive timber harvest and fire exclusion (Henjum et al. 1994).

Loss of Habitat Diversity

Many terrestrial species, including invertebrates, thrive in a complex of habitats with different types providing food, cover and breeding areas. Habitat diversity is diminished when aspen stands, shrub thickets and small wetlands are destroyed during timber harvest or development. Grazing can also reduce diversity on rangelands by favoring species more adapted to prolonged grazing pressure. Noxious weed infestations can reduce vegetation to a monoculture as weeds out-compete native plants.

Existing and Past Efforts

There are, currently, no BPA funded projects in the Powder River subbasin. However, several federal and state agencies and private organizations are working to mitigate for or restore habitats lost or degraded through development and/or poorly managed land use. Some examples of those entities and projects follow (Table 16).

US Bureau of Land Management

Table 16. Recent BLM accomplishments in the Powder subbasin by fiscal year

Year	Accomplishments
2001	BLM continued the partnership and funding with the Baker School District under the Challenge Cost Share Program.
2001	Continued temperature and water quality monitoring of numerous tributaries to the Powder River.
2000	Fencing of approximately 1.25 miles of stream along the Powder River that BLM manages.
2000	Temperature and water quality monitoring of sites within the Powder subbasin.
2000	BLM has formed a partnership with the Baker School District under the Challenge Cost Share Program. This allows classes to grow and maintain native plants for the BLM, help in planting projects, provide transportation to the project sites, and manufacture of some planting tools.

US Bureau of Reclamation

The Bureau of Reclamation operates in the Powder subbasin under the guidance of the Baker Project. The Baker Project consists of two divisions, the Lower and Upper with water stored in Thief Valley and Phillips reservoirs respectively.

The Bureau of Reclamation has also undertaken the Snake River Resources Review (SR^3) with the goal of developing "the best set of tools available to analyze the operation of the river and reservoir system for traditional uses such as irrigation and flood control, and to identify the possible tradeoffs when considering other demands on the system for water related resources such as threatened and endangered species, fish, wildlife, cultural resources, Indian Trust Assets and recreation, as well as water quality and economics" (http://www.pn.usbr.gov/SR3/overview.html).

Oregon Department of Fish and Wildlife

Streamflow Restoration Prioritization: ODFW has established the priorities for streamflow restoration needs in the Powder subbasin as well as all other basins in the state. Priorities

are based on individual rankings of several biological and physical factors, water use patterns and restoration optimism. Biological and physical factors included the number of native anadromous species, presence of designated "key watersheds", fish related ecological benefits, other types of ecological benefits, physical habitat condition, the extent of human influence, water quality, current status or proposed as sensitive, threatened, or endangered, presence of instream flow protection (Instream Water Rights), and natural low flow problems. Water use pattern factors included the estimated amount of consumptive use and the frequency that an existing Instream Water Right is not satisfied. The final factor in the ranking of restoration need was an optimism factor of how well the fish resources would respond if flow were restored. Many of these factors were derived from existing data sources while others were ranked by ODFW's District Fish Biologists, based on local knowledge and professional judgment. Extensive use was made of Geographic Information Systems (GIS) and relational database analytical methods. The flow restoration priorities project was funded by the Oregon Watershed Enhancement Board, through a grant to the Oregon Water Resources Department.

Access and Habitat Program. The Access and Habitat Program of the ODFW is designed to improve wildlife habitat and public hunting access to private lands by providing funding for approved projects. From 1993 to 1996, statewide program accomplishments included over 67,700 acres of habitat enhanced through project funding. Some examples of the Access and Habitat Program at work in the Powder subbasin include projects to fence riparian areas, assist landowners with improvements to mitigate for wildlife damage, and thin juniper stands to improve forage.

Green Forage Program. The ODFW Green Forage Program works toward mitigation of wildlife damage to agricultural crops by planting new fields to attract wildlife away from private lands, assisting landowners with seed to replace lost crops, or both. Green Forage program funds are also used to enhance deer habitat, seed private lands with palatable forage after logging, and supply shrubs beneficial to wildlife to landowners at no cost.

Deer Enhancement Program. The goal of the Deer Enhancement Program is to enhance deer habitat. Similar to the Green Forage Program, this program funds seeding on private lands following logging, beneficial shrubs to be given to landowners at no cost, and other habitat improvements

Upland Bird Program. The upland bird program is funded through sales of bird stamps and is directed toward projects, such as riparian fencing, that improve habitat for upland game birds.

Fish Restoration and Enhancement Program. Through the Fish Restoration and Enhancement Program, ODFW develops 10-year cooperative agreements with landowners to exclude cattle from riparian areas. In the Powder subbasin, most of the work under this program to date has been initiated by the landowners. Riparian fencing projects through 1999 have accomplished the following on subbasin streams:

- North Powder River – 0.5 stream miles fenced
- Powder River – 0.6 stream miles fenced
- Powder River – 1.3 stream miles fenced
- Powder River – 1.2 stream miles fenced
- Clover Creek – 0.4 stream miles fenced
- Big Creek – 1.0 stream miles fenced

Oregon Department of Environmental Quality

The ODEQ's comprehensive approach for protecting water quality includes developing pollution load limits, known as Total Maximum Daily Loads (TMDLs) for both point and non-point sources. ODEQ is committed to having federally approved TMDLs on all waterbodies listed on the 1998 303(d) list by the end of the year 2007. The target date for completion of a TMDL in the Powder subbasin is 2005.

Oregon Water Trust

Oregon's Instream Water Rights Law allows water rights holders to donate, lease or sell some or all of their water right for transfer to instream use. Oregon Water Trust, a private, non-profit group, negotiates voluntary donations, lease or permanent purchase of out-of-stream water rights to convert to instream water rights in those streams where acquisition will provide the greatest ecological benefits for fish and water quality. Acquired rights are held in trust for the people of Oregon by the Oregon Water Resources Department.

Idaho Power

Idaho Power is in the process of conducting studies preliminary to application for relicensing of the Hells Canyon Complex (Idaho Power 2001). The final application is expected to be filed with the Federal Energy Regulatory Commission (FERC) in July 2003. Final Protection, Mitigation and Enhancement measures developed for relicensing may have an impact in the Powder River subbasin. Steps to provide passage for anadromous fish are under discussion; the results of that discussion will affect the potential for recovery of anadromous fish in the Powder.

Natural Resources Conservation Service

The NRCS works with landowners and a variety of cooperators including OWEB, USBR, ODA and Ducks Unlimited (DU) to improve aquatic and terrestrial habitat on private land. In the Powder River subbasin, NRCS has recently assisted with projects to: install fish screens in water diversions and improve instream habitat; improve efficiency of irrigation systems; develop watershed assessments; improve water storage to augment late summer flows; implement water quality monitoring and insure compliance with the federal Clean Water Act

Rocky Mountain Elk Foundation

The mission of the Rocky Mountain Elk Foundation (RMEF) is to ensure the future of elk, other wildlife and their habitat. The RMEF has cooperated with a variety of agencies and organizations in projects affecting the Powder River subbasin. The following are some examples of those projects in Baker County since 1995.

- 1995 Blue Mountains Elk Initiative Video – Developed 15 minute video to communicate program successes and encourage additional support.

- 1995 Elkhorn Wildlife Area Viewing Site – Provided interpretive signage/materials for winter elk feeding site.
- 1996 Sparta Butte Prescribed Burn – Burned 200 acres to promote resprouting browse species and rejuvenate grasses and forbs.
- 1996 Auburn prescribed burn – Burned 80 acres to rejuvenate bitterbrush on big game winter range.
- 1997, 1998, 1999 Beulah/South Sumpter Elk Telemetry Study – Ongoing study to determine seasonal ranges, migration routes and disease prevalence of elk that winter in these two WMUs.
- 2000, 2001 Keating Noxious Weed Control – Project to control noxious weeds including yellow starthistle, diffuse and spotted knapweed and whitetop on big game winter range between Balm Creek and Eagle Creek.

Present Subbasin Management

Existing Plans, Policies, and Guidelines

Multiple agencies and entities are involved in management and protection of fish and wildlife populations and their habitats in the Powder River subbasin. Federal, state, and local regulations, plans, policies, initiatives, and guidelines are followed in this effort. Federal involvement in this arena stems from Endangered Species Act responsibilities. 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 recently that will guide federal involvement in the Powder subbasin and the Blue Mountains. 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 (discussed previously), 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 BiOp

This is a biological opinion written by NMFS and the Fish and Wildlife Service (FWS) regarding the operation of the federal hydropower system on the Columbia River, and 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. Part of the Reasonable and Prudent Alternative to prevent jeopardy to 12 stocks of anadromous fish considered in the BiOp includes an action to conduct off-site habitat improvement to correct all barrier, screen and flow deficiencies in certain tributary subbasins.

