Draft

Closed Basin Subbasin Summary

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Prepared for the
Northwest Power Planning Council

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

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Background

In 1980 Congress passed the Northwest Power Act, establishing the Northwest Power Planning Council (Council) and articulating the legal mandate to develop a program to protect, mitigate, and enhance fish and wildlife in the Columbia River Basin. The Council developed its first Fish and Wildlife Program in 1982 and has revised it every few years, most recently in November, 2000. The program includes support of management and research projects to mitigate and benefit fish and wildlife resources, and is reviewed by an Independent Scientific Review Committee (ISRC). The current program has a clearly stated goal for which the Council is developing local subbasin plans for each of the 62 subbasins within the 12 provinces of the Columbia River Basin (Figure 1). An interim step in developing subbasin plans is summarizing the existing information on fish and wildlife resources, habitats, programs, and needs into documents called subbasin summaries.

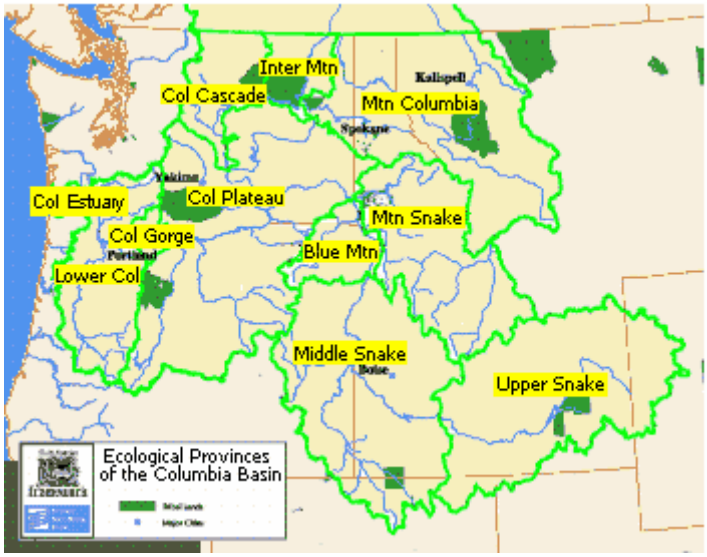

Figure 1. Ecological Provinces of the Columbia Basin.

The following report was drafted to meet the Council's need for a summary of environmental conditions and conservation efforts for fish and wildlife in the Closed Basin Subbasin of southeastern Idaho. The report is a first step toward a more ecologically based process for establishing budgets and identifying and prioritizing fish and wildlife conservation projects that ought to be funded by the Bonneville Power Administration (BPA). The report also establishes a basis for a more thorough assessment of conditions across the Closed Basin Subbasin and the development of a final subbasin plan. When completed, the final plan will be a comprehensive document meeting objectives and standards set forth in the Northwest Power Planning Council's amended Fish and Wildlife Program, and against which future projects proposed for the Closed Basin Subbasin will be

assessed. That plan will be central to meeting BPA's Endangered Species Act responsibilities in its future funding decisions.

The report briefly addresses existing information on the Closed Basin Subbasin's environmental setting, the status of its fish, wildlife, and their habitats, recent efforts related to habitat restoration and species conservation, and ongoing research or data collection activities that may help improve or evaluate future conservation effectiveness.

Introduction

The Closed Basin Subbasin occupies a remote and sparsely populated area of east-central Idaho. Agency jurisdiction is mixed, with portions of the subbasin included in three BLM Field Areas (Idaho Falls, Challis, and Salmon), two national forests (Targhee and Challis), parts of seven counties (Butte, Clark, Lemhi, Jefferson, Custer, Fremont and Madison; Figure 2) and seven Soil and Water Conservation Districts, six Fish and Game Hunting Units and four Elk Hunt Zones, and much of the 890 square mile U.S. Department of Energy Idaho National Engineering and Environmental Laboratory. Until recently there has not been a great deal of coordination among agencies to develop or assemble natural resource data. Similarly, there has not always been a particularly coordinated effort for research, monitoring, or management.

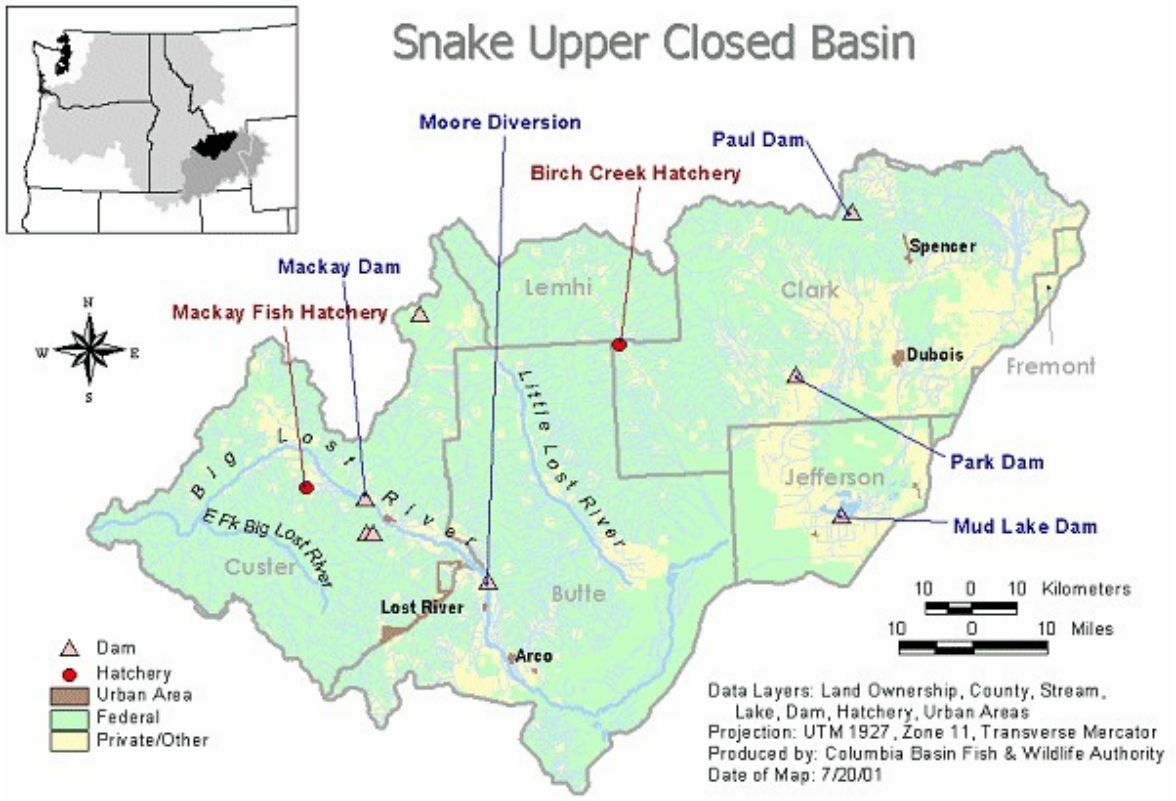

Figure 2. Counties and significant features of the Closed Basin Subbasin in SE Idaho.

The Closed Basin Subbasin, because it does not have a surface water connection to an ocean, does not support an anadromous fishery. More than 70% of the roadless areas greater than 200,000 acres in the lower 48 states are in this subbasin. Because of its remoteness and areas of limited accessibility, most wildlife populations for which there are data are in reasonably good condition. Exceptions include sage grouse, some neo-tropical bird migrants, lynx, wolf, and others which are experiencing range-wide declines. Fish populations and aquatic habitats in the subbasin are more impacted by anthropogenic activities, including historical fish management and stocking practices. Basin-wide information is lacking for a number of taxa, notably non-game species, including song birds, amphibians and reptiles, bats and small mammals. Management plans and policies are in line with individual agency missions, and recently are more coordinated among agencies. Limiting factors mostly relate to habitat loss or degradation (or the potential thereof) due to human activities and drought. Needs range from small individual management issues (e.g., replacing a collapsed road culvert to promote fish movement) to developing overarching research and basin-wide strategy plans.

Although the Editors of this summary have made every reasonable effort to identify and contact all agencies, organizations, and individuals with information germane to this Subbasin Summary (see Appendix A), the information herein remains incomplete. Some state and federal agencies would not provide information to us, beyond inviting us to examine their files. While we made the effort to locate and include what electronic data we could find from those agencies, we know there are gaps.

One of the most important features of this subbasin summary is the identification of needs for research, monitoring, and management of fish, wildlife, and habitat resources. We did not attempt to generate a list of needs for those agencies which did not provide meaningful contributions to this document. We sincerely thank those individuals who made the time and effort to develop and provide worthful information in a format consistent with our request.

Subbasin Description

General

The Closed Basin includes five drainages in east central Idaho (Figure 3). These drainages are the Big Lost River, the Little Lost River, Birch Creek, Medicine Lodge Creek, and the Beaver-Camas Creek complex. These streams originate in the mountains of southeastern and south central Idaho and terminate on the Snake River Plain. While these streams are located within the Snake River Basin, immense lava formations on the upper Snake River Plain prevent Closed Basin drainages from forming an overland connection with other streams in the basin. During the Pleistocene, increased stream flows from these combined to form Lake Terreton (Pierce and Scott 1982). This would likely have been the most recent connection each had with other streams. Today, and for the past 12, 000 years, waters from these drainage basins sink into the lava along the northern edge of the Snake River Plain and contribute recharge to the Snake River Plain Aquifer system. The aquifer surfaces and discharges to the Middle Snake at Thousand Springs near Hagerman, Idaho, approximately 125 miles distant from the terminus of the Closed Basin watercourses.

Although extremely sparsely populated (< 0.5 persons/square mile), the Closed Basin has a long history of human use. Various artifacts from earlier peoples in the Birch Creek Valley date to approximately 10,000 years BP (C. Marlor, Pers. Comm). Shoshone-Bannock peoples traditionally occupied and used these lands until their removal to the Fort Hall Reservation in 1907. The Shoshone-Bannock tribes and the Northwest Band of the Shoshone Nation retain treaty rights that allow access to traditional cultural properties and resources in the subbasin. The Nez Perce tribes also retain certain rights and interest related to their seasonal travels through portions of the subbasin and their association with the Nez Perce (Nee Me Poo) National Historic Trail (USDI BLM & USDA FS, 2001).

The first Euro-Americans entered the subbasin in 1819. They were fur trappers led by Donald Mackenzie of the British-owned Northwest Company (soon subsumed by the Hudson's Bay Company). They were followed by American trappers in 1824, including such famous names as Jedediah Smith, William Sublette, Jim Bridger, Hugh Glass, and Etienne Provost (USDI BLM & USDA FS, 2001). The rivalry between the two fur companies virtually eliminated beaver and other fur-bearing mammals from much of the subbasin and surrounding areas before the mid-19th century.

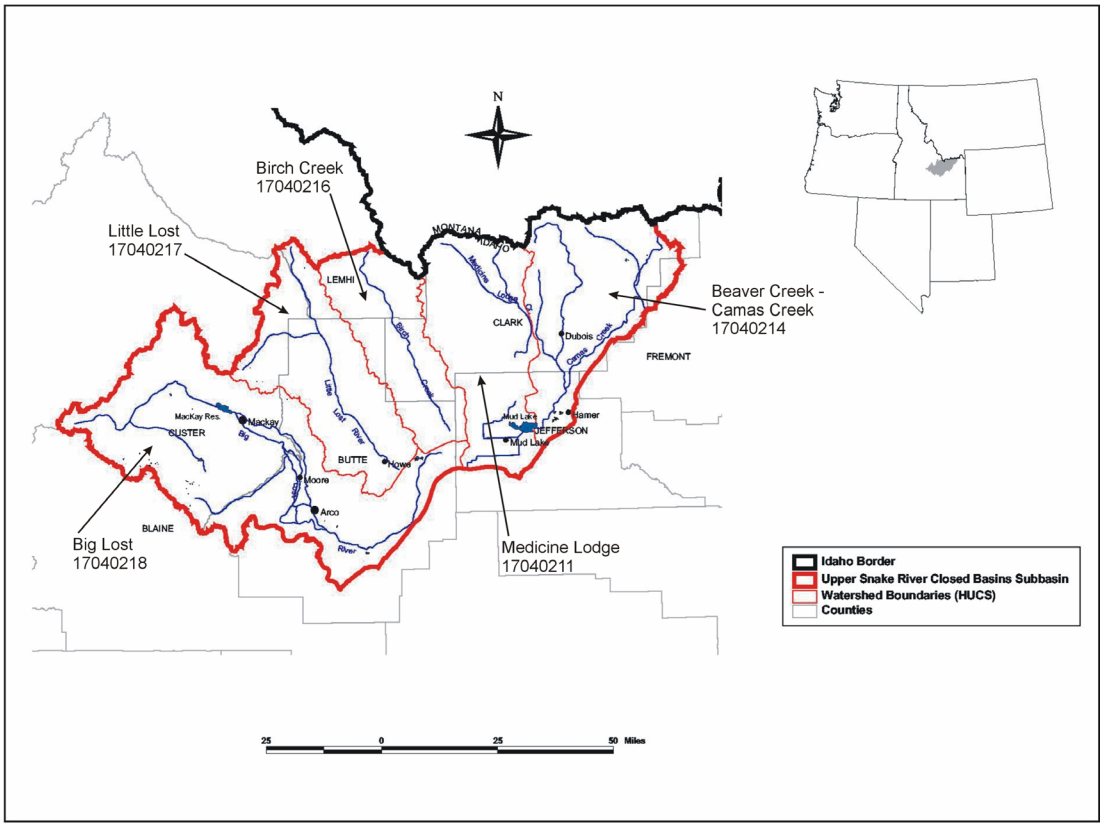

Figure 3. Watersheds, Drainages, and Habitat Unit Codes (HUC) Numbers in the Closed Basin Subbasin.

Although much of the present-day agriculture is irrigated cropland, there are only two significant reservoirs in the subbasin for irrigation water storage (Table 1). Larger towns (ca. 2,000-3,000 residents) in the subbasin include Arco, Dubois, and Mackay.

Table 1. General Closed Basin Characteristics

(Source = http://cfpub1.epa.gov/surf/huc.cfm?huc_code=hucnumbercode)

Watershed Cataloging Unit	Rivers/ streams in watershed	Reservoirs in watershed	Land Area (mi^2) (acres) Perimeter (mi)	Habitat
Big Lost 17040218	30	1 Mackay Reservoir	1,904 117,343 285	Forest Riparian Habitat Agricultural/Urban Riparian habitat
Little Lost 17040217	15	0	971 56,586 173	Forest Riparian Habitat Agricultural/Urban Riparian habitat
Birch 17040216	3	0	706 40,420 134	Forest Riparian Habitat Agricultural/Urban Riparian habitat
Beaver-Camas 17040214	12	1 Mud Lake	956 59,616 144	Forest Riparian Habitat Agricultural/Urban Riparian habitat
Medicine Lodge 17040215	13	0	976 57,178 153	Forest Riparian Habitat Agricultural/Urban Riparian habitat

Location, Drainage, and general information

Big Lost River

The Big Lost River is the largest of the Closed Basin drainages. Included in the drainage is Mackay Reservoir. Major tributaries include Antelope, Summit and Wildhorse creeks and the East, West and North forks of the Big Lost River (IDFG, 2001).

The Big Lost River originates 27 miles west of Mackay, Idaho and drains more than 1,900 mi^2 of mountainous area bounded by the Lost River and Pioneer Mountain Ranges to the east and west, respectively. Downstream from the town of Arco, flow in the Big Lost River infiltrates to the Snake River Plain Aquifer along its channel and at sinks and playas at the river's terminus. Since 1965, excess runoff has been diverted to spreading areas to protect facilities at the U.S. Department of Energy's on the Idaho National

Engineering and Environmental Laboratory, where much of the water rapidly infiltrates to the aquifer (Bennett, 1990).

The Bureau of Land Management-administered portion of the upper Big Lost basin includes Thousand Springs and Chilly Slough, areas of unique hydrologic and ecosystem expression. The Thousand Springs/Chilly Slough Area of Critical Environmental Concern (ACEC) was designated in 1987, and its management plan supports the protection and improvement of waterfowl and shorebird habitat. Species using these areas as breeding habitats include Sandhill Cranes, Long-billed Curlews, and numerous waterfowl. BLM has joined with the Idaho Department of Fish and Game, as well as the Nature Conservancy and Ducks Unlimited, to develop the Chilly Slough Wetland Conservation Project Plan.

Little Lost River

The Little Lost River subbasin is located in eastern Idaho on the northern margin of the Snake River plain. The watershed is approximately 50 miles long by 20 miles wide (963 mi^2 miles; 2,520 km^2). The river is flanked by the Lost River Mountain Range to the west and the Lemhi Range to the east. The headwaters of the river are located in the far northern corner of the subbasin in Sawmill Canyon. The river disappears into an ephemeral playa, the Little Lost River Sink, just south of Howe, Idaho on the margin of the Snake River Plain. The river sometimes drains into the Big Lost River Sinks during times of extremely high runoff (Bartholomay 1990).

Upper portions of the Little Lost drainage, within the public lands of the BLM, include portions of Summit Creek drainage and the Donkey Hills. Both of these localities include areas that BLM has designated Areas of Critical Environmental Concern (ACEC). The Summit Creek ACEC and Research Natural Area (RNA) exhibits high elevation wetlands supporting unique plant communities, rare wetland plants, and at least one special status plant species, alkaline primrose. Vegetation of the upland Donkey Hills ACEC is critical elk habitat for winter range and calving.

Elevation in the Little Lost River watershed ranges from 1,456 m at the Little Lost River Sinks to 3,718 m at the summit of Diamond Peak in the Lemhi Mountains. There are 17 natural lakes, 1 reservoir (Summit Creek Reservoir), 3 dysfunctional reservoirs (abandoned impoundments), and several private ponds in the Little Lost River drainage (Gamett 1990b). All of the lakes in the drainage are small (less than 6 hectares) mountain lakes. Howe, with a 1990 population of 20, is the largest community in the watershed. Based on 1990 census data, EPA estimates a population of 352 in the entire subbasin. There are less than 0.5 persons per square mile, making this area one of the least populated areas in Idaho outside of designated wilderness (LLRITAT 1998).

Birch Creek

Like the Big Lost and Little Lost River watersheds, the Birch Creek drainage is a high, northwest to south-east trending mountain valley. The Birch Creek Valley is bordered by rugged mountains rising to nearly 11,000 feet in the Beaverhead Mountains of the Bitterroot range to the east and the Lemhi Mountains to the west. Willow Creek and Mud Creek are the major tributaries to Birch Creek, but much of the flow comes from springs high in the valley. Although Birch Creek has a rich mining history, with the Nicholia mine once producing more lead and silver than any other mine in the world, the present

population is sparser than the Little Lost Valley. There are no towns in the Birch Creek drainage and only a handful of year-round residents.

The valleys of the Big Lost River, Little Lost River, and Birch Creek share a more common development and physiography among themselves than with the Medicine Lodge and Beaver-Camas Creek drainages. The Nature Conservancy refers to these three valleys as the "Vanishing Rivers Area." and provides this description (Goodman 1999):

> *The Vanishing Rivers area consists of three broad, flat valleys of sagebrush steppe open space occasionally divided by narrow streams, riparian areas, and wetlands. Ridged mountains emerge from massive alluvial fans, which are sediment of expired streams and glacier runoff. The broad valleys widen until the ranges hit the lava flows over the Columbia Basin ecoregion in southern Idaho. The Vanishing Rivers encompass approximately 2,000 square miles, including the Lost River, Lemhi, and Beaverhead mountain ranges, as well as Idaho's tallest peak, Mount Borah (12,262 ft). The high elevation basins each contain spring-fed creeks that form the Big Lost River, the Little Lost River, and Birch Creek, which all slowly disappear into the porous Snake River Plain lava flows. Characteristic of each drainage are numerous springs and alkaline wetlands that are habitat for various rare and endemic flora and fauna.*
>
> *The ecoregion's northwestern boundary is defined by the uplift and separation of the Salmon, Pahsimeroi and Lemhi Rivers from the Lost Rivers and Birch Creek (Moseley, 1992). In the last three million years a northeast-trending uplift obstructed the northwestern flow of the rivers, causing the Lost Rivers and Birch Creek to then flow southeast with the springs as the main water source (Alt & Hyndman 1989).*

Medicine Lodge

The Medicine Lodge watershed encompasses 872 square miles of land in Clark and Jefferson County. The upper watershed boundary runs along approximately 37 miles of the Continental Divide with Montana. The watershed has a south to southeast aspect. USFS- and BLM-administered lands make up 210 square miles and 342 square miles, respectively. State of Idaho managed lands make up 36 square miles, private lands account for 271 square miles, and the U.S. Department of Energy lands are less than 20 square miles. There are nearly 100 miles of perennial streams in this watershed, 57% of which are on lands administered by the USDA Forest Service (USDI BLM & USDA FS, 2001). Mud Lake/Terreton is the largest community in this drainage. Mud Lake at the lower end of the subbasin actually receives its water from the Beaver Creek–Camas Creek Subbasin to the east, not directly receiving water from the Medicine Lodge Subbasin.

Beaver Creek/Camas Creek

Beaver Creek and Camas Creek begin in the Centennial Mountains on the Idaho/Montana border and flow generally south and southwest, respectively. They converge just north of, and provide much of the water for, the Camas National Wildlife Refuge near Hamer, ID. After exiting the refuge, the stream flows westward into Mud Lake; a natural playa lake "improved" with a dam forming a year-round impoundment. This watershed encompasses

956 square miles. Dubois is the largest community in the Beaver Creek/Camas Creek watershed.

Geology & Geomorphology

The Closed Basin Subbasin includes portions of the Northern Rocky Mountain physiographic province and the Eastern Snake River Plain section of the Columbia Intermontane physiographic province. The boundary between these provinces is characterized by the distinctive rise in topography that is evidenced north of Lidy Hot Springs, Winsper, and Small (USDI BLM & USDA FS, 2001).

The Northern Rocky Mountain physiographic province is characterized by a number of mountain ranges and intervening valleys that have developed on the Idaho batholith and other subsidiary igneous intrusions. These mountain ranges consist of metamorphic and sedimentary rocks of Precambrian to Mesozoic age that have been subjected to intensive uplifting, faulting, and folding. Within the Subbasin, most of these deformed metamorphic and sedimentary units have been covered with a veneer of volcanic rhyolite, basalt, and welded tuff (USDI BLM & USDA FS, 2001). The subbasin occurs in portions of Snake River Basalts, Beaverhead Mountains, and Challis Volcanics ecoregional sections (McNab and Avers 1994).

In the late Cenozoic Era, during the later stages of the building of the mountain ranges of the Northern Rocky Mountain province, the mountain province was dissected by an extensive rifting in the earth's crust which created a broad trough that filled with volcanic rocks. This trough, which extends in an arcuate pattern across southern Idaho, is known as the Snake River Plain and each of the watersheds in this subbasin terminate thereon. The basalt flows that underlie the Snake River Plain are many thousands of feet thick. Volcanic vents, eruptive centers, and uplift domes, such as Richard Butte, Crater Butte, Cedar Butte, Camas Butte, Table Butte are prominent features at the lower ends of the watersheds (USDI BLM & USDA FS, 2001; Reynolds pers. obs.).

Over much of the southern portion of the subbasin, the basalt has been covered with a veneer of wind blown sediments. In the Mud Lake/Terreton area, the basalt has been covered with lake sediments left behind as the Pleistocene age Lake Terreton evaporated, leaving Mud Lake as its remnant (USDI BLM & USDA FS, 2001).

The Snake River Closed Basins Subbasin occurs within the Northern Rocky Mountain and Columbia Intermontane geomorphic provinces. The subbasin encompasses sixteen major geological formations (Table 2, Figure 4). Four geological features are predominant: quaternary alluvial deposits, Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus, Paleozoic and Mesozoic mixed sedimentary rocks, and Eocene mixed silicic and basaltic ejecta, flows, and reworked debris. The Beaver-Camas watershed is composed mainly of Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus. Quaternary alluvial deposits are the dominant geological feature in Big Lost, Birch, Little Lost, and Medicine Lodge watersheds.

Table 2. Geology of Snake River Closed Basins Subbasin: the percent occurrence of major geologic mapping units. (adapted from Bond and Wood 1978; Jensen et al. 1997).

Geologic mapping unit	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
Cretaceous metamorphic intrusive and granitic rock	0.2	0	1.3	0	0
Eocene granite	0	2.7	0.2	0.4	0
Eocene mixed silicic and basaltic ejecta, flows, and reworked debris	8.5	25.1	0.6	7.3	11.7
Mesozoic shale, siltstone, and limestone	2.6	0.8	0	0	0
Ordovician and Cambrian marine sediments	0	0.2	0	0.1	0
Other minor rocks	4.2	2.3	12.4	11.0	12.1
Paleozoic and Mesozoic mixed sedimentary rocks	1.1	15.6	24.7	30.4	9.4
Paleozoic mixed sedimentary rocks	0.2	5.9	3.0		0.0
Pleistocene fluvial and unsorted glacial debris	0.2	2.0	0.8	1.2	0.1
Pleistocene to Pliocene basalts and associated tuffs and volcanic detritus	50.8	13.2	7.4	1.0	11.2
Pliocene stream and lake deposits	0	0.3	0.6	2.8	6.8
Precambrian gneiss, amphibolite and other metamorphosed igneous rocks	0	0.6	0	0	0
Precambrian metasediments	0	0	0	0	0
Quaternary alluvial deposits	32.1	30.3	49.0	45.9	41.8
Quaternary wind-blown deposits; recent sand dunes	0	1.0	0	0	6.3
Surface Water	0.1	0.1	0	0	0.5

Topographical relief of the subbasin is reflective of a terrain that once attained a mature erosional level (by the Middle Tertiary) and subsequently uplifted, thus re-initiating stream erosional processes (Ross and Savage 1967). Quaternary glaciation occurred primarily on isolated high elevation peaks. Alpine glacier systems formed in the Pioneer Mountains, Lost River Range, Lemhi Range, and Centennial Mountains. Large-scale glacially derived physiographic features (e.g., broad U-shaped valleys) are not prominent. Rather, stream erosion has played the predominant role in shaping the physiography of the mountainous regions of the subbasin. Stream erosion since the Middle Tertiary has given rise to topography characterized by relatively narrow, V-shaped valleys, steep valley side slopes, and relatively broad, gentle ridge systems. Lower portions of the Big Lost, Little Lost, Birch watersheds and much of the Medicine Lodge and Beaver-Camas watersheds encompass the lava-filled structural and topographical basin of the upper Snake River Plain. The young lava plateau of converging low shield volcanoes is punctuated by cinder cones and low lava ridges and mantled by a thin layer of wind-blown soil (Ross and Savage 1967).

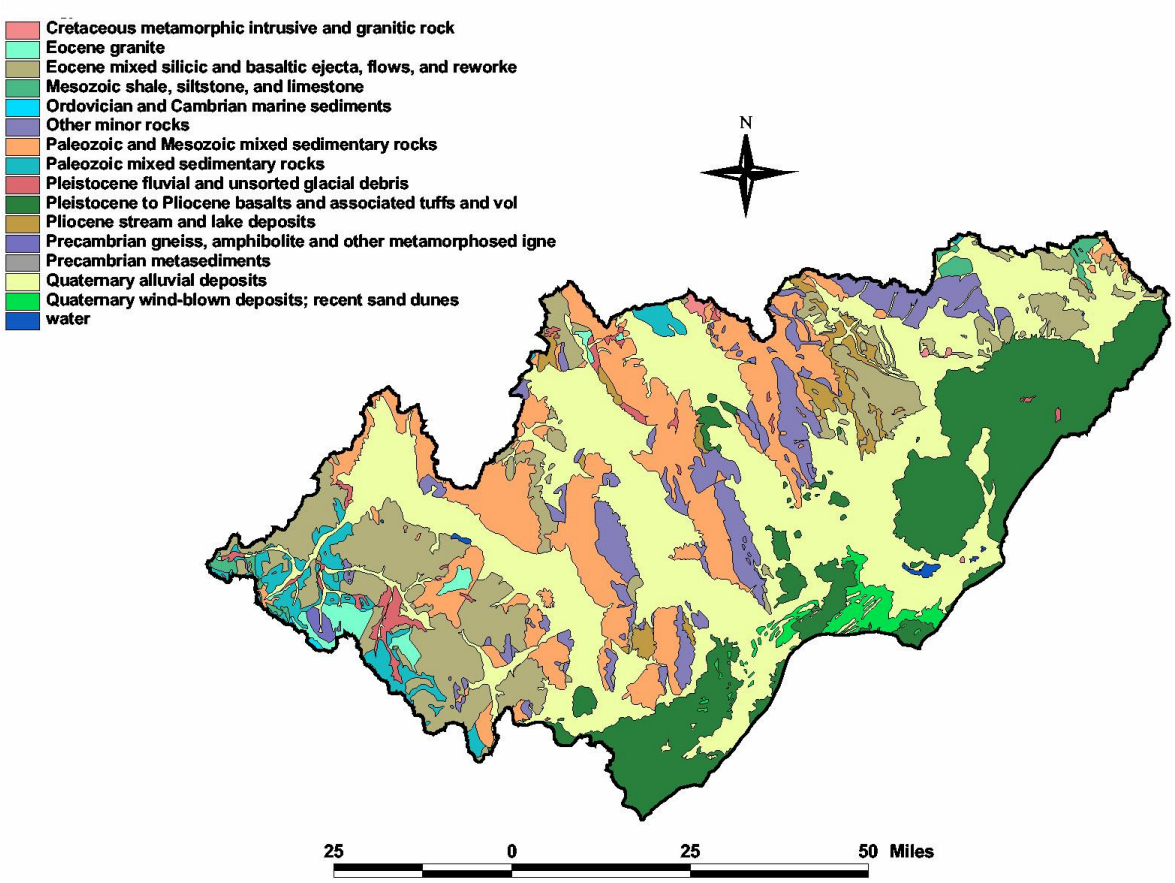

Figure 4. Major Geological Formations of the Closed Basin Subbasin.

Climate

Due to the large range in elevation, from the top of the Continental Divide (> 11,400 ft ASL) to the Lost River Sinks (< 4,800 ft ASL) on the Snake River Plain, temperatures and precipitation vary significantly throughout the subbasin. The average annual precipitation exceeds 25" on the Continental Divide and high mountains to 10" at Mud Lake. Thirty years of precipitation monitoring at the USDA Dubois Experimental Station, representative of a mid-elevation band within the Medicine Lodge Subbasin, shows the average annual precipitation at 12.8", with an average monthly peak of 1.8" in June, and the average monthly low at 0.7" in February (USDI BLM & USDA FS, 2001). Weather records for the Idaho National Engineering and Environmental Laboratory, located at the lowest elevation in the subbasin, show a 40 year average annual precipitation (Clawson et al., 1989) of 8.71 inches at the southern (highest) end of the INEEL, and 7.85 inches at northern end near the Lost River Sinks. The climate and landscape here is semi-arid steppe. Day winds on the Snake River Plain and the Medicine Lodge and Beaver/Camas Creek watersheds are primarily from the southwest, with night winds generally reversing and from the northeast (Clawson et al., 1989; USDI BLM & USDA FS, 2001). Winds in the Big Lost, Little Lost, and Birch Creek Valleys usually parallel and blow up-valley in the daytime and down-

valley at night. Similar to other interior-continent, high elevation environments, there is a significant daily and annual temperature fluctuation. Recorded high and low temperatures on the INEEL are 102F and -47F.

The Snake River Closed Basins Subbasin encompasses a climatic gradient, representing both Pacific maritime-influenced and a dry aspect of the Continental climatic regime. Coarse patterns in the distribution of climatic regimes within the subbasin are summarized in Table 3, and displayed in Figure 5, using the Koppen climate classification system (Godfrey and Molnau 1999).

Table 3. Climatic regimes of watersheds within the Snake River Closed Basins Subbasin:

The proportional representation of varying climatic regimes (using the Koppen climatic classification system, described by Godfrey and Molnau 1999) within the subbasin is summarized by watershed.

Koppen Class	Description	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
BSk	very dry Continental Climate; most precipitation occurs in summer	9.7	16.1	14.9	9.7	33.0
Dfb	warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer	89.5	36.7	52.3	56.7	53.1
Dfc	warm summers, cold winters; precipitation is relatively evenly distributed between winter and summer; summers are relatively short	0.8	40.1	32.9	28.5	13.9
Dsc	warm summers, cold winters; extreme differences occur between summer versus winter precipitation (summers are much drier); summers are relatively short and cool		7.1		5.0	

The Pacific maritime-influenced climate of the subbasin is affected by the seasonal movement of two opposing weather systems (Ross and Savage 1967). From the late fall to early spring months, the climate is influenced by cool and moist Pacific maritime air. Periodically this westerly flow of air is interrupted by outbreaks of cold, dry, continental air from Canada normally blocked by mountain ranges to the east. During the late summer months, the westerly winds weaken, and a Pacific high-pressure system becomes dominant, resulting in decreased precipitation and more continental climatic conditions.

Pacific maritime-influenced climatic conditions occur primarily in high elevation regions of Big Lost and Little Lost watersheds. Continental climatic conditions are prevalent in most of the subbasin. Warm summers and cold winters generally characterize the region. Precipitation is typically evenly distributed between winter and summer.

The Pioneer Mountains, Lost River Range, and Lemhi Mountains create a rain shadow that influences the distribution of precipitation in the low elevation, interior valleys

of the subbasin. Rain shadow effects are particularly pronounced in lower portions of Big Lost, Birch, and Medicine Lodge watersheds. In these, valleys surrounding high elevation mountain ranges permit only an occasional influx of moisture-laden winter Pacific maritime air. Rather, precipitation occurs primarily in relation to convective showers in early- and mid-summer; winters are relatively dry.

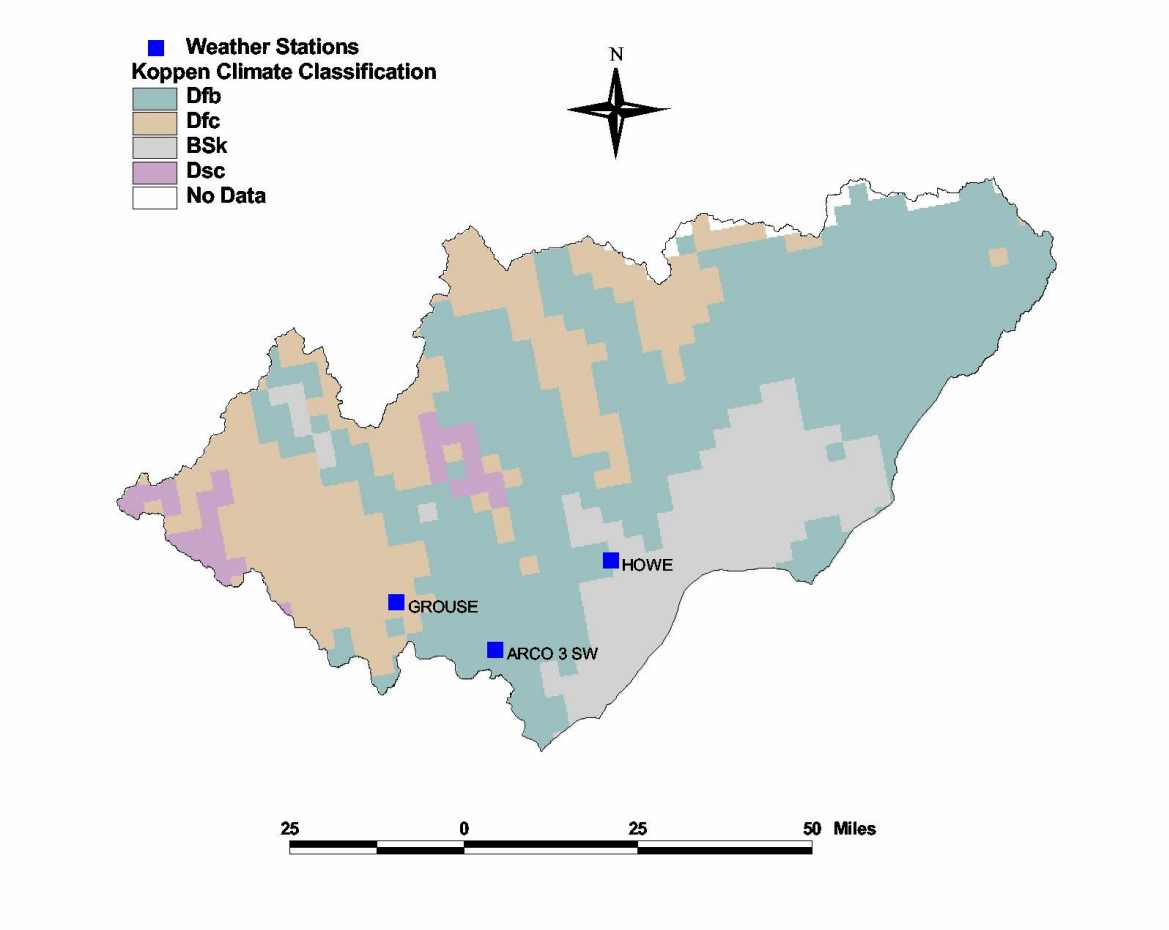

Figure 5. Coarse patterns of climatic distribution (Koppen Classes) in the Closed Basin Subbasin.

Geographic differences in the seasonal distribution of precipitation influence the characteristics of terrestrial and aquatic habitats. When snowpack is low, fish in irrigated portions of the subbasin are affected by stream dewatering and elevated summer temperatures. Occasionally, lengthy frontal rainstorms can produce a sudden abundance of precipitation. These events are a critical factor in flooding and landslides.

Hydrology

Most of the watersheds within the subbasin have a somewhat similar hydrological regime. All have a large variety of streams, from natural, steady, thermal springs to high intensity runoff streams receiving snowmelt directly from high mountain ranges. Much of the land in each watershed is semi-arid steppe with many miles of ephemeral and intermittent drainages also. Flows from many sub-drainages never enter the waterways because of

topographic barriers, irrigation withdrawals, and channel bed losses (USDI BLM & USDA FS, 2001).

There are seven USGS stream flow gages in the Closed Basin Subbasin. All are on The Big Lost River (Appendix B).

The average streamflow in the Big Lost River below Mackay Reservoir for the 83-year period of record (water years 1905, 1913-14, and 1920-99) was 225,500 acre-ft/year (Brennan et al., 2000). Streamflow in the Big Lost River below Mackay Reservoir was 274,900 acre-ft during the 1999 water year (Brennan and others, 2000). Annual peak stream flow measured below Mackay Reservoir varies by as much as a factor of 6 (Figure 6). Recharge to the Snake River Plain Aquifer can be substantial downstream from Arco; measured infiltration losses at various discharges ranged from 1 to 28 cubic feet per second (cfs) per mile (Bennett, 1990, p. 1).

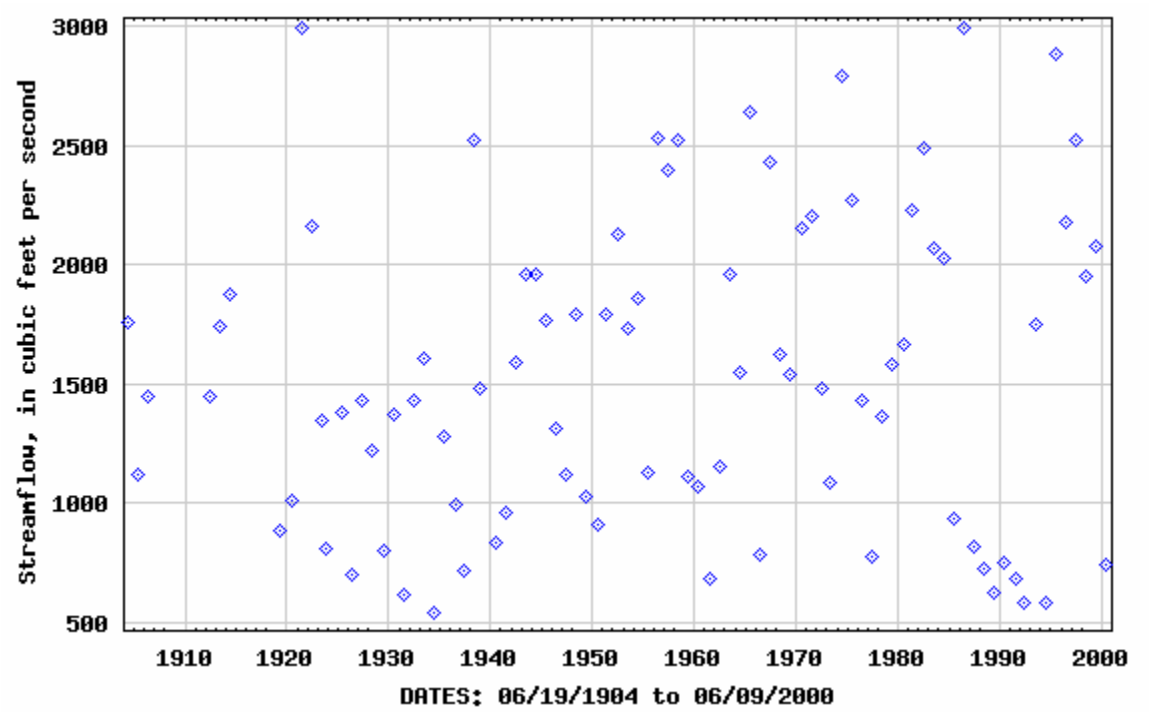

Figure 6. Peak annual flow in the Big Lost River below Mackay Reservoir

(Source: http://water.usgs.gov/nwis/peak/?site_no=13127000)

Typical of Closed Basin streams, the annual flows of the Little Lost River have significant annual and inter-annual fluctuations (Figure 7; Figure 8).