Federal Caucus All-H Paper

This document is a framework for basin-wide salmon recovery and identifies strategies for harvest management, hatchery reform, habitat restoration, and hydropower system operations. This document may become more relevant to activities in the Powder River subbasin if relicensing of the Hells Canyon Complex dams includes any provision for anadromous fish passage, which would open the door to potential reintroduction of anadromous fish to the Powder River.

ICBEMP

This document is a framework for land management for 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 for this report, this document (if approved) will affect how these federal agencies prioritize actions and undertake and fund restoration activities.

By understanding the priorities outlined in these documents, significant opportunities for federally-funded restoration activities can be refined and further identified for the Powder subbasin.

Bonneville Power Administration

The Bonneville Power Administration has mitigation responsibility for fish and wildlife restoration under the Fish and Wildlife Program of the Northwest Power Planning Council as related to hydropower development. It is also accountable and responsible for mitigation related to federal Biological Opinions and Assessments for recovery of threatened, endangered, and sensitive species. The recently released FCRPS Biological Opinion calls for the BPA to expand habitat protection measures on non-federal lands. BPA plans to rely on the Council's program as its primary implementation tool for the FCRPS BiOp off-site mitigation requirements.

US Forest Service and Bureau of Land Management

The U.S. Forest Service is required to manage habitat to maintain viable populations of anadromous fish and other native and desirable non-native vertebrate species. A Land and Resource Management Plan (Forest Plan) was developed for the Wallowa-Whitman National Forest (USDA 1990). This Forest Plan guides all natural resource management activities, establishes forest-wide multiple-use goals and objectives, and establishes management standards and guidelines for the Wallowa Whitman National Forest.

The Bureau of Land Management, in accordance with the Federal Land Policy and Management Act of 1976, is required to manage public lands to protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values. A Resource Management Plan was developed for the Vale District Office, Baker Resource Area (USDI 1989). Both the USFS and BLM are required by the Clean Water Act to ensure that activities on administered lands comply with requirements concerning the discharge or run-off of pollutants.

In the Columbia River Basin, the Forest Service and the Bureau of Land Management manage salmonid habitat under the direction of PACFISH (USDA and USDI 1994) and INFISH (Inland Native Fish Strategy; USDA 1995). These interim management strategies aim to protect areas that contribute to salmonid recovery and improve riparian habitat and water quality throughout the Basin, including the Powder subbasin. These strategies have also facilitated the ability of the federal land managers to meet requirements of the ESA and avoid jeopardy. PACFISH guidelines are used in areas east of the Cascade Crest for anadromous fish. INFISH is for the protection of habitat and populations of listed resident fishes outside anadromous fish habitat. To meet recovery objectives, these strategies:

- Establish watershed and riparian goals to maintain or restore all fish habitat.
- Establish aquatic and riparian habitat management objectives.
- Delineate riparian management areas.
- Provide specific standards and guidelines for timber harvest, grazing, fire suppression and mining in riparian areas.
- Provide a mechanism to delineate a system of key watersheds to protect and restore important fish habitats.
- Use watershed analyses and subbasin reviews to set priorities and provide guidance on priorities for watershed restoration.
- Provide general guidance on implementation and effectiveness monitoring.
- Emphasize habitat restoration through such activities as closing and rehabilitating roads, replacing culverts, changing grazing and logging practices, and replanting native vegetation along streams and rivers.

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 http://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. If ICBEMP is implemented, subbasin and watershed assessments and plans will target further habitat work (NMFS 2000).

The Bureau of Land Management is developing the Northeastern Oregon Assembled Land Exchange (NOALE) for the retention, exchange, and disposal of public land (USDI 1998). The goal of the exchange is to enable the BLM to more effectively meet ecosystem management objectives, to consolidate BLM managed lands for more effective and efficient resource protection, enhancement, and use; and to ensure that retained lands have sufficient public benefit to merit the costs of management (Land Exchange Act).

US Fish and Wildlife Service

The U.S. Fish and Wildlife Service administers the Endangered Species Act (ESA) for resident fish and wildlife. This act provides for the conservation of the ecosystem upon which T&E species of fish, wildlife, and plants depend and directs enforcement of federal protection laws. Within the Powder subbasin, the wintering bald eagle and bull trout are federally listed species. The endangered gray wolf (from Idaho reintroductions) has been discovered in the Blue Mountains northwest of the Powder subbasin although none are known to reside in the subbasin; it is included in USFWS species lists for consideration in consultation regarding federal activities in the Powder subbasin. A bull trout recovery strategy is currently being drafted for the Powder subbasin, to be incorporated in the Draft

Bull Trout Recovery Plan being prepared by the USFWS. The federal Migratory Bird Act also protects migratory birds and their habitats within the subbasin. Additional programs include wetland habitat improvement and Partners for Wildlife.

The USFWS also administers the Lower Snake River Fish and Wildlife Compensation Plan (LSRCP) authorized by the Water Resources Development Act of 1976 (Public Law 94-587). The goal of the LSRCP is to mitigate and compensate for fish and wildlife resource losses caused by construction and operation of the four lower Snake River dams and navigation lock projects (FWS 1998). The fishery resource compensation plan identified the need to replace adult salmon and steelhead and resident trout fishing opportunities. The size of the anadromous program was based on estimates of adult salmon and steelhead returns to the Snake River basin prior to the construction of the four lower Snake River dams.

National Marine Fisheries Service

The National Marine Fisheries Service administers the ESA as it pertains to anadromous fish only. The NMFS has jurisdiction over actions pertaining to Snake River spring and fall chinook salmon and Snake River Basin Steelhead. If the relicensing process for the Hells Canyon Complex dams includes any provision for fish passage at those dams, reintroduction of anadromous fish may become feasible and NMFS would have jurisdiction in that effort. Under the ESA's 4(d) rule, "take" of listed species is prohibited and permits are required for handling. Harvest management plans are required for fisheries in the Snake River Basin. Fisheries Management and Evaluation Plans have been developed for warmwater fisheries and sturgeon in the Snake River basin, others are scheduled. Biological Opinions, recovery plans, and habitat conservation plans for federally listed fish and aquatic species help target and identify appropriate watershed protection and restoration measures.

The recent Federal Columbia River Power System (FCRPS) Biological Opinion and the Basinwide Salmon Recovery Strategy (All-H Paper) contain actions and strategies relevant to the Snake River and tributaries for habitat restoration and protection. Other aspects of hatchery and harvest apply as well. Action Agencies (USBR, USACE, BPA) are identified that will potentially lead fast-start efforts in specific aspects of restoration on non-federal lands. Federal land management will be implemented by current programs that protect important aquatic habitats (PACFISH, ICBEMP). Actions within the FCRPS BiOp are intended to be consistent with or complement the NWPPC's amended Fish and Wildlife Program, the Clean Water Action Plan, the Unified Federal Policy for a Watershed Approach to Federal Land and Resource Management, the Inter-Governmental Task Force for Monitoring Principles (Oregon Plan), and state and local watershed planning efforts.

Environmental Protection Agency

The U.S. Environmental Protection Agency is responsible for implementing and administering the Clean Water Act (CWA). Accelerated and strengthened efforts to achieve clean water and aquatic habitats was the intent of the Clean Water Initiative (1998), the core of which is the Clean Water Action Plan (CWAP), a federal partnership to promote and enhance locally based watershed improvements (the Unified Federal Policy for Ensuring a Watershed Approach to Federal Land and Resource Management). A key

action with the CWAP was Unified Watershed Assessments (UWA), which identified watersheds not meeting state water quality standards and other restoration goals, and established restoration priorities. Restoration strategies called Total Maximum Daily Loads (TMDL) are being developed for the Columbia River mainstem and tributaries (including the Powder subbasin), based on court orders and negotiated agreements through CWA litigation. EPA serves an oversight and advisory role in development of TMDLs. Watershed level efforts through the CWAP will improve water quality, restore habitat, and recover threatened and endangered species. Other NRCS programs include river Basin Studies, Forestry Incentive program, Wildlife Habitat Improvement Program and Wetlands Reserve Program.

U.S.D.A. Natural Resources Conservation Service

Within the U.S. Department of Agriculture (USDA), the Natural Resources Conservation Service (NRCS) oversees the implementation of conservation programs to help solve natural resource concerns. The Environmental Quality Incentives Program (EQIP), established in the 1996 Farm Bill, provides a voluntary conservation program for farmers and ranchers who face serious threats to soil, water, and related natural resources. The Conservation Reserve Program (CRP) puts sensitive croplands under permanent vegetative cover. The Conservation Reserve Enhancement Program (CREP) helps to establish forested riparian buffers. The NRCS assists landowners to develop farm conservation plans and provides engineering and other support for habitat protection and restoration (PL 566). The Farm Services Administration provides funds.

Farm Services Agency

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.