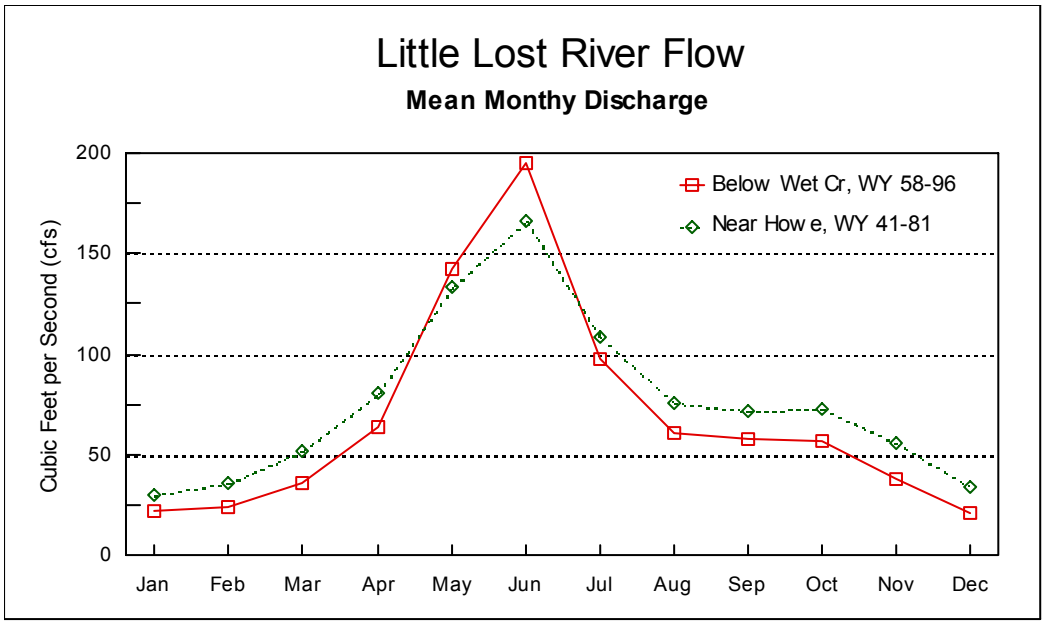

Figure 7 Mean monthly discharge of the Little Lost below Wet Creek and near Howe, Idaho (IDEQ 1998).

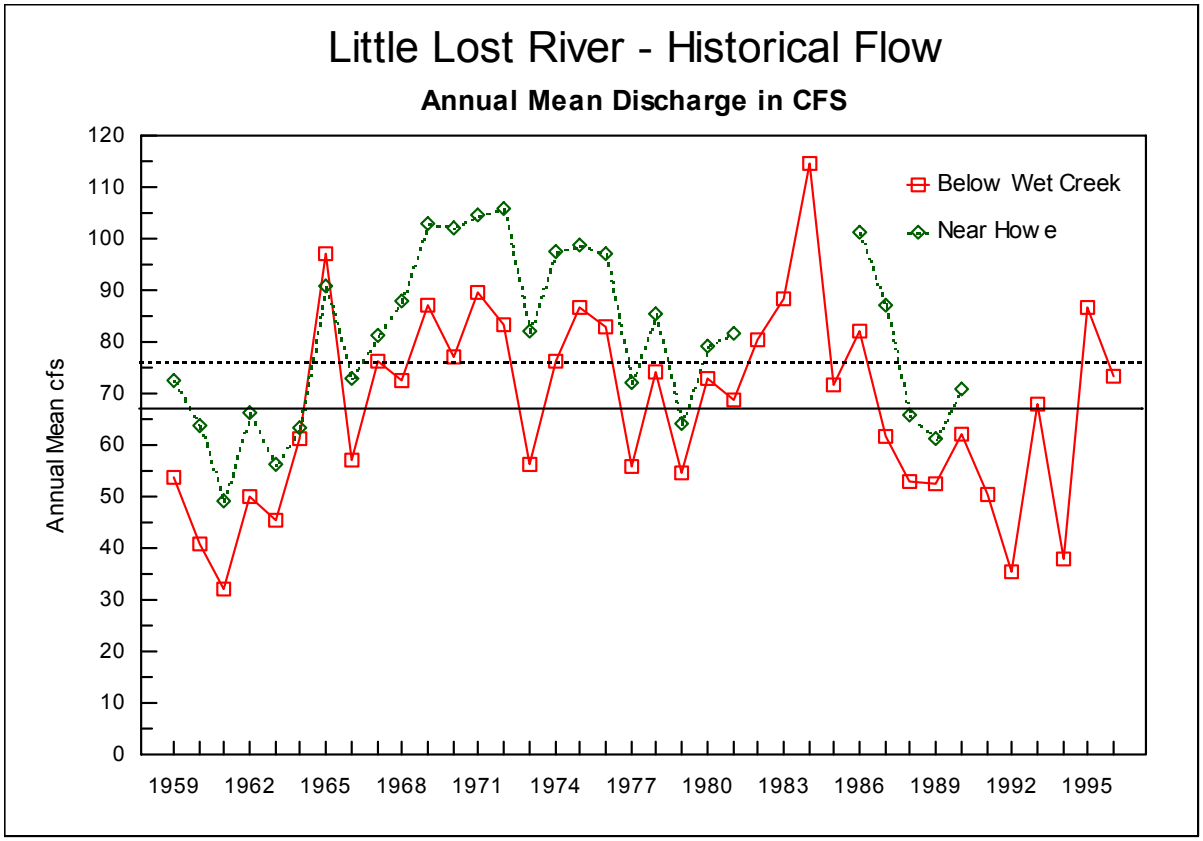

Figure 8. Mean annual discharge of the Little Lost below Wet Creek and near Howe, Idaho from 1959 to 1996 (IDEQ 1998).

The US Geological Survey maintains a staff at the Idaho National Engineering and Environmental Laboratory to provide independent water-resources monitoring and conduct independent geohydrological investigation for the U.S. Department of Energy. Most of their efforts involve the Snake River Plain Aquifer, and is summarized in the assessments section of this document.

Water Quality

Surface Water Quality

Water temperature, sediment, nutrients and streamflow alteration were the most common causes of water quality impairments in the Interior Columbia Basin Ecosystem Management Project (ICBEMP; Quigley, et al, 1997). U.S. EPA estimates that overall water quality impairment on BLM and FS lands in Idaho in the ICB affects approximately 10% of the total stream lengths in the basin (USDA-FS, 1996). By far the single greatest pollutant for impaired Idaho streams is sediment. Of the 10,024 stream miles with impaired water quality within the ICB in Idaho, 88% are listed due to sedimentation (USDA-FS, 1996).

Idaho reports that 33% of river and stream miles fully support uses, while 67% are impaired for one or more uses. Based on the state's proposed Section 303(d) list, the major causes of impairment in Idaho's rivers and streams include siltation, nutrients, thermal modifications, bacteria, habitat alterations, and oxygen-depleting substances. Condition and vulnerability indicators for the watersheds within the subbasin are below (Table 4, Table 5).

Table 4. Closed Basin Watershed Condition Indicators.

Ref: http://www.epa.gov/iwi/hucs/hucnumbercode/indicators/indindex.html

Condition Indicators [h] -	**BLR [a]**	**LLR [b]**	**BCK [c]**	**MDL [d]**	**BCM [e]**
Designated Use Attainment [i]	MS [1]	MS	MS	MS	MS
Fish & Wildlife Consumption Advisories [j]	ID [4]	ID	ID	ID	ID
Source Water Condition [k]	B [3]	B	ID	ID	B
Contaminated Sediments [l]	ID	ID	ID	ID	ID
Ambient Water Quality Data – Four Toxic Pollutants [m]	ID	ID	ID	ID	ID
Ambient Water Quality Data - Four Conventional Pollutants [n]	ID	ID	ID	ID	ID
Wetland Loss Index [o]	LS [2]	LS	LS	LS	LS

[1] MS – More Serious
[2] LS – Less Serious
[3] B – Better
[4] ID - Insufficient Data

[a] Big Lost River
[b] Little Lost River
[c] Birch Creek
[d] Medicine Lodge
[e] Beaver-Camas

[h] Designed to indicate where pollution discharges and other activities put pressure on the watershed. These could cause future problems to occur. Activities in this category include such things as pollutant loads discharged in excess of permitted levels, pollution potential from urban and agricultural lands, and changes in human population levels.

[i] DUA States and Tribes adopt water quality standards that include designated uses and criteria to protect those uses. Uses typically include drinking water supplies, aquatic life use support, fish and shellfish consumption, primary and secondary contact recreation (e.g. swimming and boating), and agriculture.

[j] SWCA Recommendations by Tribes or States to restrict consumption of locally harvested fish or game due to the presence of contaminants.

[k] SWC Provides a partial picture of the condition of rivers, lakes/reservoirs, and ground water used by public drinking water systems.

[l] CS Level of potential risk to human health and the environment for sediment chemical analysis, sediment toxicity data, and fish tissue residue data.

[m] AWQD – 4TP The Exceedance Criteria over 6 yr period (1990-1996) are based on the hardness of the water.
For freshwater (hardness <= 1000 mg/l) the exceedance criteria are:
Copper (ug/l) = 2.9
Nickel (ug/l) = 8.29
Zinc (ug/l) = 86.1
Chromium +6 (ug/l) = 17.5

For marine water (hardness > 1000 mg/l) the exceedance criteria are:
Copper (ug/l) = exp(0.85451*log(hardness - 1.465))
Nickel (ug/l) = exp(0.84601*log(hardness + 1.1645))
Zinc (ug/l) = exp(0.8473*log(hardness + 0.7614))
Chromium +6 (ug/l) = 0.29

[n] AWQD – 4CP The Exceedance Criteria over 6 yr period (1990-1996) are:

DO: < 5.0 mg/l
ph: < 6 or > 9
Phosphorus: > 0.1 mg/l
Ammonia: recommended chronic levels for ammonia were taken from Ambient Water Quality Criteria for ammonia, EPA 440/5-85-001, p. 97 and reflect temperature and pH adjustments.

[o] WLI Percentage losses of wetlands over a historic period (1870 – 1980) and more recently (1986 - 1960).

Table 5. Closed Basin Watershed Vulnerability Indicators

Ref: http://www.epa.gov/iwi/hucs/hucnumbercode/indicators/indindex.html

Vulnerability Indicators [h] -	**BLR [a]**	**LLR [b]**	**BCK [c]**	**MDL [d]**	**BCM [e]**
Aquatic Species at Risk [i]	ID [4]	M [2]	M	ID	L [3]
Toxic Loads Over Permitted Limits j	ID	ID	ID	ID	ID
Conventional Loads over Permitted Limits [k]	ID	ID	ID	ID	ID
Urban Runoff Potential [l]	L	L	ID	L	L
Index of Agricultural Runoff Potential [m]	L	L	L	M	M
Population Change [n]	L	L	ID	L	L
Hydrologic Modification [o]	ID	ID	L	ID	ID
Air Deposition [q]	L	L	L	L	L

[1] H - High (Note: no Highs)
[2] M – Moderate
[3] L – Low
[4] ID - Insufficient Data

[a] Big Lost River
[b] Little Lost River
[c] Birch Creek
[d] Medicine Lodge
[e] Beaver-Camas

[h] Designed to indicate where pollution discharges and other activities put pressure on the watershed. These could cause future problems to occur. Activities in this category include such things as pollutant loads discharged in excess of permitted levels, pollution potential from urban and agricultural lands, and changes in human population levels.

[i] ASR Assessing the conservation of plant and animal at greatest risk of extinction.

[j] TLOPL Discharges over 1 year period for toxic pollutants are combined and expressed as a percentage above or below the total discharges allowed under the NPDES permitted amount.

[k] CLPL Discharges over 1 year period for conventional pollutants are combined and expressed as a percentage above or below the total discharges allowed under the NPDES permitted amount.

[l] URP Potential for urban runoff impacts is estimated based on the percentage of impervious surface in the watershed (roads, paved parking, roofs, et.)

[m] IARP Composite index comprised of a) nitrogen runoff potential index, b) modeled sediment delivery to rivers and streams, and c) a pesticide runoff potential index.

[n] PC Population growth as a surrogate of many stress-producing activities from urbanization.

[o] HM Dams – This index shows relative reservoir impoundment volume in the watershed. The process of impounding streams changes their characteristics and reservoirs and lake formed in the process can be more susceptible to pollution stress.

[q] AD Information from the National Atmospheric Deposition Program/National Trends Network Depicting nitrogen (NO3 and NH4) deposition estimates.

Of the five major drainages in the Closed Basin, a beneficial use reconnaissance (BURP 1997) and a TMDL assessment have been completed only in the Little Lost River watershed (Table 6).

Table 6. Closed Basin Total Maximum Daily Load (TMDL) 303d Listed Stream Segments

Watershed	303d Code	Water Body	Parameter[3]	Year for TMDL Completion
Big Lost River (HUC 17040218)	ID2161-1998	Big Lost River	DO, FA, N, S, T	2003 [2]
	ID2164-1998	Big Lost River	N, S	2003 [2]
	ID2167-1998	Spring Creek	DO, FA, N, S, T	2003 [2]
	ID2168-1998	Antelope Creek	FA, S, T	2003 [2]
	ID2176-1998	Twin Bridges Cr.	N, S	2003 [2]
	ID2179-1998	East Fork Big Lost	HA	2003 [2]
	ID2180-1998	East Fork Big Lost	S, T	2003 [2]
	ID5236-1998	Little Boone Creek	UC	2003 [2]
	ID5237-1998	Warm Springs Cr.	UC	2003 [2]
	ID5295-1998	E. Fork Wood R.	UC	2003 [2]
	ID5650-1998	Fish Creek	B, DO, FA, N, S	2003 [2]
	ID7009-1998	Road Creek	UC	2003 [2]
Little Lost River (HUC 17040217)	ID2145-1998	Wet Creek	FA, S, T	1999 [2]
	ID2148-1998	Sawmill Creek	S, T	1999 [2]
	ID5656-1998	Little Lost River	T, UC	2000 [1]
	ID5660-1998	Little Lost River	UC	2000 [1]
Birch Creek (HUC 17040216)	ID2154-1998	Birch Creek	FA, HA, N, S	2004 [2]
Medicine Lodge (HUC 17040215)	ID2206-1998	Medicine Lodge Creek	FA, S, T,	2004 [2]
	ID2210-1998	Edie Creek	HA, N, S	2004 [2]
	ID2211-1998	Irving Creek	HA, N, S	2004 [2]
	ID2212-1998	Fritz Creek	N, T	2004 [2]
	ID2215-1998	Warm Springs Cr.	N, S	2004 [2]
Beaver/Camas (Huc 17040214)	ID2190-1998	Camas Creek	N, S	2004 [2]
	ID2191-1998	Camas Creek	FA, HA, N, S, T	2004 [2]
	ID2193-1998	Beaver Creek	FA, HA, N, S, T	2004 [2]
	ID2194-1998	Beaver Creek	FA, HA, N, S, T	2004 [2]
	ID5233-1998	Cow Creek	UC	2004 [2]

[1] IDEQ, 2000.
[2] http://www2.state.id.us/deq/water/tmdlschd_exp.htm
[3] DO = Dissolved Oxygen
N = Nutrients
F = Flow
FA = Flow Alteration
S = Sediment
T = Temperature
HA = Habitat Alteration
UC = Unknown Cause
B = Bacteria
TRC = Total Residual Chlorine

Big Lost River

Several stream segments within the Big Lost River watershed are 303(d) listed (Figure 9). Flow alteration, nutrients, sediment and temperature are principle concerns. A TMDL assessment is scheduled for this watershed in 2003 (Table 6).

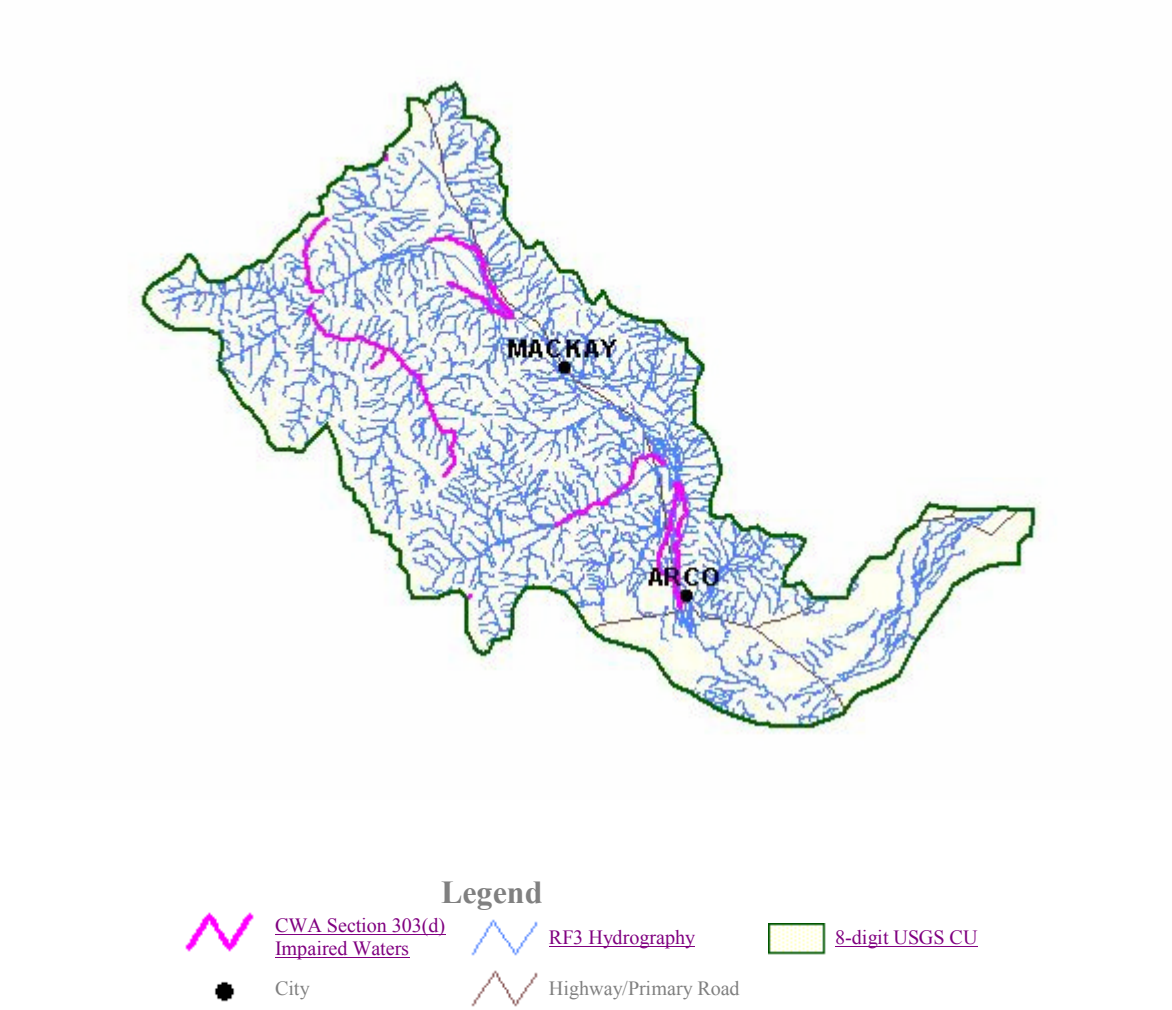

Figure 9. 303(d) listed stream segments in the Big Lost River Watershed, HUC 17040218

Little Lost River Drainage

Water quality in the Little Lost Key Watershed is most significantly impacted by elevated stream temperature and sedimentation (LLRITAT, 1998). Water quality monitoring was conducted by the Idaho Division of Environmental Quality, through the Beneficial Use Reconnaissance Program (BURP; Table 7), following the process identified in the 1997 Beneficial Use Reconnaissance Project Work Plan (Idaho Division of Environmental Quality, 1997). On those stream segments where any beneficial use is not fully supported (Figure 10) and have been placed on the 303(d) list in accordance with the federal Clean Water Act, a Total Maximum Daily Load (TMDL) was completed by the Division of Environmental Quality (IDEQ 2000).

Table 7. Summary of existing beneficial uses and support statuses for 1993-96 water bodies in the Little Lost River Drainage (LLRITAT 1998).

Water Body Status	Site Status	Water Body	BURP Site ID	Water Body I D #	CWB[2]		SS[2]		PCR[2]		SCR[2]		AWS[2]		1996 303(d)
FS[1]	FS	Badger Creek	95EIRO0A07	8	E	FS	E	FS	D	FS			E	FS	*
FS	FS	Badger Creek	95EIRO0A08	8	E	FS	E	FS	D	FS			E	FS	*
FS	FS	Bear Creek	96EIROY167	16	E	FS	E	FS			D	FS	E	FS	
FS	FS	Deer Creek	95EIRO0A10	25	E	FS	E	FS			E	FS	E	FS	*
FS	FS	Deer Creek	95EIRO0A09	25	E	FS	E	FS			E	FS	E	FS	*
FS	FS	Deer Creek	96EIROY158	25	E	FS	E	FS			D	FS	E	FS	
FS	FS	Deer Creek, North Fork	96EIROY157	25	E	FS	E	FS			D	FS	E	FS	
FS	FS	Deer Creek, South Fork	96EIROY156	25	E	FS	E	FS			D	FS	E	FS	
NFS	NFS	Dry Creek (diversion to Wet Creek)	95EIRO0A14	21	E	NFS			D	NA			E	NA	*
NFS	NV	Dry Creek (diversion to Wet Creek)	94EIRO0029	21	E	NV			D	NA			E	NA	*
NFS	D	Dry Creek (diversion to Wet Creek)	94EIRO0028	21											*
NFS	NV	Dry Creek (diversion to Wet Creek)	95EIRO0A13	21	E	NV			D	NA			E	NA	*
FS	FS	Dry Creek (headwaters to diversion)	95EIROA120	21	E	FS	E	FS	D	FS			E	FS	*
FS	FS	Dry Creek (headwaters to diversion)	95EIRO0A15	21	E	FS	E	FS	D	FS			E	FS	*
NV	NV	Garfield Creek	96EIROY163	14	E	NV					D	NA	E	NA	
FS	FS	Horse Creek	96EIROY161	9	E	FS	E	FS			D	FS	E	FS	
FS	FS	Horse Creek	96EIROY160	9	E	FS	E	FS			D	FS	E	FS	
NV	NV	Little Lost River (headwaters to sink)	94EIRO0033	10	D	NV	D	FS	D	NA	D	NA	D	NA	
FS	FS	Mill Creek	96EIROY166	14	E	FS	E	FS			D	FS	E	FS	
NV	NV	Sawmill Creek	95EIRO0B38	12	E	NV	E	FS	D	NA			E	NA	*
NV	NV	Sawmill Creek	95EIRO0B37	17	E	NV	E	FS	D	NA			E	NA	*
FS	FS	Squaw Creek	96EIROY165	15	E	FS	E	FS			D	FS	E	FS	
FS	FS	Squaw Creek	96EIROY164	23	E	FS	E	FS			D	FS	E	FS	
NV	NV	Summit Creek	94EIRO0034	19	E	NV	E	FS	D	NA			E	NA	
FS	FS	Warm Creek	96EIROY162	13	E	FS	E	FS	D	FS			E	FS	
NV	NV	Wet Creek	95EIRO0A34	17	E	NV	E	FS	D	NA			E	NA	*
NV	NV	Wet Creek	95EIRO0A11	22	E	NV	E	FS	D	NA			E	NA	*
FS	FS	Williams Creek	96EIROY159	9	E	FS	E	FS			D	FS	E	FS	

(1) FS - Fully supported, NFS - Not fully supported, NV- Needs verification, D - Dry channel, unable to assess., NA – Not Applicable. E - Existing beneficial use. Overall status for all designated or existing beneficial uses assessed.

(2) CWB - Cold Water Biota. SS - Salmonid Spawning. PCR-Primary Contact Recreation. SCR - Secondary Contact Recreation. AWS-Agricultural Water Supply. Although not listed, industrial water supply, wildlife habitats and aesthetics are designated for all waters of the state. Domestic water supply was not indicated as an existing or designated use and therefore, was not included in the table.

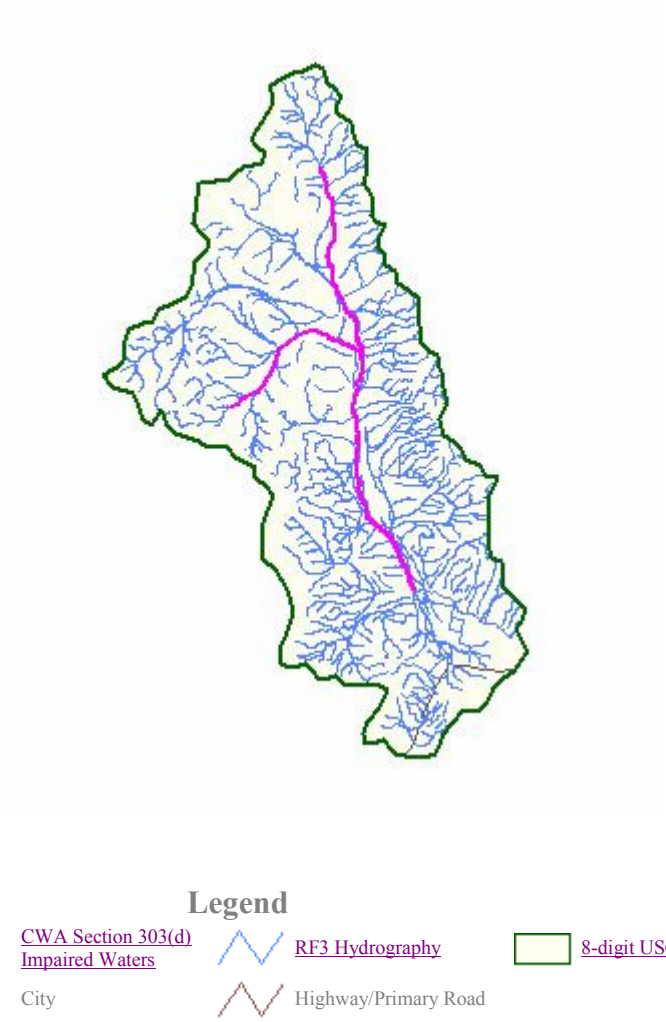

Figure 10. 303(d) listed stream segments in the Little Lost River Drainage, HUC 17040217.

Birch Creek

Primary water quality concerns in Birch Creek are flow alteration and the attendant impacts to habitat, sediment, and nutrients (Table 6), all in the lower few miles of the drainage (Figure 11).

From approximately 1920 through the mid-1980s waters were seasonally diverted from this section into the Reno Ditch to provide irrigation waters for agricultural interests near Monteview, Id. Full flow was returned to the creek after the irrigation season. In the mid-1980s, Birch Creek Hydro received the appropriate permits to divert the water further upstream year round for hydroelectric power generation. Waters passing through the power plant are still used for irrigation in the summer months. During the non-irrigation season these waters are shunted into a canal and carried near the historic Birch Creek Sinks. Birch Creek is scheduled for a TMDL assessment by the Idaho Department of Environmental Quality in 2004.

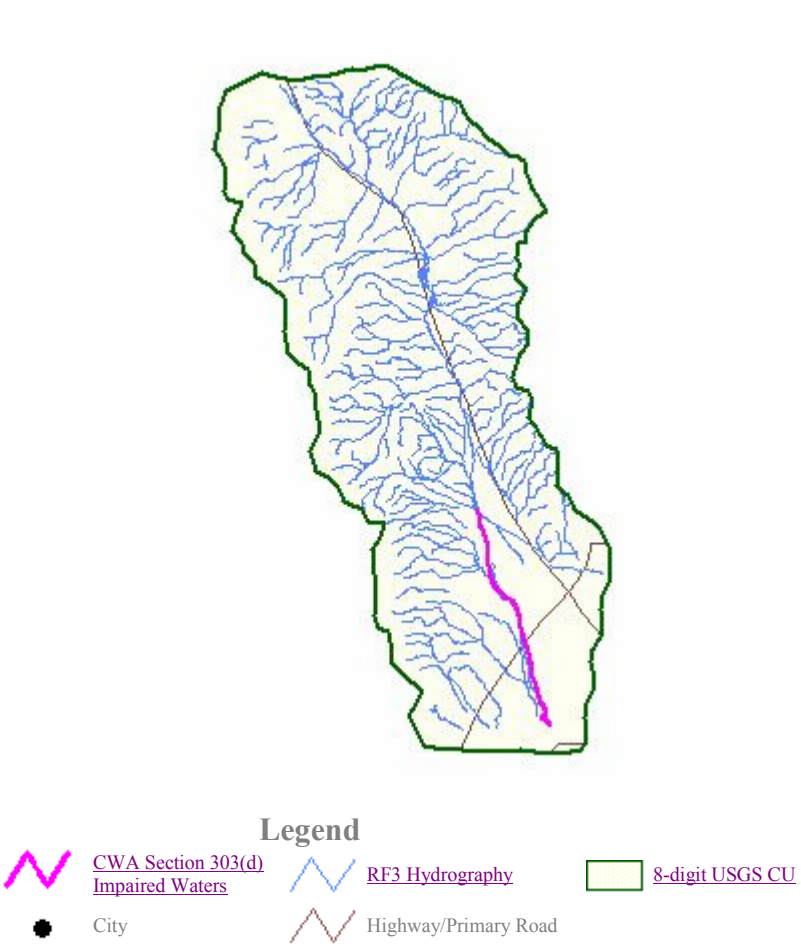

Figure 11. 303(d) listed stream segments in the Birch Creek Drainage, HUC 17040216.

Medicine Lodge Creek

Streams within the Medicine Lodge watershed exhibit the broad range of the water quality spectrum. There are clear spring creeks originating from thermal springs naturally high in water temperature and minerals; along with high runoff, transport streams seasonally carrying high sediment loads. Five streams within the Medicine Lodge Subbasin are specifically listed on the State's 303(d) List of Water Quality-Limited Streams: Edie, Fritz, Irving, Medicine Lodge and Warm Springs Creeks (Table 6, Figure 12). The pollutants listed for these streams are combinations of nutrients, sediment and temperature. While some spring creeks are thermally influenced, some of the longer tributaries to Medicine Lodge Creek have very cold water temperatures. All of the streamflow pollutants in this subbasin originate as nonpoint sources—there are no industrial/municipal point sources of discharge (USDI BLM & USDA FS 2110). The Medicine Lodge Watershed is scheduled for a TMDL assessment by the Idaho Department of Environmental Quality in 2004.

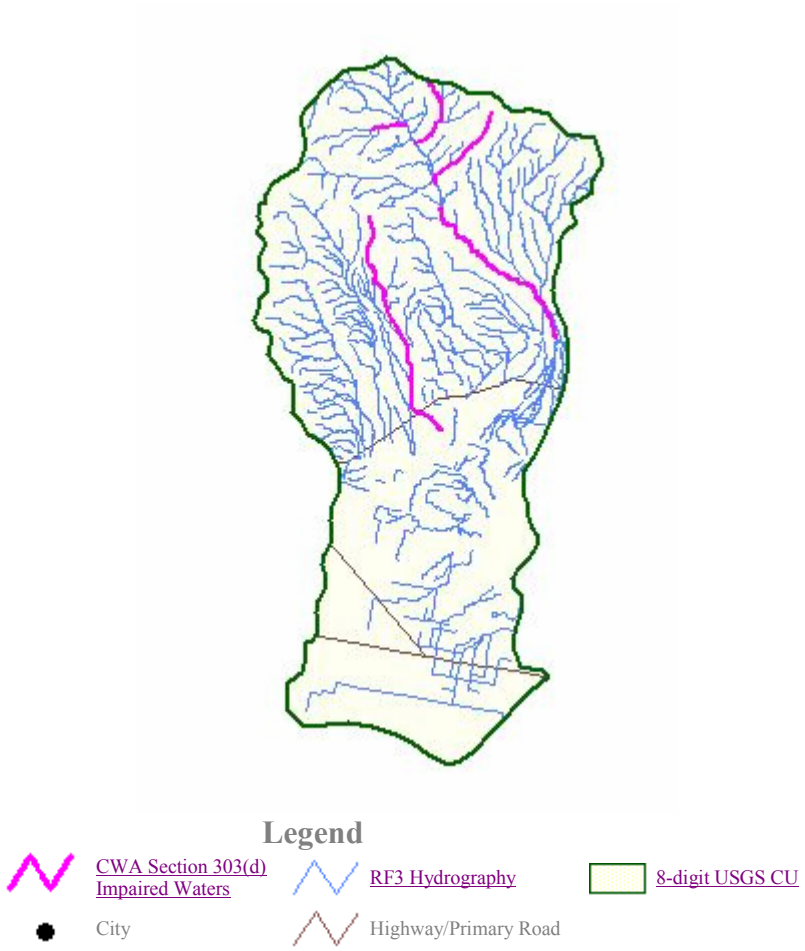

Figure 12. 303(d) listed stream segments in the Medicine Lodge Drainage, HUC 17040215.

Beaver/Camas Creek

Almost the entire lengths of both Beaver Creek and Camas Creek are listed 303(d) stream segments (Figure 13) due to flow alteration, habitat alteration, nutrients, temperature and sediment (Table 6). The watershed is scheduled to have a TMDL completed in 2004.

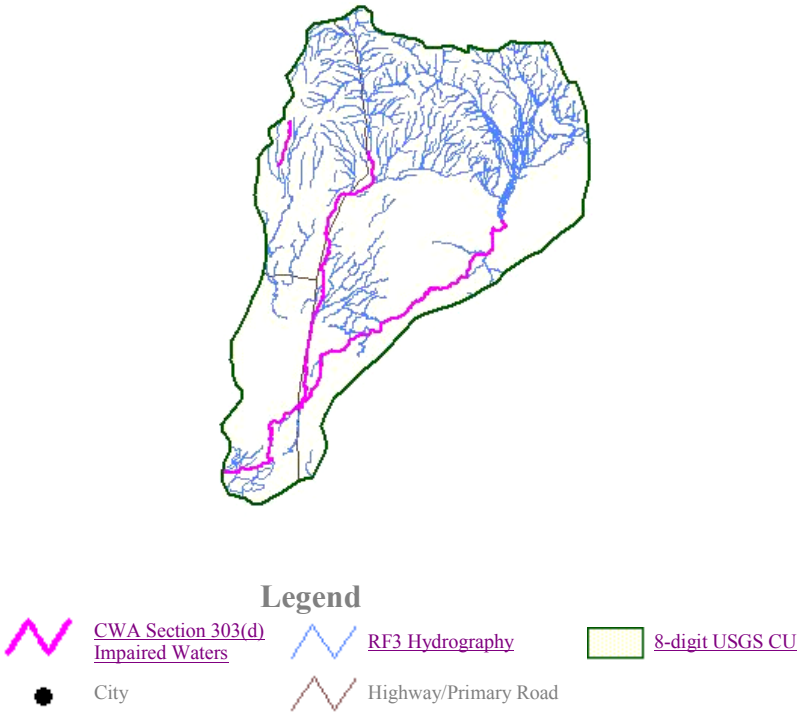

Figure 13. 303(d) listed segments in the Beaver-Camas Watershed, HUC 17040214

Vegetation & Diversity

Vegetation is described in a variety of ways: species composition, stand structure, cover, or seral status, among others. Knowledge of existing vegetation in an area provides a description of habitat which dictates the associated animal species that may utilize these plant compositions and structures as habitat. Knowledge of potential plant growth, or potential natural vegetation (PNV), provides information on the basic physical environmental factors and ecological processes that function to structure species habitats. Coupled information on existing vegetative composition and potential natural composition provides insight regarding the current dynamic status of the vegetation in relation to how the vegetation might interact with, for example, disturbance processes or how the vegetation might function to provide specific species habitats.

Steele et al. (1981 and 1983) and Mueggler (1988) describe the forested vegetation of the Snake River Closed Basins Subbasin. Mueggler and Harris (1969) and Hironaka et al. (1983) provide descriptions of the composition and ecology of grassland and shrubland plant associations. Caicco (1983), Moseley (1985), Urbanczyk (1993), and Richardson (1996) conducted work on alpine vegetation within the vicinity of the subbasin (and see Cooper and Lesica 1992). Bowerman et al. (1996), Mutz and Queiroz (1983), Youngblood et al. (1985), and Padgett et al. (1989) conducted early work on wetland and riparian plant associations and community types within the subbasin.

Descriptive work by Tuhy (1981) and Tuhy and Jensen (1982) is relevant to the subbasin. Jankovsky-Jones (1999) conducted wetland and riparian inventories within the

subbasin. Information on the distribution, composition, and ecology of vegetation with Idaho is available from Idaho Conservation Data Center (2001). Many of these data are also available in NatureServe (Association for Biodiversity Information 2001).

Eleven broad potential natural vegetation (PNV) plant association groups are identified as occurring within the Snake River Closed Basins Subbasin. The relative abundance of each is summarized by watershed in Table 8. The subbasin has considerable ecosystem diversity. Evergreen coniferous forest and evergreen shrubland ecosystems are most abundant. Dominant potential natural vegetation varies widely among watersheds within the subbasin in relation to basic environmental factors of climate and elevation. Existing vegetative cover within the subbasin is grouped into 30 cover classes. The relative abundance of each class within each watershed within the subbasin is summarized in Table 9 and the distribution of each displayed in Figure 14.

Table 8. Percent representation of 11 PNV plant association groups within the Closed Basin Subbasin listed by major watershed (adapted from Hann et al. 1997).

Potential Natural Vegetation	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
Abies lasiocarpa Forest	19.5	16.3	15.3	3.6	21.5
Alpine Bunchgrass Meadow	0	3.3	0.1	0.1	0.1
Alpine Sedge Turf Meadow	0	1.5	0	0	0
Artemisia tridentata vaseyana Shrubland	17.9	16.3	22.2	20.0	4.9
Artemisia tridentata wyomingensis Shrubland	46.3	48.4	41.1	47.7	57.0
Juniperus osteosperma Woodland	0	0.5	0	3.2	0
Montane and Subalpine Wet Meadow	0	0	0.1	0	0
Pinus albicaulis Woodland	0	1.0	0.1	2.7	0
Pseudotsuga menziesii Forest	8.8	6.5	15.3	11.6	14.1
Pseudotsuga menziesii-Pinus flexilis Forest	2.8	5.0	0.3	4.6	1.7
Rock	0	1.2	5.5	6.4	0.1
Salix-Alnus Deciduous Shrubland	4.7	0	0	0	0
Open Water	0	0	0	0	0.5

Table 9. Percent representation of 30 land cover classes within Closed Basins Subbasin is listed by watershed (adapted from Landscape Dynamics Lab 1999).