Federal, State, Tribal and Private Partnership

Blue Mountains Elk Initiative

The Blue Mountains Elk Initiative is a federal, private, state and tribal Partnership to manage elk in the Blue Mountains of Oregon and Washington. The mission of the Initiative is to more effectively manage elk and elk habitat in the Blue Mountains with an emphasis on working closely with landowners to alleviate damage, using more than 90 percent of funding for on-the-ground projects and obtaining consensus on elk management from all partners and interested groups. Partners in the Blue Mountains Elk Initiative employ a variety of methods to improve elk and habitat management including fencing, water development, noxious weed control, and research and education.

State Government - Oregon

Senate Bill 1010

Senate Bill 1010 allows the Oregon Department of Agriculture (ODA) to develop Water Quality Management plans for agricultural lands where such actions are required by state or federal law, such as TMDL requirements. The Water Quality Management Plan should

be crafted in such a way that landowners in the local area can prevent and control water pollution resulting from agricultural activities. Local stakeholders will be asked to take corrective action against identified problems such as soil erosion, nutrient transport to waterways and degraded riparian areas. It is the ODA's intent to establish WQMPs on a voluntary basis. Senate Bill 1010 allows the ODA to use civil penalties when necessary to enforce against agricultural activity that is found to transgress parameters of an approved WQMP.

Oregon Department of Fish and Wildlife

Oregon Department of Fish and Wildlife is responsible for protecting and enhancing Oregon fish and wildlife and their habitats for present and future generations. Management of the fish and wildlife and their habitats in the Powder River subbasin is guided by ODFW policies 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 and OAR 635 Division 008 – Department of Wildlife Lands sets forth management goals for each State Wildlife Area. Another pertinent ODFW policy is the Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources (ODFW 1997b). In addition to the OAR's, ODFW has developed a variety of species-specific management plans. http://www.dfw.state.or.us/

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.

Mountain Goat Management Plan

ODFW's Interim Mountain Goat Management Plan (2000) summarizes the history and status of mountain goats in Oregon and presents a means by which they will be restored to

remaining suitable habitat. The plan provides a record of reintroductions and a guide for future efforts as well as offering management direction for Oregon's mountain goat program.

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.

Fish Species Plans

ODFW uses plans that provide statewide direction for approaches to trout, steelhead, warmwater fish, coastal chinook, and coho salmon management to frame strategies subsequently proposed in basin-specific fish management plans. These plans contain broad guidelines and statewide directions. In the Powder subbasin, the trout and warmwater plans are pertinent.

Oregon's Trout Plan

The trout plan describes a series of management alternatives that provide guidelines and criteria for protecting wild fish and providing angling in a variety of circumstances. In basin plans, these alternatives provide a context for specific angling regulations. Management objectives are focused on the protection of wild fish and their habitats, providing diverse angling opportunities, making hatchery programs effective and diminishing dependence on hatchery releases, and making the public more aware of trout resources and management issues.

Warmwater Fish Plan

The warmwater plan also categorizes management into alternatives that frame regulations. Because warmwater fishes are non-native, the focus is not on species conservation but on providing diverse angling opportunities reflecting the wide distribution of the many species that are classified as "warmwater". Where biological and physical conditions are suitable, the plan directs management to increase the quality of angling. Management of these species is constrained by conservation needs of native fishes.

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 cornerstone with the Oregon Plan concept. The need for continued fish protection is a priority in accordance with Governors Excecutive Order 99-01.

Oregon Division of State Lands

The Oregon Division of State Lands (ODSL) regulates fill and/or removal of material from the bed or banks of streams (ORS 196.800 – 196.990) through the issuance of permits. Permit applications are reviewed by ODFW, U.S. Army Corps of Engineers, DEQ, the counties, and adjoining landowners, and may be modified or denied based on project impacts to fish populations or significant comments received during the review process.

Oregon Water Resources Department

The Oregon Water Resources Department (OWRD) regulates water use in the subbasin in accordance with Oregon Water Law. Statutes for water appropriation (ORS 537) govern the use of public waters; Water Right Certificates appurtenant 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 the 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 ODFW has developed a list of streamflow restoration priorities for fish in the Powder River subbasin in Oregon. http://www.wrd.state.or.us/

Oregon Department of Environmental Quality

The Oregon Department of Environmental Quality (DEQ) is the regulatory agency responsible for implementing the 1972 federal Clean Water Act and enforcing state water quality standards for protection of aquatic life and other beneficial uses. It is instrumental in designating 303(d) water quality limited streams and is charged with developing Total Maximum Daily Load (TMDL) programs.

Oregon Department of Agriculture

The Department of Agriculture oversees several programs in the Natural Resource Division that address soil, water, and plant conservation in the subbasin. Soil and Water Conservation Districts, Watershed Councils, the Environmental Quality Incentives Program (EQIP), and Coordinated Resource Management Planning (CRMP) are under the jurisdiction of the Department of Agriculture as is the Oregon Noxious Weed Strategic Plan. The Coordinated Resource Management Planning (CRMP) group addresses watershed management issues within specific subbasins and develops stream restoration goals and objectives. The ODA is responsible for the agricultural portion of the WQMP and TMDL.

Oregon Department of Forestry

The Oregon Department of Forestry enforces the Oregon Forest Practices Act (OAR 629-Division 600 to 680 and ORS 527) 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, which address stream buffers, riparian management, and road maintenance. The Oregon Department of Forestry is responsible through the OFPA for administering the forestry portion of the Water Quality Management Plan and TMDL and provides technical input to the conservation reserve enhancement program (CREP).

Oregon Department of Parks and Recreation

The Oregon Department of Parks and Recreation implements the State Scenic Waterways Act and administers and manages State Parks within the subbasin.

The Land Conservation and Development Commission

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

County and Local

County Governments

County Commissioners have established Comprehensive Plans for land use within each county in Oregon. A riparian element within the Plan is designed to establish certain regulatory control over specific activities to 1) ensure open space, 2) protect scenic, historic, and natural resources for future generations, and 3) promote healthy and visually attractive environments in harmony with the natural landscape. A riparian setback is specified in the Riparian Overlay Area Designation to conserve fish and wildlife habitat and enhance streambank stability. Some counties also assist with funding of county watershed activities in collaboration with OWEB.

Powder Basin Watershed Council

Under House Bill 2215 and its successor, HB 3441, the State of Oregon has authorized the formation of watershed councils in an attempt to include local knowledge and cooperation in addressing Oregon's environmental issues. Baker County has convened and legally recognizes this Council as empowered to shoulder the responsibility of retaining, restoring and enhancing the health of its watersheds. The Council's mission is to: Analyze watershed conditions, develop short and long-range plans and projects to protect or improve watershed conditions, educate the people in the community about the watershed conditions and function, enlist the people in the community to participate in the projects, develop peer and/or legislative partnerships when needed to achieve results and remain in compliance with legislative and legal requirements.

Other Entities and Organizations

Oregon Water Trust

Oregon Water Trust (OWT), a private, non-profit group, leases and purchases consumptive water rights for in-stream use to enhance streamflows in Oregon. Added responsibility for water brokerage contracts to restore instream flows is implied in the FRCPS BiOp. http://www.owt.org/

The Nature Conservancy

The Nature Conservancy protects the lands and waters, which plant and animals species need to survive. It is instrumental in purchasing lands for habitat protection, working with agencies with similar objectives. http://nature.org/

Northwest Power Planning Council - NWPPC

Formed under the Pacific Northwest Electric Power Planning and Conservation Act of 1980, the NWPPC is directed to develop a program to "protect, mitigate, and enhance fish and wildlife, included related spawning grounds and habitat, in the Columbia River and its tributaries… affected by the development, operation, and management of [hydroelectric project]…" the BPA funds the Council's program. http://www.nwcouncil.org/

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 Powder River subbasin has diverse populations of fish and wildlife and unique areas of habitat that are of economic and ecological significance to the people of the State of Oregon and the Northwest. Many of the natural resources of the Powder subbasin are managed for the benefit of the people of the entire Nation by way of the large amount of federal land. The overall goal for the Powder subbasin is to restore 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 Powder subbasin. The following section, organized by entity, illustrates the full range of goals, objectives and strategies guiding activities relative to fish, wildlife and habitats in the Powder River subbasin. To the casual observer, these may appear redundant and leave the impression that each entity is working independently and only toward its own goals. However, agencies and other entities in the subbasin are working together toward these goals through a variety of coalitions. On a case by case basis, cooperators in the subbasin combine individual institutional goals to achieve a common subbasin goal.

Federal

Bureau of Reclamation

US Forest Service

Management Objectives

(PACFISH/INFISH 1995) part of amended Forest LRMP for Wallowa-Whitman NF:

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

Objective 1. Establish Pool Frequencies (#pools/mi) dependent on width of wetted stream 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 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, conserve 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 that is consistent with attainment of RMOs.

Objective 3. Cooperate with federal, state, and tribal wildlife management agencies to identify and eliminate wild ungulate impacts that are 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.

US Bureau of Land Management

Objective 1. Coordinate program administration and watershed restoration activities.

Strategy 1.1. Facilitate inter-agency coordination of program activities and projects.

Strategy 1.2. Coordinate planning, prioritization, design and implementation of restoration projects.