Covertype	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
Agriculture	14.4	7.9	0.7	6.0	24.2
Alpine Meadow	0	0.5	0.6	0.4	0.1
Annual Grassland	0	0	0	0	0
Aspen	3.8	0.2	0	0	0
Bitterbrush	3.8	0.1	0	0	0.1
Curlleaf Mountain Mahogany	0.0	1.2	2.1	3.1	1.2
Disturbed	0.1	0.1	0	0	0
Douglas-fir Forest	8.3	4.5	7.2	8.9	6.5
Engelmann Spruce-Subalpine Fir	0	0	0	0	0
Exposed rock and mixed barren land	0.1	5.4	4.2	5.7	0.9
Juniper woodland	0	0.1	0.6	0.2	0.1
Limber pine - whitebark pine	0.2	8.3	8.6	8.7	2.6
Lodgepole Pine	1.5	0.4	0.1	1.1	0.5
Low Sagebrush	14.9	17.6	25.5	21.2	15.8
Montane Parkland/Subalpine Meadow	0.8	0.6	0.8	1.0	1.0
Mountain Big Sagebrush	27.5	18.6	24.0	12.8	19.3
Perennial Grassland	8.1	4.2	6.5	7.9	6.7
Ponderosa Pine	0	0	0	0	0
Rabbitbrush	1.5	0	0	0	0.8
Riparian forest	0.3	0.7	0.1	0.3	0.2
Riparian grassland	0.2	0.6	0	0	0.2
Riparian shrubland	1.3	1.4	0.4	1.0	0.3
Salt-desert Shrub	0	0.1	0.4	0.3	0.1
Subalpine Fir	1.0	2.1	3.1	3.2	1.1
Subalpine fir - Douglas fir	2.5	3.5	0	0	0
Urban	0.3	0.2	0.1	0.1	0.1
Warm Mesic Shrubs	0.7	1.4	0	0.1	0.1
Water	0	0	0	0.0	0.5
Whitebark Pine	0	0.2	0	0	0
Wyoming Big Sagebrush	8.6	20.2	14.9	18.1	17.6

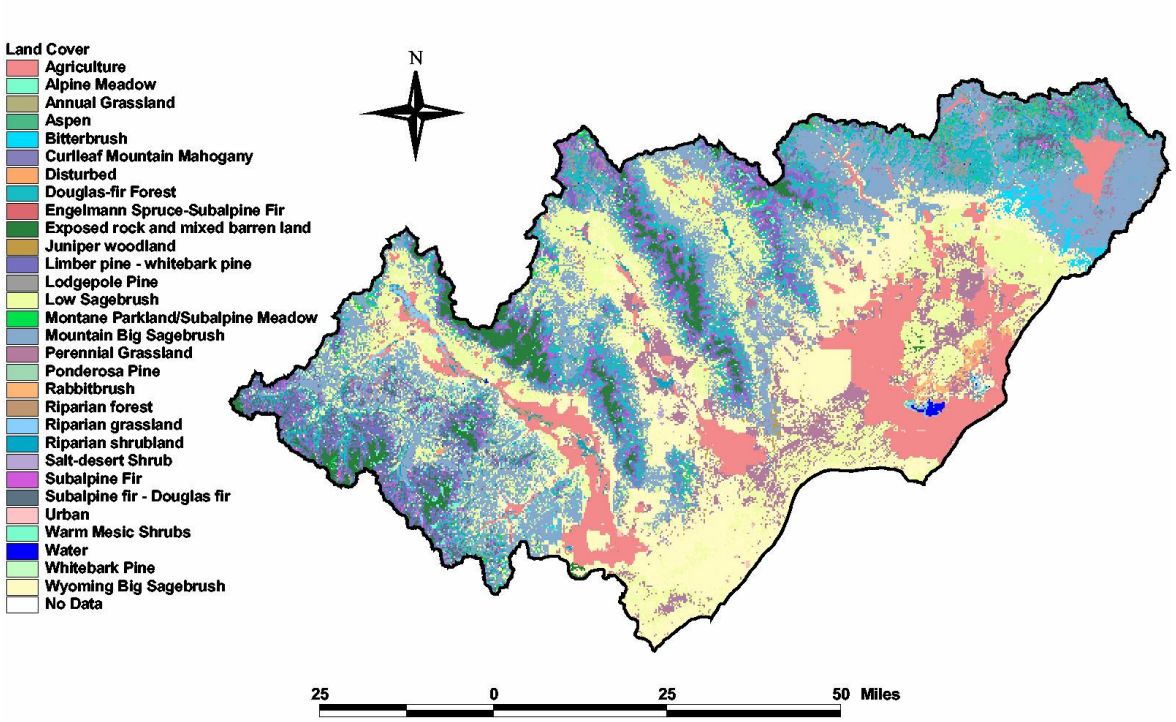

Figure 14. Distribution of Land Cover Classes within the Closed Basin Subbasin.

Forest and Woodland Vegetation

Major groups of forest plant associations include subalpine fir (*Abies lasiocarpa*) forest, Douglas-fir (*Pseudotsuga menziesii*) forest, Douglas-fir-limber pine (*Pinus flexilis*) forest, whitebark pine (*Pinus albicaulis*) woodland, and Utah juniper (*Juniperus osteosperma*) woodland. Aspen (*Populus tremuloides*) is also an important group of PNV plant associations. In the coarse vegetation modeling approach adapted here from Hann et al. (1997) these plant associations are included within the subalpine fir and Douglas fir plant association groups. Steele et al. (1981 and 1983) and Mueggler (1988) summarize species composition of forested plant associations present within the subbasin.

Whitebark pine is a slow growing, long-lived conifer that is common at higher elevations in subalpine environments of the subbasin. Whitebark pine stands are a minor component in the Big Lost, Birch, and Little Lost watersheds. In lower elevation subalpine forest and woodlands, whitebark pine is a seral species. In these environments established whitebark pine provide habitat for tree species less tolerant of intense insolation and extreme wind desiccation. In the absence of disturbance it is overtopped in 100-120 years by faster growing, shade-tolerant species (e.g., subalpine fir). Although crown fires and hot ground fires kill whitebark pine, it tolerates low-intensity ground fires that will kill the shade tolerant understory tree species. Fire intervals in these habitats range from 30-300 years (Reid et al. 1999). The distribution and abundance of whitebark pine has declined in recent decades due to mortality caused by mountain pine beetle (*Dendroctonus ponderosae*) and whitepine blister rust (*Cronartium ribicola*), an exotic fungal pathogen.

Inventories have not been conducted to determine the current distribution and condition of whitebark pine-dominated forest and woodlands within the subbasin.

Subalpine fir forest plant associations occur in relatively cool to cold, moist to dry, montane and subalpine valley and ridgetop environments within the subbasin. These plant associations are well represented in the Closed Basin in all but the Little Lost watershed. The group displays a range of disturbance regimes, predominantly by fire. Fire disturbance regimes range from frequent, low to medium intensity surface fire in dry environments to infrequent, high intensity fire disturbance on moist environments. On many dry subalpine fir sites within the Rocky Mountain region fire disturbance regimes of frequent, repeated stand replacing fire maintain persistent dominance by lodgepole pine (*Pinus contorta*). Within the Closed Basin Subbasin, however, Douglas-fir or aspen primarily dominate seral subalpine fir. Many subalpine fir stands within the subbasin form open parklands in association with mountain big sagebrush (*Artemisia tridentata vaseyana*). Key concerns for wildlife habitat and biological diversity within these ecosystems are the placement and availability of different stand structures.

The Douglas-fir forest and Douglas-fir-limber pine plant association groups occur in warm to cool, dry to very dry environments of the subbasin on mid- to upper-slope positions and ridge-spurs. The groups are an important constituent in all watersheds of the subbasin. The Douglas-fir-limber pine plant association group is less abundant in the Birch Creek watersheds. The majority of forest land in the Medicine Lodge watershed is dominated by Douglas-fir (USDI BLM & USDA FS, 2001). The age of the Douglas-fir overstory ranges from 90 to 200 years old with an average age of approximately 150 years. Increment borings from sampled stands indicate a reduction of diameter growth since European man's settlement. Understories consist of scattered patches of Douglas-fir seedlings and saplings, with some shrubs, forbs, and grasses (USDI BLM & USDA FS, 2001).

Parent materials for Douglas-fir – limber pine asssociatons are highly varied. These associations occur on low to moderately productive sites. Relatively frequent, low intensity fire, on moderately productive sites, maintains open stands of large diameter Douglas-fir with patchy Douglas-fir understory regeneration and a patchy mosaic of understory shrub, grass, and herb cover. This fire disturbance regime functions to thin understory tree regeneration, favoring the structural and compositional dominance of large diameter Douglas-fir in the overstory and reducing the development of pole-sized ladder fuels (Fischer and Bradley 1987; Crane and Fischer 1986). As ground and ladder fuels accumulate during fire-free periods, these stands become increasingly susceptible to stand-replacing fire.

In the Medicine Lodge drainage, limber pine communities exist on dry, rocky slopes and ridges ranging from low elevations (above juniper) to timberline. These communities are occasionally intermixed with Douglas-fir and alpine meadows. Limber pine communities may also form the forest ecotone with sagebrush steppe vegetation. Generally, limber pine are widely spaced in pure stands with understories of sagebrush and/or grass. Stands in the Divide Creek and Webber Creek Lake area, however, are densely stocked. Adequate regeneration of stands is occurring throughout the limber pine's range creating multi-aged stands. The incidence of white pine blister rust is low in the limber pine stands at this time (USDI BLM & the USDA FS, 2001)

Utah juniper woodlands are a minor component within the Big Lost and Little Lost watersheds. These stands occur at the northern limit of the species' distribution. Utah juniper stands within the subbasin posses globally significant biological diversity values (Grossman et al. 1994), though little ecological inventory or descriptive work has been completed.

Quaking aspen (*Populus tremuloides*) and black cottonwood (*Populus trichocarpa*) are found throughout the subbasin where there is adequate surface or subsurface moisture. In areas having sufficient subsurface moisture or with north or east aspects, aspen is a common seral species, particularly in association with Douglas-fir. Currently, increasing numbers of Douglas-fir are present within aspen stands due to the absence of fire. Historically, cool burning fires stimulated aspen root sprouting while fire-intolerant Douglas-fir seedlings and saplings were killed. Without stand disturbances (fire, windthrow, etc), aspen are also deteriorating, often to critical threshold levels. Because fire has not been allowed to play its regenerative role in the ecosystem, aspen acreage has significantly declined since the early twentieth century.

Curl-leaf mountain mahogany (*Cerocarpus ledifolius)* is present in the Closed Basin Subbasin. Minimal reproduction has been observed in the Medicine Lodge drainage (USDI BLM & USDA FS, 2001). Attempts at stimulating mahogany reproduction have had limited success, suggesting the present stands are decadent and likely seral to other communities. Current stands vary in age from 40 to 100 years old. Closed, even-aged stands of mahogany, typically seen in the Medicine Lodge watershed, are resistant to fire because of the lack of understory fuels. Although curl-leaf mahogany is sensitive to fire damage, it is still dependent on fire to provide suitable conditions for reproduction. Throughout the seral stages, Douglas-fir and limber pine may be present in the stands. Mahogany has a significant role in the fertility of its growing sites since it is a nitrogen fixing species (USDI BLM & USDA FS, 2001).

Shrubland and Grassland Vegetation

Alpine and subalpine grassland vegetation occurs over relatively extensive areas within the southern end of the Pioneer and White Knob mountains and in the Lost River Range, though they occupy a proportionally small area of the subbasin. Riparian forest, shrubland, and grassland occur over extensive areas within the subbasin, particularly within the Big Lost, Little Lost, and Birch Creek watersheds, though they, as well, occupy a proportionally small area of the subbasin.

Sagebrush shrublands form the most extensive non-forest vegetation within the subbasin. Wyoming big sagebrush (*Artemisia tridentata wyomingensis*) habitats are most abundant. Wyoming big sagebrush and mountain big sagebrush plant association groups include approximately 25 and 20 percent, respectively, low sagebrush (*Artemisia arbuscula*). Approximately 20 percent of the Wyoming big sagebrush habitat within the subbasin has been converted to agricultural use. Extensive areas of Wyoming big sagebrush potential (10 percent) are currently occupied by perennial grassland. These conditions appear particularly pronounced in the Little Lost, Medicine Lodge, and Beaver-Camas watersheds.

Riparian

Black cottonwood is common in creek bottoms (floodplains) and where standing water is present. Declining numbers of cottonwood indicates a lack of disturbance to stimulate root

sprouting, a lack of flooding to prepare a seed bed, dewatering, and/or concentrated grazing by livestock and/or big game. Cottonwood numbers have declined dramatically since settlement. Narrow-leaf cottonwood *(P. angustafolia*) and several willow (*Salix*) species are found within the subbasin along streams and creek bottoms. A partial list of riparian trees and shrubs in the Closed basin follows (Table 10; Anderson et al., 1996).

Table 10. Partial list of riparian trees and shrubs in the Closed Basin.

Common Name	**Scientific Name**	**Life Form**
Box Elder	*Acer negundo*	Tree
Squawbush, Skunkbush	*Rhus trilobata*	Shrub
Red-stemmed Dogwood, Red-osier Dogwood	*Cornus sericea*	Shrub
Golden Currant	*Ribes aureum*	Shrub
Gooseberry, Missouri Gooseberry	*Ribes oxyacanthoides*	Shrub
Wood's Rose	*Rosa woodsii*	Shrub
Narrow-leaved Cottonwood	*Populus angustifolia*	Tree
Black Cottonwood	*Populus trichocarpa*	Tree
Slender Willow, Coyote Willow	*Salix exigua*	Shrub
Slender-leaf Willow	*Salix exigua*	Shrub
Whiplash Willow	*Salix lucida*	Shrub
Watson Willow	*Salix lutea*	Shrub
Scouler's Willow	*Salix scouleriana*	Shrub
Booth's Willow	*Salix boothii*	Shrub/tree
Geyer's Willow	*Salix geyeriana*	Shrub/tree

Rare and Endemic Plants Species

Thirty-eight rare plant species (i.e., global rank G1 through G3 or state rank S1 through S2) are known to occur within the subbasin, represented by a total of 128 individual occurrences (Table 11). The Big Lost watershed encompasses a high level of rare species diversity with 45 individual population occurrences representing 21 different species. Alkali primrose, a plant species considered critically imperiled and especially vulnerable to extinction both globally and statewide (rank G1, S1) is known to occur in the Birch Creek and Little Lost River watersheds.

Table 11. Rare and endemic plant species known to occur within the Snake River Closed Basins Subbasin are listed by species with the number of population occurrences summarized by watershed (With Global rank G1 through G3 or State rank S1or S2)

Species	Common name	G Rank	S Rank	Beaver-Camas	Medicine Lodge	Birch	Little Lost	Big Lost	Total
Agoseris lackschewitzii	pink agoseris	G4	S2	4					4
Aster junciformis	rush aster	G5	S2					1	1
Astragalus bisulcatus var. *bisulcatus*	two-groove milkvetch	G5T5	S2	1	2				3
Astragalus diversifolus	meadow milkvetch	G3	S2			1	2	5	8
Astragalus drummondii	Drummond's milkvetch	G5	S2	5	5	1			11
Astragalus gilviflorus	plains milkvetch	G5	S2			2			2
Bouteloua gracilis	blue gramma	G5	S2	2	1				3
Camissonia pterosperma	winged-seed evening primrose	G4	S2			3	2	3	8
Carex incurviformis var. Incurviformis	maritime sedge	G4G5 T4T5	S1					1	1
Carex idahoa	Idaho sedge	G4T2	S2	6	1	2			9
Carex straminiformis	Mt. Shasta sedge	G4	S2					1	1
Catapyrenium congestum	earth lichen	G4	S2			1		1	2
Chrysothamnus parryi ssp. montanus	centennial rabbitbrush	G5T1	S1		4				4
Cuscuta denticulata	sepal-tooth dodder	G4	S1			1			1
Draba fladnizensis	Austrian draba	G4	S1					1	1
Draba globosa	pointed draba	G3	S2			1		1	2
draba incerta	Yellowstone draba	G5	S2		1				1
Erigeron humilis	low fleabane	G4	S2				3	4	7
Eriogonum capistratum var. welshii	Welsh's buckwheat	G4T2	S2				1	4	5
Gentianella propinqua	four-parted gentian	G5	S2					1	1
Gentianella tenella	slender gentian	G4G5 T4T5	S2					1	1
Ipomopsis polycladon	spreading gilia	G4	S2			2	1	2	5
Kobresia simpliciuscula	simple kobresia	G5	S2			2	1		3
Lomatogonium rotatum	marsh felwort	G5	S1			1	1	1	3
Orthotrichum hallii	Hall's orthotrichum moss	G3G5	S1				1	1	2
Parnassia kotzebuei var. kotzebuei	Kotzebue's grass-of-parnassus	G4T4	S2					3	3

Species	Common name	G Rank	S Rank	Beaver-Camas	Medicine Lodge	Birch	Little Lost	Big Lost	Total
Piptatherum micranthum	small-flowered ricegrass	G5	S1			1			1
Poa abbreviata ssp. marshii	Marsh's bluegrass	G5T2	S1			1			1
Primula alcalina	alkali primrose	G1	S1			1	1		2
Ranunculus gelidus	artic buttercup	G4	S1					1	1
Ranunculus pygmaeus	pygmy buttercup	G5	S1					2	2
Salix candida	hoary willow	G5	S2			1	2		3
Salix pseudomonticola	false mountain yarrow	G5?	S1			1	1		2
Saxifraga adscendens var. oregonensis	wedge-leaf saxifrage	G5T4 T5	S2				1	5	6
Saxifraga cernua	nodding saxifrage	G4	S2				3	5	8
Scirpus rollandii	rolland bulrush	G3Q	S1			1	1		2
Silene uralensis ssp. montana	petalless campion	G4T?	S1				1	1	2
Stipa viridula	green needlegrass	G5	S2		1				1

Noxious weeds

Twenty-five noxious weed species are known to occur within the subbasin (Table 12). Current location data on species occurrences within the subbasin are limited, and only allow identification to county. A number of species are relatively widespread within the subbasin. Noxious weed species of emerging concern include: buffalobur, Johnsongrass, meadow knapweed, spring millet grass, yellow starthistle, jointed goatgrass, perennial pepperweed, purple loosestrife, and rush skeletonweed.

Table 12. Occurrence of noxious weed species in Counties of the Closed Basins Subbasin.

Data are taken from Morishita et al. (2001) with supplemental information from field contacts. Bold font indicates species population locations that are known to a specific watershed within the subbasin.

Species	Common Name	BUTTE	CLARK	CUSTER	FREMONT	JEFFERSO	LEMHI
Aegilops cylindrica	jointed goatgrass		X				X
Cardaria draba	hoary cress	**X**	X	X	X	X	X
Carduus nutans	musk thistle	**X**	X	X	X	X	X
Centaurea diffusa	diffuse knapweed	**X**	X	**X**	X	X	
Centaurea maculosa	spotted knapweed	**X**	**X**	**X**	X	X	X
Centaurea pratensis	meadow knapweed		X				
Centaurea repens	Russian knapweed	**X**	**X**	X	X		X
Centaurea solstitialis	yellow starthistle				X		
Chondrilla juncea	rush skeletonweed	X					X
Cirsium arvense	Canada thistle	**X**	X	X	X	X	X
Conium maculatum	poison hemlock	X	X	X	X	X	X
Convolvulus arvensis	field bindweed	**X**	X	X	X	X	X
Euphorbia esula	leafy spurge	**X**	**X**	X	X	X	X
Hyoscyamus niger	black henbane	X	**X**	X	X	X	X
Isatis tinctoria	Dyer's woad		X		X		X
Lepidium latifolium	perennial pepperweed		X			X	
Linaria dalmatica	dalmation toadflax		X	X	X		X
Linaria vulgaris	yellow toadflax	**X**	X	X	X		X
Lythrum salicaria	purple loosestrife			X	X		
Milium vernale	spring millet grass		X				
Onopordum acanthium	Scotch thistle	**X**	X	X	X		
Solanum rostratum	buffalobur		X				
Sonchus arvensis	perennial sowthistle			X	X		X
Sorghum halepense	Johnsongrass						X
Tribulus terrestris	puncturevine	**X**	X		X	X	

Major Land Uses

Historic and present land uses in the Closed Basin include grazing, timber harvest, recreation, mining, agriculture (irrigated and dry farming), and industry dominated by the Idaho National Engineering and Environmental Laboratory: an 890 square mile US Department of Energy research facility (USDI BLM & USDA FS, 2001). This subbasin

contains > 70% of the roadless areas in the lower 48 states > 200,000 acres (Quigley et al., 1997).

Lands within the subbasin are primarily under intensive land use practices: cultivated agriculture, intensive range and timber management, and recreational use. With the exception of the Big Lost watershed, modified ecological conditions are prevalent within the subbasin. Sixty-three to 98 percent of the land area outside the Big Lost watershed is in intensive land use related to agriculture, range management, timber management, or recreational use (Table 13).

Table 13. Land use patterns within the watersheds of Snake River Closed Basins Subbasin

Landuse Class	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
1 - Natural, unmodified environments	0.0	12.7	6.2	10.9	4.4
2 - Special natural areas	0.0	0.3	1.0	0.3	0.4
3 - Essentially unmodified forested and grassland ecosystems	1.8	30.9	30.0	17.4	18.2
4 - Natural appearing, but modified for human use and occupancy	0.0	0.2	0.1	0.1	0.0
5 - Modified forest ecosystems	20.6	3.3	0.9	20.6	0.5
6 - Modified grassland ecosystems	26.0	36.5	56.7	37.4	32.7
7 - Areas modified by human occupation and activities	51.6	16.1	5.1	13.2	43.8
8 - Modified non-sustainable areas	0.0	0.0	0.0		

Ownership

Land ownership patterns within the subbasin follow patterns often observed in southern Idaho (Table 14). That is, with the exception of the Beaver-Camas watershed, lands within the subbasin are predominantly within Federal management (Figure 15). Within Beaver-Camas watershed, 51 percent of the land area is State or private. In drainages within the remainder of the subbasin, 65 to 95 percent of the land area is under Federal management. USDA Forest Service and USDI Bureau of Land Management are the principal managing agencies. US Department of Energy manages 15 and 18 percent of the land area in the Birch and Big Lost watersheds, respectively.

Table 14. Land ownership patterns within the watersheds of Snake River Closed Basins Subbasin.

Agency	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
Department of Energy		15.0	18.2	1.9	8.3
Private	39.3	14.2	2.9	8.8	31.1
State Lands	11.4	1.9	2.5	2.7	3.5
US Fish and Wildlife Service	1.7				
USDA Forest Service	22.8	42.6	36.5	43.8	23.5
USDI Bureau of Land Management	24.9	26.2	40.0	42.9	33.0
Open Water	0.1	0.1			0.5

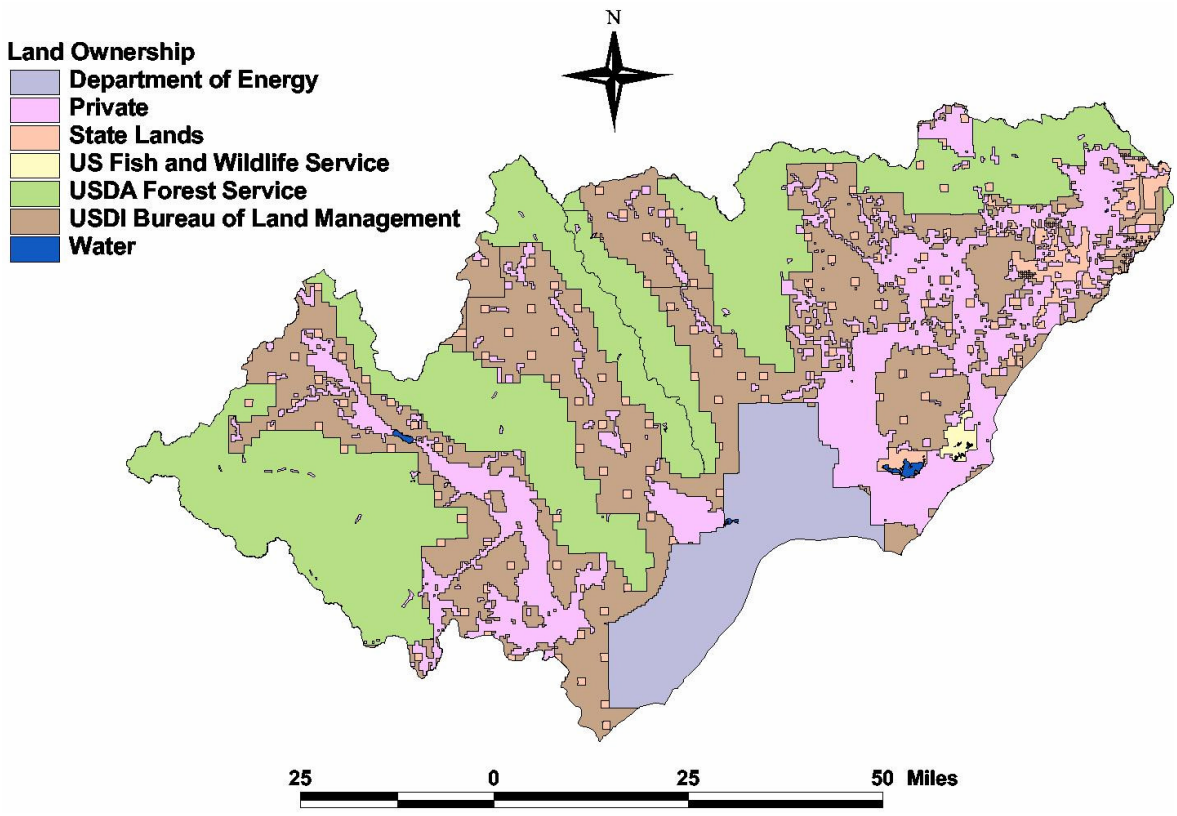

Figure 15. Land Ownership in the Closed Basin Subbasin.

Little Lost River

The Little Lost River drainage is comprised of Forest Service, Bureau of Land Management, private, Department of Energy (Idaho National Engineering and Environmental Laboratory), State of Idaho, and private lands. All Forest Service lands are managed by the Lost River Ranger District of the Salmon and Challis National Forests. The Idaho Falls BLM District manages most of the BLM land in the drainage; the Challis Field Office, of the Upper Columbia-Salmon Clearwater District, manages those BLM lands in the extreme northern portion of the drainage. The extreme southern tip of the drainage is managed by the Idaho National Engineering and Environmental Laboratory. Private land in the drainage is limited and is confined primarily to agricultural land at the lower end of the valley and along the mainstem of the river. Lands belonging to the state of Idaho are scattered throughout the drainage. The entire drainage is within the jurisdiction of the Upper Snake Region of the Idaho Department of Fish and Game. Over seventy percent of the land in the Little Lost River Watershed is some category of rangeland (Table 15).

Table 15. Land use within the Little Lost River Key Watershed (IDEQ 1998).

Land Use Category	Acres	Square Miles	Square Km	% of Total
Transportation, communication, utilities	162	<1	1	<1%
Cropland and pasture	39,249	61	159	6%
Confined feeding operations	102	<1	<1	<1%
	62	<1	<1	<1%
Herbaceous rangeland	35,385	55	143	6%
Shrub and brush rangeland	116,521	182	472	19%
Mixed rangeland	279,628	437	1,132	45%
Evergreen forest land	91,396	143	370	15%
Mixed forest land	10,189	16	41	2%
Reservoirs	22	<1	<1	<1%
Nonforested wetland	2,246	4	9	<1%
Bare exposed rock	851	1	3	<1%
Strip mines	123	<1	<1	<1%
Shrub and brush tundra	6,389	10	26	1%
Herbaceous tundra	9,891	15	40	2%
Bare ground	21,131	33	86	3%
Mixed tundra	3,028	5	12	<1%
Total	616,375	963	2,494	100%

Medicine Lodge

USFS- and BLM-administered lands make up 210 square miles and 342 square miles, respectively. State of Idaho managed lands make up 36 square miles, while private lands account for 271 square miles (Table 16).

Table 16. Land ownership in the Medicine Lodge Watershed

(USDI BLM & USDA FGFS, 2001)

Feature	Landowner Type					Total
	USFS	BLM	State	Private	DOE	
Land Ownership: square miles and (%)	210 (24%)	342 (39%)	36 (4%)	271 (31%)	13 (2%)	872

Land use and habitat on private-owned lands within the watersheds of the Closed Basin is illustrated in Figure 16.

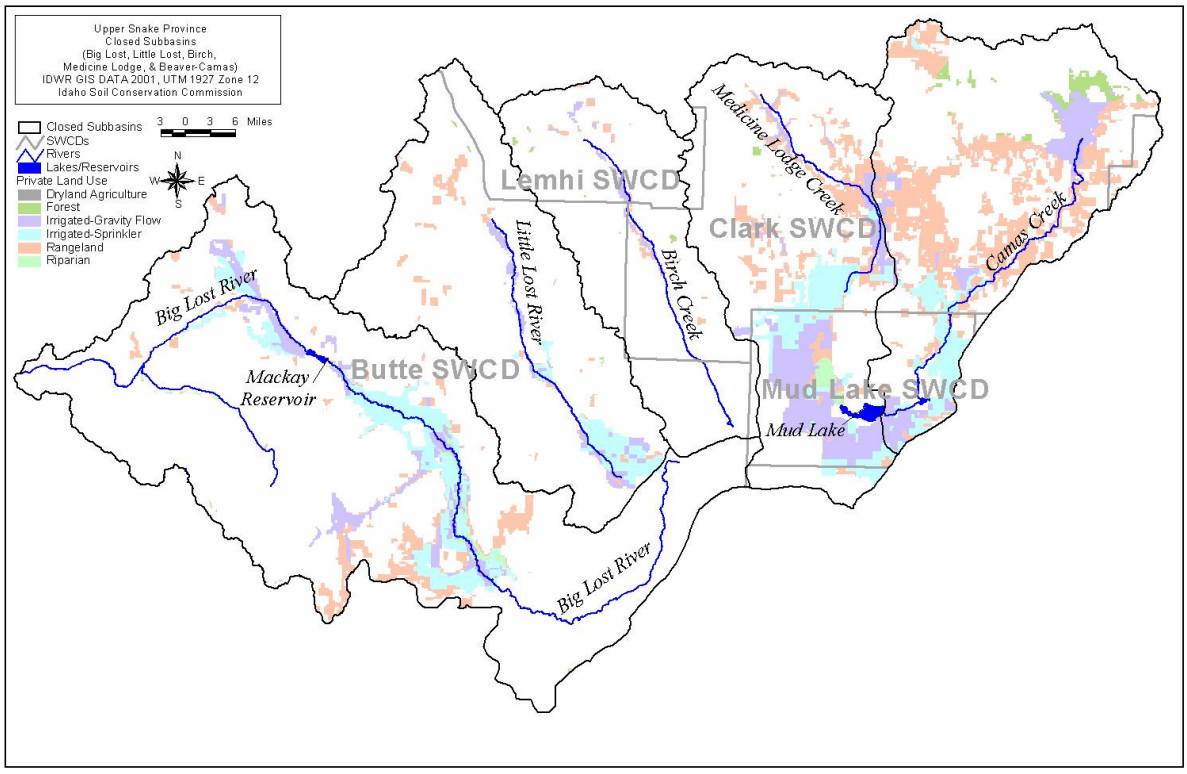

Figure 16. Private Land use within the Closed Basin (NRCS, 2001).

Protected Area

A diverse range of protected areas is present within the Snake River Closed Basins Subbasin (Figure 17). Specially designated areas include vast roadless areas, relatively small ecological reference areas, wild and scenic rivers, national recreation areas, and fishing and hunting access areas. The Idaho Fish and Game's Conservation Data Center maintains detailed information on these conservation sites and specially managed areas.

The Snake River Closed Basins Subbasin encompasses 30 USDA National Forest System roadless areas (Table 17). These occur in the peaks of the Pioneer Mountains, Lost River Range, Lemhi Range, and Beaverhead Mountains. Ten USDI Bureau of Land Management wilderness study areas are present within the subbasin (Table 18).

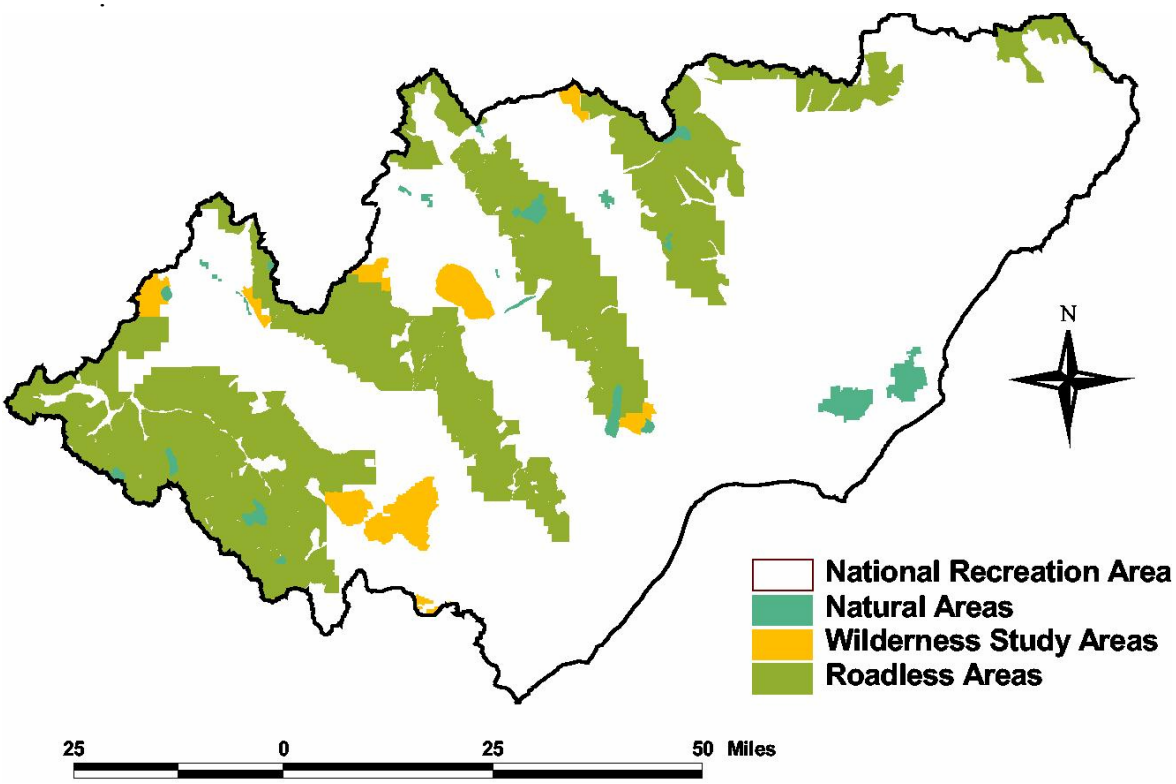

Figure 17. Areas of Special-use Designation within the Closed Basin Subbasin.

Forty-three relatively small, highly protected ecological reference areas are present within the subbasin. These include USDA Forest Service Research Natural Areas and Special Interest Areas, USDI Bureau of Land Management Research Natural Areas and Areas of Critical Environmental Concern, and The Nature Conservancy preserves. Research Natural Areas provide pristine, high quality, representative examples of the important ecosystems within the subbasin. These sites combine with the large tracts of undeveloped land within the subbasin to provide excellent opportunities for research of physical and biological ecosystem processes. Jankovsky-Jones et al. (1999) provide a guide to the wetland and riparian values of conservation sites within the subbasin. Rust (2000) provides an assessment of the representation of ecological components and

identifies targets for selection of new conservation sites within the subbasin. USDA Forest Service Research Natural Areas and USDI Bureau of Land Management Research Natural Areas and Areas of Critical Environmental Concern management guidelines are identified by site-specific establishment documents and decision notices.

Table 17. Summary of USDA National Forest System Inventoried Roadless Areas within Snake River Closed Basins Subbasin.

Roadless areas are listed with X's indicating their distribution within watersheds of the subbasin.

Roadless Area Name	Beaver-Camas	Big Lost	Birch	Little Lost	Medicine Lodge
06-011 Pahsimeroi		X			
06-012 Borah Peak		X		X	
06-013 King Mountain		X		X	
06-014 Jumpoff Mountain		X		X	
06-017 Prophyry		X			
06-019 Copper Basin		X			
06-024 Warm Creek				X	
06-025 White Knob		X			
06-026 Cold Springs		X			
06-028 Wood Canyon		X		X	
06-601 Diamond Peak			X	X	
06-903 Lemhi Range				X	
06-920 Boulder - White Clouds		X			
06-921 Pioneer Mountains		X			
13903 Lemhi Range			X	X	
Diamond Peak			X	X	
Garfield Mountain	X				X
Italian Peak			X		X
Mt. Jefferson	X				
Pioneer Mountains		X			
White Cloud - Boulder		X			

The entire 890 square mile Idaho National Engineering and Environmental Laboratory is designated as a National Environmental Research Park. Because these lands have been withdrawn from the public domain for over 50 years, the INEEL arguably retains the largest and best representation of the shrub-steppe ecosystem in the Western United States (Anderson, 1999). Over 60,000 acres of the INEEL at the mouth of the Birch Creek Valley were recently set aside as the Shrub-steppe Ecosystem Reserve, under

joint management of the U.S. Department of Energy, Bureau of Land Management, and U.S. Fish and Wildlife Service.

Table 18. USDI Bureau of Land Management Wilderness Study Areas within Snake River Closed Basins Subbasin.

Wilderness Study Areas are listed with X's indicating their distribution within watersheds of the subbasin.

Wilderness Study Area ID Number	Big Lost	Birch Creek	Little Lost
ID-31-014	X		
ID-31-017	X		
ID-32-003			X
ID-32-009		X	X
ID-43-003		X	
ID-45-012			X
ID-46-014	X		
ID-47-004	X		
ID-53-005	X		
ID-GREAT RIFT-ISA	X		

Impoundments

Most of the dams in the Closed Basin are private and provide water for agricultural purposes or for hydropower generation (Figure 18).

Big Lost River Watershed

The Mackay Reservoir is the only significant artificial impoundment in the Big Lost River Watershed. Construction of the Mackay Dam started in 1906 and was completed in 1930 following a tumultuous history of water wars and dynamite. The reservoir is at 6000 feet elevation and, when full, covers about 1392 acres and contains 44,370 acre feet of water (B. Ondrechen, IDWR, in litt.). The reservoir is operated for irrigation of 33,000 acres of land in the Big Lost River Irrigation District. The reservoir provides excellent provides summer and, in particular, winter fishing opportunities. Birding in the area is considered excellent. Dependant mostly on snow melt and operated for irrigation, the reservoir experiences significant and predictable monthly variation (Table 19). The 2001 drawdown left little surface water in the Mackay Reservoir.

Table 19. Average monthly water storage (in 1,000s of acre feet) in Mackay Reservoir

(Source: http://idsnow.id.nrcs.usda.gov/snow/data/basin_reports/resv/resvtab.txt).