Strategy 1.3. Provide technical support for project planning, design and implementation.

Objective 2. Improve in-stream habitat diversity for migrating, spawning, and rearing of native fish species.

Strategy 2.1. Implement in-stream habitat restoration according to sound fluvial geomorphic principals.

Strategy 2.2. Increase pools w/LWD to improve over-winter survival of juveniles.

Strategy 2.3. Decrease width and increase stream depth.
Strategy 2.4. Identify cool water refugia and protect and restore in-stream and riparian habitat.
Strategy 2.5. Construct off-channel rearing areas from springs and add LWD component for habitat complexity.
Strategy 2.6. Increase sinuosity to return streams to natural form

Objective 3. Enhance riparian condition (vegetation, function, etc.)
Strategy 3.1. Implement riparian plantings for shade, cover, and LWD recruitment.
Strategy 3.2. Design riparian management plans with fencing and off-site watering.
Strategy 3.3. Restore wet meadows.
Strategy 3.4. Treat noxious weeds and seed/plant treated areas with native vegetation after treatment.

Objective 4. Reduce stream sedimentation.
Strategy 4.1. Revegetate streambanks with native vegetation
Strategy 4.2. Treat noxious weeds and seed/plant treated areas with native vegetation after treatment.
Strategy 4.3. Construct structures as appropriate to the site (e.g., J-hooks, W-weirs, other rock structures).
Strategy 4.4. Use bio-engineering where hard structures are not appropriate or possible.
Strategy 4.5. Determine the source of the problem (e.g., land use, changed hydrograph) and correct if possible.
Strategy 4.6. Identify and fix road related sources of sediment. Replace undersized culverts, surface and maintain existing roads, close or restrict access to roads not needed for management.

Objective 5. Improve upland watershed condition and function.
Strategy 5.1. Treat and contain noxious weeds. Seed and/or plant treated areas with native vegetation after treatment.
Strategy 5.2. Construct livestock pasture fencing.
Strategy 5.3. Promote the development of off-stream watering systems for livestock (often in conjunction with riparian fencing projects).
Strategy 5.4. Manipulate tree density.
Strategy 5.5. Promote the reseeding of areas affected by natural processes (e.g. mass wasting, rain on snow, forest fires) to accelerate the regeneration of ground cover to minimize the potential for erosion and noxious weed invasions.
Strategy 5.6. Promote and maintain partnerships to fund program implementation.

Objective 6. Improve adult and juvenile fish passage.
Strategy 6.1. Replace/modify inadequate culverts.
Strategy 6.2. Repair inadequate crossings (fords) by hardening the entrances and stream bottom or by replacing them with culverts or bridges as appropriate.

Objective 7. Improve water quality.
Strategies: All tasks under Objectives 2, 3, 4, and 5.

Tribal and State

Bull Trout Recovery Team (State, Federal, Tribal)

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

The **Goal** for recovery of bull trout in the Hells Canyon Complex Recovery Unit is to increase their stability and long-term persistence.

Objective 1 Maintain or expand distribution of bull trout within their current range in the Hells Canyon Complex Recovery Unit.
Objective 2 Maintain stable or increasing trends in abundance of bull trout.
Objective 3 Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.
Objective 4 Provide opportunities for genetic exchange between local populations.

State of Oregon

Oregon Department of Forestry

Goal: Protect, manage and promote a healthy forest environment which will enhance Oregon's livability and economy for today and tomorrow.

Oregon Department of Agriculture

Oregon Noxious Weed Strategic Plan
Goal: Heightened awareness among Oregon's citizens, the legislature, local governments, tribal governments, conservation organizations and land managers of the impact of noxious weeds and the need for effective noxious weed management.

Objective 1. Leadership and Organization
Strategy: Provide consistent statewide and local leadership and organization
Objective 2. Cooperative Partnerships
Strategy: Develop and expand partnerships
Objective 3. Planning and Prioritizing
Strategy. Develop and maintain noxious weed lists and plans all levels
Objective 4. Education and Awareness
Strategy: Provide education and awareness
Objective 5. Integrated Weed Management (IWM)
Strategy: Continue to support and advocate the principles of IWM

Objective 6. Early Detection and Control of New Invaders
Strategy: Implement early detection and control
Objective 7. Noxious Weed Information System and Data Collection
Strategy: Upgrade Noxious Weed Information System
Objective 8. Monitoring and Evaluation
Strategy: Monitor noxious weed projects to evaluate effectiveness
Objective 9. Policy, Mandates, Law Compliance and Enforcement
Strategy: Use mandates, policy and law to encourage effective weed management
Objective 10. Funding and Resources
Strategy: Increase base level funding for state, county local, and federal noxious weed control programs to address priorities and to assist private land managers.
Strategy: Additional funding sources for weed control.

Oregon Department of Environmental Quality

Goal:

- Restore, maintain and enhance the quality of Oregon's air, water and land.

Oregon Parks and Recreation Department

Goal:

- Provide and protect outstanding natural, scenic, cultural, historic, and recreational sites for the enjoyment and education of present and future generations.

Oregon Division of State Lands

Goals:

- Manage and protect state trust lands for the maximum long-term benefit of the public schools, consistent with sound stewardship, conservation and business management principles.
- Manage non-trust lands for the greatest benefit of all the people of the state.

Oregon State Police

Goal:

- Develop, promote and maintain protection of the people, property, and natural resources of the state.

Department of Land Conservation and Development

Goals:

- Establish a framework for all land use decisions and actions.
- Preserve and maintain all agricultural lands.
- Conserve forest lands in a manner consistent with sound management of soil, air, water, and fish and wildlife resources, and to provide for recreational opportunities and agriculture.
- Protect natural resources and conserve scenic and historic areas and open spaces.
- Maintain and improve the quality of the air, water, and land resources of the state.
- Protect life and property from natural disasters and hazards.

Oregon Water Resources Department

Goal: To serve the public by practicing and promoting wise long-term water management.
Oregon Revised Statutes are laws passed by the legislative bodies (House and Senate) of Oregon, giving guidance to ODFW for management of fish and wildlife resources. ORS 496.012 refers specifically to wildlife, but fish are included as part of wildlife.

Oregon Revised Statute - ORS 496.012

Goals:

- Species of wildlife maintained at optimum levels.
- Lands and waters of this state that are developed and managed to enhance the production and public enjoyment of wildlife.
- Utilization of wildlife that is orderly and equitable.
- Public access to lands and waters of the state, and the wildlife resources thereon, that are developed and maintained.
- Wildlife populations and public enjoyment of wildlife are regulated compatibly with primary uses of the lands and waters of the state.
- Provision of optimal recreational benefits

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 Powder subbasin is to improve habitat health and function for the enhancement and productivity of wild, native resident trout, and numerous wildlife species (ODFW 1990).

Warmwater Game Fish Plan

Goal:

- Provide optimum recreational benefits to the people of Oregon by managing warmwater game fishes and their habitats.

Objective 1. Provide diversity of angling opportunity

Strategy 1. Identify the public's needs and expectation for angling opportunity.
Strategy 2. Choose management alternatives for individual waters of groups of waters, and incorporate the alternatives in management plans subject to periodic public review.
Strategy 3. Design management approaches to attain the chosen alternative.
Strategy 4. Constantly remind the public of the consequences of unlawful transfers of fishes in order to reduce the incidence of the introductions.
Strategy 5. Inform the public as to why ODFW chooses particular management strategies, in order to establish a positive perception of warmwater game fish.
Strategy 6. Use existing state and federal laws and regulations to deal with illegal introductions.

Trout Plan

Goal:

- 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.

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

Strategy 1. Identify wild trout stocks in the state.

Strategy 2. Minimize the adverse effects of hatchery trout on biological characteristics, genetic fitness, and production of wild stocks .

Strategy 3. Establish priorities for the protection of stocks of wild trout in the state.

Strategy 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 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 1. Determine the desires and needs of anglers.

Strategy 2. Use management alternatives for classifying wild trout waters to provide diverse fisheries.

Strategy 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 1. Summarize information on the current hatchery program and determine necessary changes.

Strategy 2. Increase the involvement of the STEP program in the enhancement of trout.

Strategy 3. Publicize Oregon's trout management program through the ODFW office of Information and Education.

Oregon Wildlife Diversity Plan (ODFW 1993)

Goal:

- 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.

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)

Goal:

- 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.

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 population 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)

Goals:

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

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)

Goals:

- 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.
- Maintain population levels where herds are at management objectives.
- 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)

Goal:

- 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.

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)

Goal:

- Restore bighorn sheep into as much suitable unoccupied habitat as possible.

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, as well as the Burnt, Deschutes, and John Day river drainages.

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)

Goal:

- 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.

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

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

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

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

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

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

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

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

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

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

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

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

Strategy 3.1. Provide migratory game bird harvest opportunity.

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

Strategy 3.3. Eliminate impacts to endangered or threatened species.

Strategy 3.4. Reduce impacts to protected or sensitive species.

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

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

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

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

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

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

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

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

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

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

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

Other General Habitat Goals, Objectives and Strategies that might be applicable

Goal:

- Protect and maintain remaining high quality riparian, aquatic, and upland habitats.

Objective 1. Maintain or increase wildlife species diversity.

Strategy 1. . Protect, enhance, and restore wildlife habitat in the subbasin.

Strategy 2. Protect federal and state threatened, endangered, and sensitive wildlife species.

Habitat Strategies

- Grazing: Develop livestock control measures to include limited grazing periods, reduced stocking rates, temporary or permanent stream corridor fencing, and management of riparian pasture systems.
- Mining: Require mining and dredging operations to meet county, state, and federal regulations. Ensure that the Department of Environmental Quality, Environmental Protection Agency, and Oregon Division of State Lands jointly develop guidelines, standards, and enforcement procedures for protection of streambed conditions under provisions of the 1987 amendments to the Clean Water Act, Title III – Standards and Enforcement, Sections 301-310, and 404. Prevent mining activities in or near critical fish habitat.
- Road Building: Enforce Forest Service Practices Rules requiring adequate maintenance or closure and rehabilitation of roads. Social, economic, wildlife, fisheries, and recreation factors must be considered and positive road management plans developed to close unnecessary roads and return them into resource production where possible. Examine alternative road construction sites in areas classified as having high erosion and slope failure potential.
- Timber Harvest: Develop a system for classifying and mapping forest lands susceptible to erosion, including slope failures, streamside landslides, gully erosion, and surface erosion. Such a system should take into account the potential for damage to downstream resources in addition to the potential for on-site erosion.
- Timber Harvest: Require the USFS, BLM, and ODF to increase monitoring of timber harvest activities for compliance with rules, guidelines, and recommendations for habitat protection.
- Pesticide and Herbicide Use: Ensure that chemical treatments from federal, state, and private individuals for plant and insect control adjacent to waters in the Powder River subbasin will not endanger fish life and aquatic organisms or damage watershed and riparian systems.
- Water Quality and Quantity: Require the EPA, ODEQ, BLM, and USFS to establish monitoring programs required by the Clean Water Act (Sections 301-310), the National Forest Management Act, and the National Environmental Protection Act (NEPA).

- Require the ODEQ, EPA, and DSL to enforce guidelines, standards, and procedures for protection of streambed conditions under provisions of the Clean Water Act (1987 amended)
- Continue landowner involvement and cooperation in protecting, restoring, and enhancing riparian systems and watersheds.
- Require the DSL to develop procedures and provide manpower to monitor compliance with fill and removal permit conditions.
- Develop acceptable methods of erosion control for necessary bank protection, through agency and landowner cooperation.
- Apply for instream water rights or recommend additional sites for adoption of minimum streamflow by the Water Resources Commission.
- Require all diversion inlets be properly screened and maintained as required by the Fish Screen Law (1987) and ORS 509.615.
- Monitor irrigators to ensure all diversion structures minimally provide adult and juvenile passage as required by state law.
- Obtain funding for landowners through state and federal agencies to implement more efficient irrigation methods and develop water conservation practices benefiting landowners and instream flows.
- Purchase, lease, exchange, or seasonally rent water rights for selected fish habitat during critical low flow periods.
- Develop a comprehensive plan for reintroduction, regulation, and management of beaver in suitable sites in the Powder subbasin for the specific purpose of using beaver to restore streamflows, improve fish habitat, and improve watersheds.
- Support and expand existing watershed programs.
- Develop a system of riparian natural areas associated with critical fish habitat throughout the basin.

Statement of Fish and Wildlife Needs

The Powder River subbasin once supported important populations of anadromous fish. These populations were extirpated as a result of hydropower development on the Snake River. This statement of fish and wildlife needs identifies needs within the Powder River subbasin for restoration, conservation and management of fish and wildlife populations and their habitats. However, issues outside the subbasin, such as passage barriers and habitat on the Columbia and Snake Rivers, need to be addressed even as plans for in-basin restoration and conservation are developed and implemented.

The foregoing subbasin summary includes information regarding the status and condition of fish and wildlife populations and habitat within the subbasin. In synthesizing this information, three general needs for restoration and recovery of fish and wildlife populations and habitat emerge:

- Monitoring - Monitoring the status of high priority populations and habitats is important to understanding recovery status and focusing recovery priorities and efforts. Current monitoring efforts should

continue and in some cases be expanded to meet emerging information needs;

- Habitat Restoration - Cooperative efforts among landowners, resource managers and regulatory agencies to restore watershed function should continue.
- Evaluation – Restoration and recovery measures implemented should be evaluated to document their success. An adaptive management approach to implementation should be used to insure activities to meet expectations.

The following provide specific immediate or critical needs developed and submitted by fish and wildlife resource managers and other interested parties within the Powder River subbasin. This list is not exhaustive as other specific needs may emerge as species and habitats become better understood and out-of-basin limiting factors are addressed. Needs have been defined to address limiting factors to fish and wildlife, ensure that gaps in current data or knowledge are addressed, enable continuation of existing programs critical to successful management of fish and wildlife resources, and to guide development of new programs to facilitate or enhance fish and wildlife management.

Both aquatic and terrestrial needs have been identified, as well as general needs which apply equally to both aquatic and terrestrial resources. The order in which needs are listed in no way implies priority. It is important to note that aquatic and terrestrial needs are separated here for organizational purposes, and are not perceived to be mutually exclusive. Restoration efforts directed at either aquatic or terrestrial resources are likely to impact the ecosystem as a whole. The extent to which needs are addressed and goals and objectives are achieved is dependent upon available funding and timeliness of the permitting and consultation process.

General Needs

5. Reduce road densities through closure and obliteration to minimize human caused harassment of wildlife.
6. Reduce off -road vehicle use and use of closed roads; restrict ATV use (no cross-country travel) and restrict snowmobile use in big game winter range areas.
7. Protect riparian areas from livestock grazing to restore vegetative cover and improve associated water tables.
8. Protect, enhance, and acquire riparian areas in large riverine valleys with emphasis on old growth cottonwood galleries (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).

Fish / Aquatic Needs

9. Conduct additional studies and analyses to determine potential for restoration of fish passage at dams including Mason, Wolf Creek and Thief Valley dams as well as diversion dams such as exists on West Eagle Creek.
10. Develop and implement, as appropriate, a plan to restore fish passage at dams including Mason, Wolf Creek and Thief Valley dams as well as diversion dams such as exists on West Eagle Creek.

11. Improve / increase stream flows:
    - Investigate potential for increasing minimum flow requirements below Mason Dam (current requirement is 10 cfs by agreement between USBR and ODFW).
    - Provide for water releases from dams as needed to benefit fish.
    - Restore and augment streamflows using (but not limited to) water right leases, transfers or purchases and improved irrigation efficiency.
    - Measure flow at the mouth of Wolf Creek to ensure the 2 cfs minimum is met and to document the effect of return flows which were expected to supplement minimum flow.
12. Restore, protect and create riparian, wetland and floodplain areas within the subbasin and establish connectivity.
13. Reduce road density and minimize long-term cumulative impacts of sediment production.
14. Restore instream habitat to natural conditions and protect as much as possible to provide suitable holding, spawning and rearing areas for fish and to avoid future cumulative impacts.
15. Reduce stream temperature, sediment and embeddedness levels to levels meeting appropriate state standards.
16. Investigate and develop priorities for screening diversions.
17. Implement diversion screening beginning with highest priority diversions.
18. Continue monitoring and investigations into the distribution and abundance of known populations of bull trout (e.g., estimates of abundance to establish trends and measure population response to restoration efforts; extent and magnitude of nonnative species interaction and hybridization to better define treatment options).
19. Conduct feasibility analyses to determine potential for restoration of bull trout populations into historic habitat in the subbasin.
20. Develop and implement, if appropriate, a plan to restore bull trout into historic habitats including establishment of a fluvial population in Eagle Creek.
21. Continue efforts to educate anglers and the general public as to the importance of bull trout and the need to protect them.
22. Reconnect resident fish populations within the Powder subbasin through habitat and passage improvements.
23. Reconnect Powder subbasin resident fish populations with Snake River populations through habitat and passage improvements.

Wildlife / Terrestrial Needs

24. Acquire lands with high priority habitat components (e.g., low elevation forest and forest/rangeland mix habitats) when opportunities arise for improved habitat protection, restoration and connectivity and for mitigation of lost wildlife habitat and/or seasonal range (land purchases, land trusts, conservation easements, landowner cooperative agreements, exchanges).
25. Reduce road density in the upper Powder River drainage above Mason Dam.
26. Develop and implement management prescriptions to restore and promote late successional forest habitats with emphasis on low elevation, ponderosa pine type.