Time Span	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
75 yr Avg 1926-2000	12.1	18.5	23.6	27.1	29.6	31.0	32.1	31.8	32.1	21.3	9.7	8.5
30 yr Avg 1961-1990	13.6	20.5	25.4	29.1	31.9	33.1	34.3	33.5	36.9	25.4	10.9	9.1

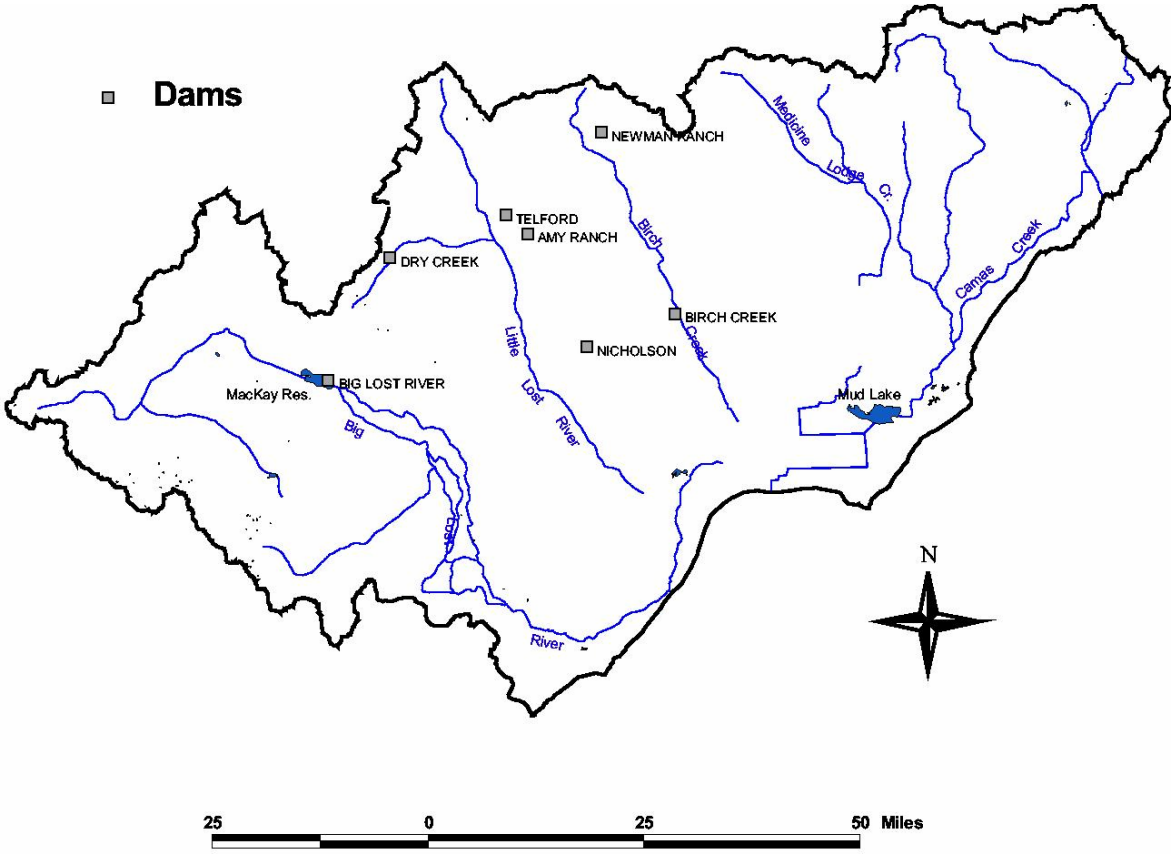

Figure 18. Location of Dams within the Closed Basin Subbasin.

Little Lost River Watershed

Summit Creek Reservoir, located near the Little Lost River and Pahsimeroi River divide, is the only functional reservoir remaining in this watershed. It is approximately 40 hectares (ca. 100 acres) in size at maximum capacity. There is no record of fish being introduced into the reservoir, and it is not known if it contains a fish population. The reservoir is utilized during the spring, summer, and fall by a variety of waterfowl species and probably serves as a nesting area.

Birch Creek

Birch Creek has a small, approximately 5 acre, impoundment established along the creek in the late 1980s as partial mitigation for the Birch Creek Hydroelectric Project.

Beaver Creek/Camas Creek

Mud Lake, three miles north of Terreton, ID, is a 3000+ acre shallow (5 ft) lake. This was originally a sump area where Camas Creek spread out and disappeared, and extended several miles farther southeast, south, and west from its present area. Over the years, dikes were built and the water was kept in a smaller but deeper lake. Bordering farmlands have been established in areas once covered by water. Water to fill Mud Lake comes from Camas Creek and pumping from wells by local irrigators (IDFG, 1999). Mud Lake is within the 8,833 acre Mud Lake Wildlife Management Area under the direction of the Idaho Department of Fish and Game. Land acquisition for the WMA began in 1940, with the most recent acquisition in 1969. Although water levels in Mud Lake vary annually, mostly in response to snow pack, inter-annual differences are predictable: peak reservoir levels in the late spring and early summer, minimum levels in the fall following the irrigation season (Table 20).

Table 20.Average monthly water storage in Mud Lake (in 1,000s of acre feet)

(Source: http://idsnow.id.nrcs.usda.gov/snow/data/basin_reports/resv/resvtab.txt).

Time Span	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
79 yr Avg 1922-2000	12.0	13.9	15.7	18.0	21.0	25.3	30.4	33.0	29.2	19.7	14.7	10.9
30 yr Avg 1961-1990	18.8	20.7	22.6	25.3	28.7	33.0	38.0	40.5	36.5	26.8	21.6	17.2

Demographics

Population

Unless otherwise stated, all population information is from the US Census Bureau 2000 census (http://quickfacts.census.gov/qfd/states/16000.html). Idaho has 44 counties with a population of 1,293,953 and 82,747 square miles (average density: 15.64 people/sq. mile [ppsm]). The Closed Basin, however, is sparsely populated. The average population density for the counties, which make up the Closed basin is 4.50 ppsm. Note this average includes data from all communities within each of the counties represented in the Closed Basin, even though no county is entirely within the Closed Basin. Because Rigby, the largest community in Jefferson County, and Salmon, the largest community in Lemhi County, are included in the county population totals but are not located within the subbasin, the actual population density of the Closed Basin is most likely considerably less than 4.50 ppsm. More complete demographics from the 2000 census for all counties are found in Appendix C.

Butte County

Butte County has 2,237 square miles and is not part of a Metropolitan Area. Its 1999 population of 3,012-ranked 42nd in the State. Population density is 1.35 ppsm. The population declined 0.7 percent between 1990 and 2000. Arco is the county seat.

Clark County

Clark County has 1,764 square miles and is not part of a Metropolitan Area. Its 1999 population of 913-ranked 43rd in the State. Population density is 0.52 ppsm. The population increased by 34.1 percent between 1990 and 2000. Dubois is the county seat.

Custer County

Custer County has 4,938 square miles and is not part of a Metropolitan Area. Its 1999 population of 4,089-ranked 37th in the State. Population density is 0.83 ppsm, and increased by 5.1 percent between 1990 and 2000. Challis is the county seat.

Jefferson County

Jefferson County has 1,106 square miles and is not part of a Metropolitan Area. Its 1999 population of 19,949-ranked 16th in the State. Population density is 18.04 ppsm and exceeds the state average. Population increased by 15.8 percent between 1990 and 2000. Rigby is the county seat.

Lemhi County

Lemhi County has 4,571 square miles and is not part of a Metropolitan Area.. Its 1999 population of 7,978 ranked 31st in the State, and increased by 13.1 percent between 1990 and 2000. Population density is 1.75 ppsm. Salmon is the county seat.

Economy & Employment (Unless stated otherwise, all E&E information from: http://www.bea.doc.gov/bea/regional/bearfacts/bf1/16/).

Butte County

Per Capita Personal Income

In 1999, Butte County had a per capita personal income (PCPI) of $19,376. This PCPI ranked 21st in the State, and was 85 percent of the State average, $22,871, and 68 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 2.6 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income

In 1999, Butte County had a total personal income (TPI) of $58,360,000. This TPI ranked 42nd in the State and accounted for 0.2 percent of the State total. The 1999 TPI reflected an increase of 1.6 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings by Industry

Earnings by persons employed in Butte County increased from $329,165,000 in 1998 to $332,328,000 in 1999, an increase of 1.0 percent. The largest industries in 1999 were services, 94.5 percent of earnings; state and local government, 1.3 percent; and farm, 1.0 percent. Services was the only industry that accounted for 5 percent or more of earnings in 1999. Services grew by 1.4 percent between 1998 and 1999.

Clark County

Per-Capita Personal Income

In 1999, Clark County had a PCPI of $22,022. This PCPI ranked 10th in the State, and was 96 percent of the State average, $22,871, and 77 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 15.4 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income

In 1999, Clark County had a TPI of $20,106,000. This TPI ranked 43rd in the State and accounted for 0.1 percent of the State total. The 1999 TPI reflected an increase of 18.5 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry

Earnings by persons employed in Clark County increased from $15,894,000 in 1998 to $18,811,000 in 1999, an increase of 18.4 percent. The largest industries in 1999 were farm, 34.5 percent of earnings; nondurable goods manufacturing; and state and local government, 12.0 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was nondurable goods manufacturing, which decreased 6.4 percent; the fastest was farm, which increased 79.5 percent.

Custer County

Per-Capita Personal Income

In 1999, Custer County had a PCPI of $23,087. This PCPI ranked 7th in the State, and was 101 percent of the State average, $22,871, and 81 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 3.0 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income

In 1999, Custer County had a TPI of $94,402,000. This TPI ranked 36th in the State and accounted for 0.3 percent of the State total. The 1999 TPI reflected an increase of 3.0 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry

Earnings by persons employed in Custer County decreased from $54,846,000 in 1998 to $52,734,000 in 1999, a decrease of 3.9 percent. The largest industries in 1999 were mining; state and local government, 14.7 percent; and services. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was mining, which decreased 12.0 percent; the fastest was retail trade (9.6 percent of earnings in 1999), which increased 5.3 percent.

Jefferson County

Per-Capita Personal Income

In 1999, Jefferson County had a PCPI of $16,947. This PCPI ranked 36th in the State, and was 74 percent of the State average, $22,871, and 59 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 2.5 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income

In 1999, Jefferson County had a TPI of $338,084,000. This TPI ranked 19th in the State and accounted for 1.2 percent of the State total. The 1999 TPI reflected an increase of 4.7 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry

Earnings by persons employed in Jefferson County increased from $140,740,000 in 1998 to $149,044,000 in 1999, an increase of 5.9 percent. The largest industries in 1999 were state and local government, 18.8 percent of earnings; farm, 16.6 percent; and construction, 9.9 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was farm, which decreased 3.6 percent; the fastest was construction, which increased 21.8 percent.

Lemhi County

Per-Capita Personal Income

In 1999, Lemhi County had a PCPI of $18,886. This PCPI ranked 25th in the State, and was 83 percent of the State average, $22,871, and 66 percent of the national average, $28,546. The 1999 PCPI reflected an increase of 1.6 percent from 1998. The 1998-99 State change was 4.3 percent and the national change was 4.5 percent.

Total Personal Income

In 1999, Lemhi County had a TPI of $150,672,000. This TPI ranked 32nd in the State and accounted for 0.5 percent of the State total. The 1999 TPI reflected an increase of 0.8 percent from 1998. The 1998-99 State change was 6.1 percent and the national change was 5.4 percent.

Earnings By Industry

Earnings by persons employed in Lemhi County increased from $82,385,000 in 1998 to $82,440,000 in 1999, an increase of 0.1 percent. The largest industries in 1999 were services, 18.6 percent of earnings; state and local government, 17.4 percent; and federal civilian government, 17.3 percent. Of the industries that accounted for at least 5 percent of earnings in 1999, the slowest growing from 1998 to 1999 was mining, which decreased 13.5 percent; the fastest was services, which increased 6.1 percent.

Fish and Wildlife Resources

Fish and Wildlife Status

Fish

Anadromous Fish

There is no surface-water connection between waters within the Closed Basin to the Snake River. Therefore, the Closed Basin watercourses support no anadromous fishery.

Resident Fish

Rainbow trout (*Oncorhynchus mykiss*), of generally small size, are the predominant fish throughout the Closed Basin drainages, except for some headwaters and a few minor tributaries where brook trout are dominant. Native bull trout (*Salvelinus confluentus)* and Yellowstone cutthroat trout (*O. clarki bouvieri*) are maintaining fishable populations in

some limited areas. Mountain whitefish (*Prosopium williamsoni*) are found only in the Big Lost River drainage. Stream quality and fish populations vary from excellent to poor where streams alternately intersect and perch above the groundwater table or enter irrigation ditches. Streams become marginal where they flow into the Snake River Plain due to diversion and freeze out. Where groundwater inflow is lacking, wintertime air temperatures often cause streams to become icebound and leave their channels. Habitat degradation has occurred to many streams due to past and/or present grazing practices on private and public rangeland. Natural flood events have also severely impacted some drainages, such as Wildhorse Creek in the Big Lost River Drainage (IDFG 2001).

Irrigation diversions often dewater the lower segment of most drainages. Productivity is generally high due to large amounts of groundwater input. Stream improvement structures, to restore losses of riparian habitat due to grazing, on lower Birch Creek and Summit Creek (Little Lost River drainage) have provided 100% to 400% increases in trout populations (IDFG, 2001).

Drought conditions since 1987 have impacted many of the smaller headwater tributaries in the Closed Basin drainages. With a return to normal snowpack years the Idaho Department of Fish and Game will consider supplemental hatchery releases on a case by case basis where fish populations have been impacted. This may include those drainages managed for wild trout (IDFG, 2001).

Native Resident Fish

Most of the fisheries within the Closed Basin are artificially sustained. Few sustaining populations of native, resident fish remain. Bull trout are the exception. In the Closed Basin, bull trout occur in the Little Lost River Drainage (Figure 19). Although bull trout are widely distributed in the drainage, their distribution is fragmented. Data collected during the study on the history and status of fished in the Little Lost River (Gamett 1999) indicate bull trout occupy approximately164 km of stream, including the upper reach of Badger Creek, the upper reach of Big Creek, the lower reach of Bunting Canyon Creek, the lower reach of Camp Creek, Firebox Creek, Hawley Creek, Iron Creek, Jackson Creek, the mid and upper reaches of the mainstem (including Sawmill Creek), Mill Creek, Quigley Creek, Redrock Creek, Smithie Fork, an unnamed tributary to Smithie Fork, Summit Creek, Timber Creek, Squaw Creek (Sawmill Canyon), North Fork Squaw Creek, the lower reach of Slide Creek, the upper reach of Warm Creek, Wet Creek (except the mid section), and Williams Creek. Bull trout comprised 25% or more of the salmonids captured in the lower reach of Bunting Canyon Creek, the lower reach of Camp Creek, Firebox Creek, Hawley Creek, Iron Creek, Jackson Creek, the mainstream (including Sawmill Creek) above Iron Creek Road, Mill Creek, Quigley Creek, Redrock Creek, the lower reach of Slide Creek, Smithie Fork, an unnamed tributary to Smithie Fork, upper Squaw Creek (Sawmill Canyon), North Fork Squaw Creek, Timber Creek, the upper reach of Warm Creek, the lower and upper reach of Wet Creek, and Williams Creek. Populations of bull trout in some stream segments appear to be well below historic levels (Gamett 1999).

Because of the species' limited and sporadic distribution, the biologists speculate that European settlers introduced bull trout in the 1800s. The lack of information on bull trout in the area prior to European settlement supports this theory. Alternately, the hydrology of the Vanishing Rivers suggests the possibility of fish migration between

adjacent drainages over the millennia due to headwater capture in both drainages from geologic elevation shifts. Despite the possibility bull trout may not be native to the drainage, they have historically occupied the entire mainstream of the Little Lost from the headwaters to the sinks. Now, its distribution is widespread but extremely fragmented throughout the valley (Gamett 1998).

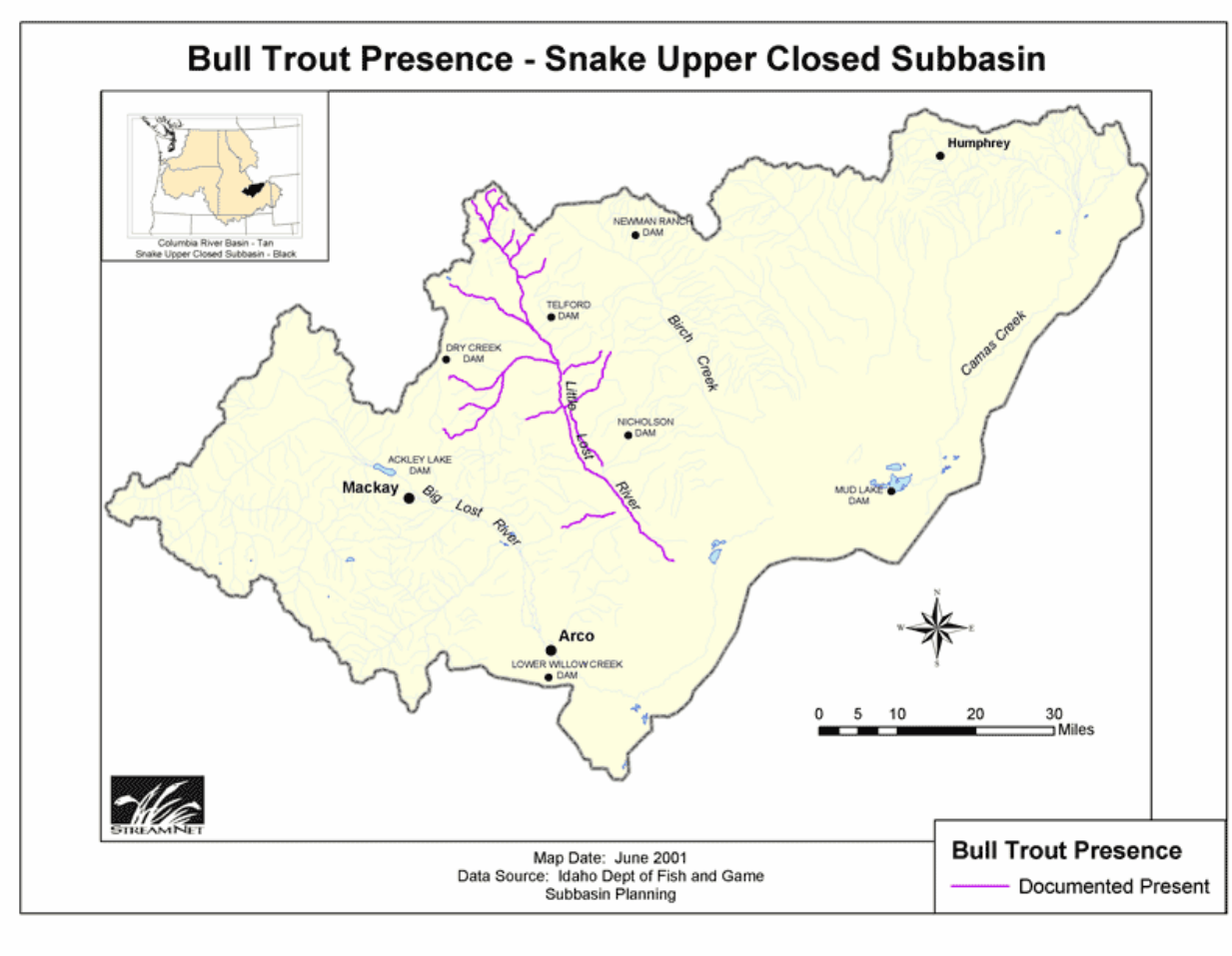

Figure 19. Distribution of Bull Trout within the Closed Basin Subbasin.

In the Little Lost River, bull trout have exhibited both migratory and resident life history forms. Resident fish live only in the smaller, colder, higher elevation tributaries of the Little Lost, while the fluvial (migratory) fish live in the mainstem but spawn in the smaller tributaries (Gamett 1998). Some fluvial bull trout migrate over 30 km to reach tributaries of Sawmill Canyon, which contains some of the most important spawning habitat for bull trout (Gamett 1998). Populations in Big Creek, Upper Wet Creek, and below Iron Creek on the mainstem migrate to spawn. At one time bull trout in Williams Creek were migratory, but passages are now blocked (Little Lost River Interagency Technical Advisory Team 1998). Specifically, there are two diversions located on Williams Creek which dewater the lower portion of Williams Creek throughout the year.

The lower diversion, which is located approximately 2 km above the Little Lost River, completely dewaters Williams Creek during the spring, summer, and fall. The upper diversion, which is located approximately 1.5 km above the lower, completely dewaters Williams Creek during the winter. Water from Williams Creek may occasionally reach the Little Lost River during the winter from the upper diversion. However, if this does occur, it is on an irregular basis, does not flow through a stream channel, and likely does not allow fish to move into or out of Williams Creek. It is important to point out that while these diversions have isolated bull trout in Williams Creek, they also may be the reason that bull trout are still in Williams Creek because the dewatering has likely prevented brook trout from the Little Lost River from invading this stream and replacing the bull trout population. The bull trout recovery team recognizes the need to reconnect Williams Creek to the river to provide for genetic exchange, but preventative measures must be taken to ensure the population is protected from brook trout.

Recognizing historical fluvial populations is important in order to determine which streams are a priority for removing physical and thermal barriers and allow and encourage migration and spawning.