27. Increase density and area of shrub cover on Keating winter range and on winter range between Glasgow Butte and Daly Creek.
28. Increase density and area of sagebrush cover in Virtue Flat area.
29. Protect, restore and create wetland and riparian habitat, especially in lower elevation riparian areas such as those in the Keating and Baker valleys.
30. Improve wetland and riparian area management in the Keating and Baker valleys.
31. Increase / improve riparian habitat in areas inundated by construction and operation of Snake River dams.
32. Reduce the spread of non-native vegetation through chemical and biological control methods.
33. Develop and use restoration techniques for noxious weed infested communities.
34. Improve access to private lands for hunters.
35. Improve access to private lands for wildlife damage management.
36. Restore populations of sharp-tailed grouse through translocation to historic range, especially where range restoration efforts are underway.
37. Restore native grasses, forbs, and shrub species in sagebrush habitats. Restore habitats presently in cheatgrass monoculture through chemical and other methods and re-seed with native grass species.
38. Identify and conserve remaining areas of high quality shrub-steppe, big sage, fescue-bunchgrass, mountain big-sagebrush, and wheatgrass-bunchgrass habitat types through acquisition, easement, or other actions.
39. Retain all large diameter (>20" dbh) ponderosa pine, cottonwood, fir, and western larch snags.
40. Complete mitigation agreements for remaining habitat unit losses due to construction and inundation of the Lower Snake River dams. These agreements should equal 200% of the habitat unit losses (NWPPC 1995 Fish and Wildlife Program).
41. Conduct an assessment of direct operational impacts of Lower Snake River dams on wildlife habitat as called for in Section 7 of the NWPPC's 2000 Fish and Wildlife Program.
42. Mitigate for direct operational and secondary losses of wildlife habitat from the Lower Snake River dams.

Powder Subbasin Recommendations

Projects and Budgets

The following project proposal was reviewed by the Middle Snake Province Budget Work Group for Bonneville Power Administration project funding for fiscal year 2003 through fiscal year 2005. Table 17 summarizes how each project relates to existing goals and objectives in the subbasin.

Continuation of Ongoing Projects

Project: 199405400 - Tools for Managing Bull Trout Populations Influenced by Non-native Brook Trout Invasions

Sponsor: Oregon Department of Fish and Wildlife (ODFW)

Short Description:

Develop models of ecological and genetic effects of non-native brook trout on bull trout; monitor population abundance and habitat.

Abbreviated Abstract

Non-native trout invasions are widespread in the Columbia River basin in general and the Middle Snake in particular, yet their implications for fishery management are poorly understood. In many, but not all cases, it is believed that non-native trout can have adverse impacts on native salmonids. These impacts can result from ecological (e.g., competition, predation) or genetic (e.g., hybridization) interactions, or both. Efforts to manage factors related to salmonid productivity (e.g., harvest, hatcheries, habitat, hydropower) must also explicitly consider the issue of non-native trout invasions. For example, many wilderness areas contain large, relatively pristine habitats with minimal harvest; however, these habitats may support large populations of non-native trout. Management options for dealing with non-native trout are limited and controversial. Furthermore, there is little understanding of larger-scale patterns that could be used to support a more strategic approach to managing non-native trout.

We propose to study non-native brook trout invasions and their potential ecological and genetic impacts on native bull trout in the Middle Snake Province to provide better information for managing those species. We will consider ecological impacts by looking at multi-scale (e.g., subbasins, subwatersheds, reaches) patterns in the distribution of bull trout and brook trout. Our goal is to produce a series of models to predict brook trout distributions and their ecological impacts on bull trout. Patterns of hybridization between bull trout and brook trout will also be described and analyzed in relation to local habitat and landscape characteristics to identify areas where hybridization is and may likely be a problem. Finally, we will conduct a more focused genetic study of brook trout population

structure to better understand how this species disperses through streams to colonize habitats.

In addition, a coordinated approach to monitoring habitat status and trends in bull trout populations is needed to support recovery efforts. Currently, most research and monitoring activities do not have an overall framework for coordination of efforts or for interpretation and synthesis of results. We propose to use the approach employed by the Oregon Plan for Salmon and Watersheds Monitoring Program (Nicholas 1997a; 1997b; 1999) as adapted to bull trout and other salmonids in the Oregon subbasins of the Middle Snake Province. This approach, successfully implemented in Oregon's coastal watersheds, applies a rigorous sampling design to answer key monitoring questions, provides integration of sampling efforts, and has greatly improved coordination among state, federal, and tribal governments, along with local watershed groups. The proposed project is high priority based on the high level of emphasis the NWPPC Fish and Wildlife Program and Subbasin Summaries, NMFS, and the Oregon Plan for Salmon and Watersheds have placed on monitoring and evaluation to provide the real-time data to guide restoration and adaptive management in the region.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
9107	North Fork Malheur River Bull Trout and Redband Trout Life History Study	Collaborative where objectives overlap

Relationship to Existing Goals, Objectives and Strategies

Columbia Basin Fish and Wildlife Program. The Columbia Basin Fish and Wildlife Program (CBFWP) fully recognizes the importance of mitigation for native resident fishes, including ESA (Endangered Species Act) listed species, such as bull trout. In regard to resident fishes, the CBFWP states the following needs for mitigation of hydrosystem effects on resident fish populations:

"Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species."

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

The statements above highlight the need to better understand how important native and non-native game fishes (such as salmonids) can be managed to attain multiple objectives, such as ecosystem integrity and sustainable consumptive and non-consumptive fisheries.

Furthermore, the CBFWP recognizes the need for mitigation of lost anadromous fisheries above human barriers ("resident fish substitution policy"). Again, the multiple fishery restoration objectives and options span the range from native to wild non-native to hatchery-reared fish stocks:

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

Much of our work will be focused on habitats that may be classified in terms of "off-site mitigation." The CBFWP recognizes the role of these habitats in off-setting impacts of the hydrosystem on important fisheries:

"Changes in the hydrosystem are unlikely within the next few years to fully mitigate impacts to fish and wildlife. However, the Northwest Power Act allows off-site mitigation for fish and wildlife populations affected by the hydrosystem. Because some of the greatest opportunities for improvement lie outside the immediate area of the hydrosystem --- in the tributaries and subbasins off the mainstem of the Columbia and Snake Rivers --- this program seeks habitat improvements outside the hydrosystem as a means of off-setting some of the impacts of the hydrosystem."

Subbasin summaries (http://www.cbfwa.org/files/province/midsnake/subsum.htm). The draft subbasin summaries are consistent with the CBFWP in recognizing the need to consider both native and non-native salmonids for attaining fishery restoration and management objectives. Statements of fish and wildlife needs in the summaries repeatedly refer to the impacts of non-native species invasions and the need to better understand them, and also refer to the relative lack of knowledge of resident native fishes, such as bull trout. For example, the Powder Subbasin Summary specifically identifies the need to determine the extent and magnitude of non-native species interactions and hybridization with bull trout to better define treatment options. The Lower Middle Snake and Malheur subbasin summaries call for determination of the distribution and abundance of native and non-native species and the effects of non-native species, including hybridization. The Malheur Subbasin Summary also recommends control of brook trout in bull trout areas and reduction of possible brook trout X bull trout hybridization.

NMFS-USFWS "Reasonable and Prudent Alternatives." Biological opinions issued by National Marine Fisheries Service (NMFS 2000), and U.S. Fish and Wildlife Service (USFWS 2000) for hydrosystem operations and fisheries mitigation in the Columbia River basin identify a number of reasonable and prudent alternative (RPAs) to avoid jeopardy to listed fish. At least one RPA related to tributary habitat needs would be addressed by research proposed (see NMFS 2000). Offsite habitat enhancement measures, as specified in RPA 152, would be greatly enhanced with information from this research .

The USFWS biological opinion focused on fisheries mitigation for listed bull trout in the Columbia River basin. Many issues over use of habitat within areas most obviously affected by the hydrosystem were listed. Research proposed herein will complement the goal of bull trout conservation by providing key information on the ecological requirements of bull trout in headwater habitats, which are used extensively for spawning and early rearing. These habitats supply most of the migratory bull trout that use the larger streams, lakes, and reservoirs that are more directly affected by the hydrosystem.

NMFS Guidance Regarding BPA/NW Council Columbia Basin Provincial Review Solicitations. Our objectives in this proposal are very consistent with guidelines outlined

by NMFS. The guidance calls for "ecological context in habitat initiatives" and for approaches that "identify and provide rationale for measurable benefits to specific salmonid life stages in a spatially explicit manner." Our research products will address the issue of "context" and "space" in several ways (see Luce et al. 2001 and Rieman et al. 2001 for other examples). Most obvious is the importance of understanding habitat restoration alternatives in the context of non-native salmonid invasions. Which habitat restoration options are likely to benefit native fishes the most? Are some habitat restoration efforts likely to benefit non-native fish more than native fish?

Context is also important in terms of evaluating individual habitat restoration projects in relation to larger-scale objectives. For example, how does restoration in stream "X" benefit the species/ESU/region as a whole? All restoration projects are "local," but they must also be consistent with attaining larger regional goals to be truly effective. Our multi-response, multi-scale investigation of the causes and effects of non-native invasions will provide managers with new information and new tools for understanding the context of management alternatives.

Interior Columbia Basin Ecosystem Management Project. The science assessments in the Interior Columbia Basin Ecosystem Management Project (ICBEMP) have played a critical role in providing regional perspectives on management opportunities (e.g., Rieman et al. 2001). The focus for salmonids was primarily on native species (Lee et al. 1997; Rieman et al. 1997; Thurow et al. 1997), and our work will complement these assessments by including information on non-native salmonids. Furthermore, we intend to further examine the factors considered in the larger-scale assessment with finer-scale environmental data and more detailed information on biological responses (both ecological and genetic indicators). This will allow us to biologically validate many of the relationships indicated by the ICBEMP analysis.

Return to the River 2000. A central focus in the review of the Northwest Power Planning Council's Fish and Wildlife Program by the Independent Scientific Group (Williams et al. 1999; ISG 2000) was the "normative river" concept. This concept is embraced in many disciplines and is increasingly advocated in aquatic restoration (Rieman et al., in press). The practical application of this concept to the Columbia River basin hinges critically on the role of non-native species, of which non-native salmonids are a dominant component. Many habitats considered to be relatively "pristine" in the physical sense (e.g., cold, clean, and connected) are not pristine in the biological sense (e.g., they have strong populations of non-native trout). Management for protection and restoration of habitats must, therefore, explicitly consider the issue of non-native salmonids. Return to the River also identifies spatial processes (e.g., patterns of intraspecific diversity, metapopulation structure) as important, but often ignored components of salmonid recovery (see also McElhaney et al. 2000). Our past work has played a central role in applying these concepts to bull trout and other salmonids (Rieman and Dunham 2000; Dunham et al., in press; Spruell et al., in press B), and our proposed research will explicitly address the importance of spatial processes for non-native salmonid invasions and the distribution of native salmonids in headwater streams.

Monitoring

The program described in this proposal is consistent with and supports the monitoring needs specified by the amended NWPPC's Columbia Basin Fish and Wildlife Program and Subbasin Summaries, NMFS 2000 FCRPS Biological Opinion, and the Oregon Plan for Salmon and Watersheds. The Fish and Wildlife Program (Chapter 9) calls for monitoring and evaluation of biological and environmental conditions at the scale of provinces and subbasins. The subbasin summaries this proposal addresses call for a framework for the coordination and integration of monitoring efforts and increased monitoring of the status trends in anadromous and resident fish populations and habitats in their respective "Fish and Wildlife Needs" sections. The proposed monitoring program will provide a framework for improved coordination and integration of monitoring efforts. ODFW will monitor and evaluate the status and trends in fish populations (abundance and distribution) and habitat (quantity and quality) at the Province (Oregon portion) scale. The purpose of the monitoring and evaluation program is to assure that the effects of actions taken under subbasin plans are measured, that these measurements are analyzed so that we have better knowledge of the effects of the action, and that this improved knowledge is used to choose future actions.

Under the Oregon Plan (Coastal Salmon Restoration Initiative, Steelhead Supplement, Executive Order No. EO 99-01) monitoring is one of the four essential elements to implement the Plan. ODFW's monitoring proposal for the Middle Snake Province Project Selection is consistent and complementary to the program ODFW has implemented in coastal watersheds. This proposal also supports the implementation of the Oregon Plan statewide for all salmonids at-risk throughout the state.

Review Comments

CBFWA recommends that Objectives 1-3 should be funded; however, concerns were expressed about changes of scope of ongoing projects and CBFWA suggests that the project sponsors be held to the following allocation schedule: 2003 - $329,581, 2003 - $293,482, 2005 - $106,425, and 2006 - $0

Budget

FY03	FY04	FY05
$329,581 Category: High Priority Comments:	$293,482 Category: High Priority	$106,425 Category: High Priority

New Projects

No new projects have been proposed for the Powder subbasin in FY 2003 – FY 2005.

Research, Monitoring and Evaluation Activities

The single BPA-funded project ongoing in the Powder subbasin at this time is a research and monitoring project. As proposed, the project will provide data "to quantify the current

status and long-term trends in bull trout and other resident salmonid populations and the habitats they are dependent on."

Needed Future Actions

The recommended action outlined above, in the fiscal year 2003 project proposal, addresses just a few of the fish and wildlife needs identified in the Powder Subbasin Summary. More action is needed in research, monitoring and restoration to fully restore fish and wildlife populations and their habitats within the Powder subbasin. Future action is necessary to satisfy subbasin goals and objectives and to address the limiting factors and fish and wildlife needs identified in the foregoing Subbasin Summary (Pp 63, 43 and 79, respectively). Some of those continuing needs are outlined below.

The most critical needed future action is protection and restoration of terrestrial and aquatic habitats for the benefit of a variety of ESA and non-ESA fish and wildlife species. There is a need to develop a process for evaluating and selecting priority habitat projects. There is a need to develop mechanisms to effectively and efficiently secure and fund these habitat projects. There is a need to develop new partnerships with private landowners, Soil and Water Conservation Districts (SWCDs), watershed councils, local governments, and other interested parties within the Powder subbasin to accomplish habitat protection and restoration actions. These could be accomplished through conservation easement, fee-title purchase, long-term lease and cooperative management agreements. There is a need for BPA to provide funding for such projects to mitigate for the effects of the Columbia Basin Federal Hydropower System on Powder subbasin fish and wildlife. There is a need to assess and mitigate hydrosystem operational impacts to fish and wildlife and their habitats. There is a need to improve water quality and fish screening, and to control noxious non-native vegetation. There is continued need to restore flows to improve the quantity and quality of fish habitat and improve fish passage.

There is a need to reintroduce fish species that have been extirpated from the subbasin and augment populations of species that are in decline or in peril of becoming extirpated. Bull trout need to be reintroduced into historic habitats where appropriate and feasible. There is a need to address out-of-subbasin as well as within-subbasin fish passage barriers and the feasibility of reintroducing anadromous fish to the subbasin should those barriers be removed.

There is a need for research, monitoring and evaluation (RME) in all facets of natural resource restoration enhancement and protection. Ongoing RME is important for ensuring work plan compliance and effectiveness. Ongoing RME is necessary to assess trends and determine success in restoration efforts, particularly at the watershed level. RME is needed to help demonstrate habitat and species response to habitat protection and restoration actions. There is a continuing need to document life history, distribution and habitat needs of high-priority fish and wildlife species and the effect of exotic species on native fish, wildlife and plants. There is a need for on-going inventories of limiting factors to help plan and prioritize future actions. For example, inventories of upland habitat conditions, fish and wildlife population distributions, spread of invasive weeds, and location and status of wetland areas will be used to adapt management actions. There is a need for consistency in data collection and a shared repository where data can be accessed

by all subbasin entities. Continuation and enhancement of the cooperative approach in RME will facilitate restoration and enhancement measures.

There is a need to ensure compliance with natural resource laws, codes and ethics through improved public education and enforcement efforts.

Actions by Others

There is a need for BPA to partner with state, federal, county and local entities (SWCDs, watershed councils), tribes, and private landowners to protect and restore fish and wildlife and their habitats within the Powder subbasin. There is a need to take advantage of opportunities raised by landowners willing to enter into conservation easement agreements, fee-title acquisitions, long-term leases, and cooperative management agreements in areas of critical habitat.

There is a need to develop interstate and interagency cooperative initiatives to prevent the introduction and spread of terrestrial and aquatic nuisance species. Plans, initiatives, and agreements need to be suitably designed and monitored (i.e., weed spraying programs should be coupled with reseeding efforts, etc.) and should acknowledge and incorporate the experience and successes of private land managers. The public needs to become more aware of the ability of many non-native species to out-compete native species. Public outreach and education could occur through schools, homeowner associations, sporting groups, SWCDs, watershed councils and agencies. Cost-sharing arrangements with BPA would be appropriate.

There is a need to foster grassroots support to implement conservation measures on private lands. Agencies could help private groups acquire grants; assist with project design and implementation; and facilitate cost-share arrangements, grants, rehabilitation / enhancement efforts, and the promotion of conservation activities. Agencies need to develop and/or implement other land and resource management plans, research the effectiveness of conservation programs and activities, and encourage the securing of management rights (including the use of conservation easements and land acquisitions) to improve water quality and fish and wildlife habitat in the subbasin. Workshops could be provided to demonstrate methods of water conservation and techniques for protecting and restoring riparian areas and wetlands. Such improvements may reduce sedimentation, increase density and diversity of riparian vegetation, improve channel form, and improve water quality.

There is a need to investigate and mitigate the impacts associated with transportation corridors. State departments of transportation and county road programs should seek alternative alignments and other long-term roadway solutions to identify and mitigate impacts to wildlife movement, mortalities, and soil permeability. These agencies and programs especially need to address channel confinement, culverts and related fish/wildlife impediments. States should identify and adequately mitigate cumulative impacts associated with new highway construction, improvement, or expansion projects. There is a need to increase effort by management agencies to reduce road densities, implement closures of existing roads on public lands and enforce road closures.

There is a need for increased protection of water resources through reduction/elimination of point sources of pollution and voluntary adherence to, or enforcement of, allowable water rights. Many streams in the Powder subbasin are over

allocated, leaving little or no instream water for fish and wildlife during low water periods. A review of water rights and use relative to availability may allow opportunities to provide flows to improve the quantity and quality of aquatic habitat. Irrigation systems and diversions need to be inventoried and facilities improved to allow for more efficient use of water and for fish passage. There is also a need to develop off-stream water sources for livestock near critical aquatic habitats.

BPA-funded actions need to be more closely coordinated with the actions of city, county, state, and federal agencies and other organizations that are directed at benefiting fish and wildlife and their habitats. Agencies need to investigate, document, and monitor population trends and develop coordinated recovery plans for high-priority management species and other species that show declining populations.

Table 17. Subbasin Summary FY 2003 - Funding Proposal Matrix – Continuation of Ongoing Projects.

Project Proposal ID	**199405400**
Provincial Team Funding Recommendation	**Recommended Action**
Federal	
US Forest Service	
Fish and Fish Habitat Objectives (Riparian Management Objectives – RMO)	
Objective 1. Establish Pool Frequencies (#pools/mi) dependent on width of wetted stream 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 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, conserve 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.	

Project Proposal ID	199405400
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 that is consistent with attainment of RMOs.	
Objective 3. Cooperate with federal, state, and tribal wildlife management agencies to identify and eliminate wild ungulate impacts that are 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.	X
US Bureau of Land Management	
Objective 1. Coordinate program administration and watershed restoration activities.	
Objective 2. Improve in-stream habitat diversity for migrating, spawning and rearing of native fish species.	
Objective 3. Enhance riparian condition (vegetation, function, etc.).	
Objective 4. Reduce stream sedimentation.	
Objective 5. Improve upland watershed condition and function.	
Objective 6. Improve adult and juvenile fish passage.	
Objective 7. Improve water quality.	
Federal, State and Tribal	
Bull Trout Recovery Team	
Goal: Increase stability and long-term persistence of bull trout in the Hells Canyon Complex Recovery Unit.	X
Objective 1. Maintain or expand distribution of bull trout within their current range in the Hells Canyon Complex Recovery Unit.	
Objective 2. Maintain stable or increasing trends in abundance of bull trout.	X
Objective 3. Restore and maintain suitable habitat conditions for all bull trout life history stages and strategies.	X
Objective 4. Provide opportunities for genetic exchange between local populations.	
State of Oregon	
Oregon Department of Forestry	
Goal: Protect, manage and promote a healthy forest environment which will enhance Oregon's livability and economy for today and tomorrow.	
Oregon Department of Agriculture	
Goal: Heightened awareness among Oregon's citizens, the legislature, local governments, tribal governments, conservation organizations and land managers of the impact of noxious weeds and the need for effective noxious weed management.	
Objective 1. Leadership and Organization.	
Objective 2. Cooperative Partnerships.	
Objective 3. Planning and Prioritizing.	
Objective 4. Education and Awareness.	
Objective 5. Integrated Weed Management (IWM).	
Objective 6. Early Detection and Control of New Invaders.	
Objective 7. Noxious Weed Information System and Data Collection.	
Objective 8. Monitoring and Evaluation.	
Objective 9. Policy, Mandates, Law Compliance and Enforcement.	
Objective 10. Funding and Resources.	
Oregon Department of Environmental Quality	
Goal: Restore, maintain and enhance the quality of Oregon's air, water and land.	
Oregon Parks and Recreation Department	

Project Proposal ID	199405400
Goal: Provide and protect outstanding natural, scenic, cultural, historic, and recreational sites for the enjoyment and education of present and future generations.	
Oregon Division of State Lands	
Goals: Manage and protect state trust lands for the maximum long-term benefit of the public schools, consistent with sound stewardship, conservation and business management principles.	
Manage non-trust lands for the greatest benefit of all the people of the state.	
Oregon State Police	
Goal: Develop, promote and maintain protection of the people, property, and natural resources of the state.	
Department of Land Conservation and Development	
Goals: Establish a framework for all land use decisions and actions.	
Preserve and maintain all agricultural lands.	
Conserve forest lands in a manner consistent with sound management of soil, air, water, and fish and wildlife resources, and to provide for recreational opportunities and agriculture.	
Protect natural resources and conserve scenic and historic areas and open spaces.	
Maintain and improve the quality of the air, water, and land resources of the state.	
Protect life and property from natural disasters and hazards.	
Oregon Water Resources Department	
Goal: To serve the public by practicing and promoting wise long-term water management.	
Oregon Revised Statute – ORS 496.012	
Goals: Species of wildlife maintained at optimum levels.	
Lands and waters of this state that are developed and managed to enhance the production and public enjoyment of wildlife.	
Utilization of wildlife that is orderly and equitable.	
Public access to lands and waters of the state, and the wildlife resources thereon, that are developed and maintained.	
Wildlife populations and public enjoyment of wildlife are regulated compatibly with primary uses of the lands and waters of the state.	
Provision of optimal recreational benefits.	
Oregon Department of Fish and Wildlife	
Warmwater Game Fish Plan	
Goal: Provide optimum recreational benefits to the people of Oregon by managing warmwater game fishes and their habitats.	
Objective 1. Provide diversity of angling opportunity.	
Trout Plan	
Goal: 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.	
Objective 1. Maintain the genetic diversity and integrity of wild trout stocks throughout Oregon.	X
Objective 2. Protect, restore and enhance trout habitat.	
Objective 3. Provide a diversity of trout angling opportunities.	
Objective 4. Determine the statewide management needs for hatchery trout.	
Oregon Wildlife Diversity Plan (ODFW 1993)	
Goal: 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.	
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,	

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improvement or expansion of habitats and by conducting other conservation actions.	
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.	
Objective 3. Provide recreational, educational, aesthetic, scientific, economic and cultural benefits derived from Oregon's diversity of wildlife.	
Objective 4. Address conflicts between non-game wildlife and people to minimize adverse economic, social, and biological impacts.	
Oregon Black Bear Management Plan (ODFW 1987)	
Goal: 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.	
Objective 1. Determine black bear population characteristics.	
Objective 2. Determine black bear harvest levels.	
Objective 3. Continue current practice of allowing private and public landowners to take damage causing black bear without a permit.	
Oregon's Cougar Management Plan (ODFW 1993a)	
Goals: Recognize the cougar as an important part of Oregon's wildlife fauna, valued by many Oregonians.	
Maintain healthy cougar populations within the state into the future.	
Conduct a management program that maintains healthy populations of cougar and recognizes the desires of the public and the statutory obligations of the Department.	
Objective 1. Continue to gather information on which to base cougar management.	
Objective 2. Continue to enforce cougar harvest regulations.	
Objective 3. Document and attempt to eliminate potential future human-cougar conflicts.	
Objective 4. Manage cougar populations through controlled hunting seasons.	
Objective 5. Continue to allow private and public landowners to take damage-causing cougar without a permit.	
Objective 6. Manage deer and elk populations to maintain the primary prey source for cougar.	
Mule Deer Management Plan (ODFW 1990)	
Goals: 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.	
Maintain population levels where hers are at management objectives.	
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.	
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)	
Goal: 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.	
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.	
Objective 2. Coordinate with landowners to maintain, enhance and restore elk habitat.	
Objective 3. Enhance consumptive and non-consumptive recreational uses of Oregon's elk resource.	
Oregon's Bighorn Sheep Management Plan (ODFW 1992)	
Goal: Restore bighorn sheep into as much suitable unoccupied habitat as possible.	
Objective 1. Maintain geographical separation of California and Rocky Mountain subspecies.	

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Objective 2. Maintain healthy bighorn sheep populations.	
Objective 3. Improve bighorn sheep habitat as needed and as funding becomes available.	
Objective 4. Provide recreational ram harvest opportunities when bighorn sheep population levels reach 60 to 90 animals.	
Objective 5. Conduct annual herd composition, lamb production, summer lamb survival, habitat use and condition, and general herd health surveys.	
Oregon Migratory Game Bird Program Strategic Management Plan (ODFW 19193)	
Goal: 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.	
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.	
Objective 2. Assist in the development and implementation of the migratory game bird management program through information exchange and training.	
Objective 3. Provide recreational, aesthetic, educational, and cultural benefits from migratory game birds, other associated wildlife species, and their habitats.	
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.	
Other General Habitat Goals, Objectives and Strategies that might be applicable	
Goal: Protect and maintain remaining high quality riparian, aquatic, and upland habitats.	
Objective 1. Maintain or increase wildlife species diversity	

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

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