Bull trout distribution is most limited by high stream temperatures (Rieman and McIntyre 1993). Data from the Little Lost illustrates that when maximum summer stream temperatures remain below 15^{o}C, bull trout generally comprise more than 50% of the trout population (Gamett 1998). In addition, egg incubation occurs most successfully in streams that remain below 8^{o}C (Gamett Pers. Comm). If bull trout cannot spawn in the warmer tributaries, resident populations will not inhabit these areas. Fluvial populations may, however, pass through warmer waters to reach cooler headwaters for spawning. Stream temperatures above 15^{o}C may act as a thermal barrier to prevent migration to the cooler tributaries. Groundwater temperatures in the Idaho Batholith ecoregion vary considerably, and high stream temperatures, in many cases, are a natural occurrence. For example, the temperature of Barney Hot Springs, in the Little Lost drainage, is 27^{o}C. The temperature of Williams Creek springhead is 4^{o}C and Horse Creek springhead is 10^{o}C, even though they are less than one mile apart (Gamett 1998). In many instances, streams with low groundwater temperatures have surface water temperatures exceeding 15^{o}C due to lack of stream channel complexity, lack of water flow, or lack of shading from riparian vegetation. Grazing, irrigation diversions, and fire are important sources of erosion or altered stream morphology that directly influence stream temperature.

Although bull trout populations are currently increasing in the mainstem of the Little Lost River, populations are declining in other areas. In the mainstem between USFS boundary and Smithie Fork the bull trout density declined 62% between 1987 and 1995 (Table 21) as a result of angler harvest, low water flow, high stream temperatures and degraded habitat conditions below Warm Creek (Gamett, 1998). Since 1995, bull trout populations in the mainstem have been increasing, most likely due to changes in land management, subsiding drought conditions, and closure to recreational harvest.

Fisheries and non-native resident fish

Because of recent cooperative studies on fish and fish habitat conducted by the U.S. Forest Service, Idaho Department of Fish and Game, Bureau of Land Management, Idaho Department of Environmental Quality, U.S. Fish and Wildlife Service, The Nature Conservancy, and private individual in the Big Lost and Little Lost River drainages, these

watersheds have significantly more information than the other watersheds in the Closed Basin on fish distribution, population trends, habitat quality, stream temperatures and historic fisheries data. These data are available in Gamett, 1999 for the Little Lost River. The USDA Forest Service is in the process of summarizing these data for the Big Lost River.

Big Lost River

The Big Lost River is the largest of the Closed Basin drainages. Included in the drainage is Mackay Reservoir. Major tributaries include Antelope, Summit and Wildhorse creeks and the East, West and North forks of the Big Lost River. Mackay Reservoir is a widely fluctuating irrigation supply reservoir having a maximum capacity of 44,700 acre-feet and a minimum pool of 125 acre-feet. Pool levels below 4,600 acre-feet occur about every three years, causing flushing of most trout and kokanee through the outlet structure of the dam into the Big Lost River. This results in a poor fishery the following year in the reservoir and makes it difficult to manage Mackay Reservoir for a wild trout fishery. Hatchery rainbow trout comprise the majority of fish caught. Some brook trout and wild rainbow trout are also present. Kokanee salmon have recently become a significant component of the reservoir fishery, particularly in the winter. The kokanee salmon population is naturally sustained without hatchery supplementation.

The 60 miles of Big Lost River below Mackay Reservoir has been extensively modified by numerous irrigation diversions and channelization for flood control, which has destroyed about 25% of the channel. Drought conditions affected the Sinks drainages from 1987 through 1990. During that period, water storage and natural stream flows did not meet irrigation demand, which resulted in extensive development of wells in the area from Mackay to the Idaho National Engineering and Environmental Laboratory boundary. Well development combined with lower natural flows has reduced or eliminated most salmonid populations downstream from the Moore Diversion. In years of normal or above-normal precipitation, restoration of a fishery is possible below the Moore diversion.

From Moore Diversion to Mackay Reservoir, the Lost River supports wild rainbow trout, brook trout and mountain whitefish populations. Fish from Mackay Reservoir produce an excellent fishery immediately downstream of Mackay Dam. Large numbers of fish are lost annually to irrigation canals.

The Big Lost River from Mackay Reservoir upstream to Chilly Bridge is annually de-watered for irrigation and has suffered from long-term stream alteration activity. From Chilly Bridge upstream, the river and tributaries support wild rainbow, brook trout and whitefish populations. From Bartlett Point Road upstream to the West Fork-East Fork Confluence, the main-stem and East Fork of the Big Lost River had been under restricted harvest for rainbow trout since 1988. This section of the Big Lost River was managed under a quality trout regulation – 2 trout over 14 inches, until 2000. Due to limitations imposed by whirling disease, this reach is now managed under general regulations. Big Lost River tributaries, with the exception of Wildhorse Creek, are productive for small brook trout and rainbow trout. Supplemental stocking of catchable rainbow trout will continue in Wildhorse Creek and other high use sections of the North, East and West Forks of the Big Lost River. Wild trout numbers and catch rates in Antelope Creek and the upper Big Lost River drainage have plummeted since 1988. Recent research has confirmed that the Big Lost River drainage above the North Fork and the Antelope Creek drainage is heavily infested with the parasite

Myxobolus cerebralis, the causative agent for whirling disease. Management options to provide a sustainable wild trout fishery in these waters are being evaluated. One option, stocking Snake River Yellowstone cutthroat trout, which appear to survive in the wild at higher rates than rainbow trout or brook trout, was implemented in 2000. Stocking of cutthroat trout will continue with monitoring and evaluation to determine the success and utility of this strategy.

Little Lost River

The Little Lost River drainage contains primarily wild rainbow trout, although brook trout are abundant in headwater areas. Healthy populations of native bull trout are present in Sawmill Creek and the upper Little Lost River. Catch rates have averaged 1.2 to 1.3 trout/hour in recent years. The Little Lost River has been managed on wild trout production since 1983, and under wild trout regulations (2 trout possession limit) since 1993. Bull trout harvest has been closed (concurrent with the state-wide bull trout harvest closure) to protect this important population of listed, threatened, fish.

Bull trout, brook trout, rainbow trout, cutthroat trout, rainbow trout x cutthroat trout hybrids, brook trout x bull trout hybrids, grayling (*Thymallus arcticus*), shorthead sculpin (*Cotus confuses*), guppy (*Poecilia reticulata*), green swordtail (*Xiphophorus helleri*), amelanic convict cichlids (*Cichlasoma nigrofasciatum*), Mozambique tilapia (*Tilapia mossambica*), and goldfish (*Carassius auratus*) have been documented in the Little Lost River drainage (Gamett 1999, Gamett 1990a, Gamett 1990b, Corsi and Elle 1989, Courtenay et al. 1987, Elle et al. 1987, Corsi et al. 1986, Corsi and Elle 1986, Ball and Jeppson 1978, Jeppson and Ball 1978, Andrews 1972, USR file data, UMMZ). Mountain whitefish have not been found in fish collections completed in the drainage. However, local residents indicate whitefish were present in the Little Lost River in the early 1900's (James Waymire, local resident, personal communication). Although not documented, brown trout have apparently been caught in the lower portion of the drainage in recent years (Will Marcroft, LRRD, personal communication). A single introduction of golden trout did not establish a population.

Table 21. Comparison of estimated trout/km in the Little Lost River between the Forest boundary and Summit Creek between 1984 and 1997 (Elle et al. 1987, Corsi and Elle 1989, Gammet 1999).

Sampling Date	Total trout/km[a]	Rainbow	Brook trout/km	Bull trout/km
July 1997	245	208	16	21
August 1993	227	203	20	4
July 1987	226	150	52	24
July 1986	189	123	21	45
July 1985	176	83	32	61
October 1984	245	173	27	45

[a] This number represents the sum of the individual species densities and may different slightly from the actual mean density due to rounding errors.

The shorthead sculpin appears to be the only sculpin species present in the Little Lost River drainage (Gamett 1999, Simpson and Wallace 1982). It is widely distributed in the drainage below 2,280 m elevation. Sculpin were not found above this point anywhere in the drainage although they had access to higher stream reaches. This suggests some factor or combination of factors is limiting their distribution. Data from Sawmill Canyon suggest stream gradients greater than about 4% restrict the distribution of shorthead sculpin (Gamett 1999). Meyer and Lamansky (2001, in progress) found that, in southeast Idaho streams, mottled sculpins were more prevalent at sites that were deeper, wider, had deeper pools, lower gradient, and less shading.

Fish stocking provides the many non-native resident fishes to the Closed Basin in general, and the Little Lost River Watershed in particular (Table 22).

Brook Trout -- Although brook trout are widely distributed in the drainage, they are only abundant in a few stream reaches. Data indicate that brook trout occupy approximately 140 km of stream in the drainage (Gamett 1999). Gamett (1999) found, brook trout in Big Creek, Big Springs Creek, Dry Creek, an unnamed tributary to Meadow Creek, Mill Creek, Squaw Creek (Sawmill Canyon), an unnamed tributary to Squaw Creek (Sawmill Canyon), North Fork Squaw Creek, upper Summit Creek, Uncle Ike Creek, Wet Creek, and portions of the mainstem. Brook trout comprised 25% or more of the salmonids captured in upper Big Creek, Dry Creek, the mainstem near Mill Creek, an unnamed tributary to Meadow Creek, Mill Creek, lower Squaw Creek (Sawmill Canyon), an unnamed tributary to Squaw Creek (Sawmill Canyon), the lower reach of North Fork Squaw Creek, and Uncle Ike Creek. The range of brook trout has increased within the drainage during the last 25 years (Gamett 1999).

Rainbow Trout -- Rainbow trout are the most widely distributed fish species in the Little Lost River. Data collected during the present study indicate rainbow trout occupy approximately 274 km of stream and are found in most streams in the drainage

Cutthroat Trout -- Cutthroat trout have been introduced throughout the Little Lost River Drainage Most of the cutthroat trout introduced into the drainage have been the Yellowstone subspecies. However, Westslope cutthroat trout were introduced into several lakes in 1988. Westslope cutthroat trout may have also been introduced into the drainage by early settlers from the Pahsimeroi River drainage. The current distribution of cutthroat trout is limited primarily to mountain lakes.

Guppy, Green Swordtail, Amelanic Convict Cichlids, Mozambique Tilapia, and Goldfish--Several species of tropical fish have been found in Barney Hot Springs and Barney Creek. Guppy, green swordtail, amelanic convict cichlids, and Mozambique tilapia were collected from Barney Hot Springs in September 1985 (Courtenay et al. 1987). At this same time, guppy, green swordtail, and amelanic convict cichlids were collected in Barney Creek immediately below Barney Hot Springs. These 4 species appeared to be present in brief checks of the hot springs in 1995 and 1997 Gamett 1999). Although goldfish were present in Barney Hot Springs in 1977 none were found in 1985 (Courtenay et al. 1987).

Table 22. Summary of waters and species stocked in the Little Lost River drainage (adapted from Idaho Department of Fish and Game stocking records).

Water	Species Planted
Badger Creek	rainbow trout, brook trout
Big Creek	rainbow trout, cutthroat trout, brook trout
Big Creek Lake #2	rainbow trout, cutthroat trout
Big Springs Creek	rainbow trout
Copper Lake	cutthroat trout
Deer Creek	rainbow trout
Dry Creek	rainbow trout, cutthroat trout
Dry Creek Reservoir	rainbow trout
Little Lost River (including Sawmill Creek)	rainbow trout, brook trout, cutthroat trout, mountain whitefish[a]
Mill Creek	rainbow trout, brook trout[b], cutthroat trout[b]
Mill Creek Lake	rainbow trout, cutthroat trout, grayling
Nolan Lake	golden trout
Shadow Lake #1 (lower)	cutthroat trout
Shadow Lake #2 (upper)	rainbow trout, cutthroat trout
Squaw Creek	brook trout[b], cutthroat trout[b]
Summit Creek	rainbow trout
Swauger Lake #1 (lower)	rainbow trout, cutthroat trout
Swauger Lake #2 (upper)	cutthroat trout
Uncle Ike Creek	brook trout
Wet Creek	rainbow trout, cutthroat trout

[a] These fish are recorded as "whitefish" from "MACKAY SALVAGE". Likely these were mountain whitefish salvaged from the Big Lost River drainage.

[b] The stocking records indicate that these fish were stocked into Mill Creek and Squaw Creek in Custer county. However, it is not clear if these particular species were stocked into these streams in the Little Lost River or another stream in Custer county with the same name.

Brown Trout -- Brown trout have not been documented in the Little Lost River drainage. However, they have reportedly been caught in the lower portion of the drainage in recent years (Will Marcroft, LRRD, personal communication).

Golden Trout -- There has been a single introduction of golden trout into the drainage. In 1986, 2,000 golden trout were introduced into Nolan Lake in the Wet Creek subdrainage. Due to the small, shallow nature of the lake, it is unlikely these fish survived. In October 1990, the lake was dry (Gamett 1999).

Mountain Whitefish -- Mountain whitefish may have been present in the drainage at one time. Mountain whitefish have not been found in fish collections completed in the drainage (Gamett 1999, Gamett 1990a, Gamett 1990b, Corsi and Elle 1989, Courtenay et al. 1987, Elle et al. 1987, Corsi et al. 1986, Corsi and Elle 1986, Ball and Jeppson 1978, Jeppson and Ball 1978, Andrews 1972, USR file data, UMMZ). However, this species was reportedly present in the Little Lost River in the early 1900's. James Waymire, a local resident, indicated that the Basinger family and other early residents of the valley reported catching whitefish in the Little Lost River near Wet Creek (personal communication). The last whitefish that Mr. Waymire knew of in the drainage was caught in 1939. These fish could either have been native or originated from introductions. On May 2, 1960, 500 whitefish from "MACKAY SALVAGE" were released into the Little Lost River. Likely these fish were mountain whitefish salvaged from the Big Lost River drainage. However, the lack of whitefish in recent sampling indicates the species has not persisted in the drainage.

Grayling -- In 1995, grayling were introduced into Mill Creek Lake. In July 1997, a 243 mm grayling was caught from the lake by an angler and turned into the Lost River Ranger District Office (Gamett 1999). This species may be able to reproduce in the lakes inlet, and a reproducing population may become established. Outmigration from the lake into lower Mill Creek cannot occur due to the lack of an overland connection between the lake and Mill Creek.

Birch Creek

Birch Creek provides a high catch rate supported by hatchery supplementation and a strong wild rainbow trout population. Birch Creek is a popular destination fishery for consumption oriented anglers. In 1987, catch rates averaged 1.5 fish/hour. Birch Creek is primarily a hatchery catchable fishery although a creel census during 1982 indicated a 46% wild rainbow contribution.

Medicine Lodge Creek

Estimated effort for Medicine Lodge Creek was 3,700 hours with a catch rate of 1.1 fish/hour in 1987. Estimated effort for the Medicine Lodge drainage was 5,300 hours with a catch rate of 1.1 trout/hour during 1982. Effort and catch rates were lower than those observed during 1963 (11,000 hours fished with 1.4 fish/hour). Rainbow trout comprised 94% of the fish harvest during 1982. Electrofishing surveys of the Medicine Lodge drainage have found good populations of cutthroat trout and brook trout present in several tributaries, although wild rainbow trout are the dominant species. Yellowstone cutthroat trout are also found in several Medicine Lodge Creek tributaries. Because of stocking efforts, whether or not they are definitively considered native is open to debate. The Medicine Lodge drainage has been managed on wild trout production since 1983 and under the wild trout regulation (2 trout possession limit) since 1998.

Beaver Creek/Camas Creek

This drainage includes Mud Lake, Beaver and Camas creeks as important waters. Good populations of wild rainbow and brook trout exist in most streams in the headwater areas. Brown trout fingerling releases have provided a limited fishery for larger trout in Camas Creek. Water conditions limit trout populations in the lower ends of these streams. Native cutthroat trout are found in minor numbers in headwater areas. Little comprehensive angler use and harvest information is available on streams in the Camas Creek drainage. Creel surveys have shown catch rates averaging 0.86 trout/hour and ranging up to 1.8 trout/hour in some tributaries.

Mud Lake originally contained large numbers of cutthroat trout. Presently, it supports a warmwater fishery with yellow perch (*Perca flavescens*), largemouth bass (*Micropterus dolomieui*), brown bullhead *(Ictalurus nebulosus*) and tiger muskie (*Esox lucius* x *masquinongy*). Nongame fish are abundant with Utah chubs (*Gila atraria*) and Utah suckers (*Catostomus ardens*) the major species. The lake supports a few hatchery rainbow trout, which move down out of Camas Creek, but the high summer temperatures, fluctuating water levels and low winter dissolved oxygen have greatly decreased the suitability for trout.

In 1988, introductions of tiger muskie were made into Mud Lake to create a trophy fishery while utilizing the nongame biomass available in the lake. Tiger muskies are sterile hybrids of northern pike and muskellunge, and will be managed through fingerling releases every three years. Bluegills were introduced from 1983-1985. No population has developed. From 1987-1989 black crappie introductions were made into Mud Lake to try to create a self-sustaining population. This effort was also unsuccessful.

Mud Lake has lacked a cold water fishery since water management changes in the early 1960's impacted Camas Creek and Mud Lake water quality. Experimental introductions of Lahonton cutthroat began in 1990 to evaluate this subspecies potential under existing high alkalinity and temperature conditions. Since introduction, Lahontan cutthroat have provided a limited, but consistent fishery, primarily during the winter ice season. Stocking of Lahontan cutthroat trout will continue.

Wildlife

Because of the vast remoteness, limited access, and small human population, the watersheds within the Closed Basin support relatively good populations of wildlife. The best population data are available for game species.

Threatened and Endangered Species

Bald Eagles are monitored in the Closed Basin as part of the National USGS Mid-winter Bald Eagle Survey. Results for Clark and Butte Counties for 2001 are in Table 23.

Table 23. Mid-Winter Raptor survey results for Clark and Butte Counties

(Reynolds, Unpubl. Data)

Jan 12, 2001	INEEL	Medicine Lodge	BIrch Ck	Craters & Big Lost	Little Lost	Camas NWR	Dubois & East1	Totals
Bald Eagle								
AD	4	1				2		7
IMM	2	2			2			6
UNK								0
TOT	6							6
Golden Eagle								
AD	3		2	1	2	3	1	12
IMM	2	1					1	4
UNK								0
TOT	5							5
UNK Eagle		1						1
Prairie Falcon		1	1		1			3
Peregrine Falcon								0
Gyrfalcon								0
Merlin								0
Kestrel								0
Rough-legged Hawk	43	7	4	6	14	3		77
Red-tailed Hawk		1						1
Ferrugious Hawk								0
Swainson's Hawk								0
Northern Harrier	3	1			1			5
Great-horned Owl								0
Short-eared Owl								0
Raven	78	4	3	48	4	5	9	151
Northern Shrike		1						1

Pronghorn Antelope

The Closed Basins of the Big Lost River, Little Lost River, Birch Creek, and Medicine Lodge Creek support antelope herds. The Bureau of Land Management and US Forest Service manage most of the land with limited private cultivated land occurring along the major stream corridors. Pronghorn occurring in these basins are seasonally migratory and during severe winters are forced on to the Snake River plain.

Antelope in the lower end of the Beaver Creek/Camas Creek drainage and east of Interstate 15 have productive summer range, but access to traditional winter range was blocked when Interstate 15 was built. Under current conditions this herd increases during light to moderate winters, but is decimated during hard winters. Antelope in the upper Beaver Creek drainage and its tributaries winter southeast of Dillon, Montana.

Population surveys have not been conducted for antelope in the Big Lost River Valley, Little Lost River Valley, Medicine Lodge Creek area, and Beaver Creek/Camas Creek area in many years. Populations declined during the harsh winter in 1988-89, however incidental observation indicates populations have rebounded. A herd composition and trend survey (Table 24) was conducted in Birch Creek during August 2000. Methodology described by Pojar *et al.* (1995) was followed except that the search unit size was increased to ensure that antelope were observed in most search units.

Table 24. Antelope Herd Composition and Trend Survey results for Birch Creek

Parameter	Observed	Estimate ± 90% CI
Total Pronghorn	426	612 ± 149
Doe Pronghorn	230	321 ± 72
Fawn Pronghorn	102	144 ± 31
Yearling Buck Pronghorn	57	84 ± 28
Adult Buck Pronghorn	37	63 ± 31
Fawns/100 Does	44	45
Bucks/100 Does	41	46

The 2000 raw count is comparable to the raw counts conducted during the early half of the 1980's (Table 25). Counts done during the 1980's concentrated on the area from Lone Pine north to Gilmore Summit on the west side of the valley and from Timber Canyon to Gilmore Summit on the east side of the valley.

Table 25. Birch Creek pronghorn production survey results, 1973-2000.

Year	Total	Bucks	Does	Fawns	Fawns 100 Does	Bucks 100 Does
1973	270	54	132	84	64	41
1974	364	73	164	127	77	45
1975	349	58	167	124	74	35
1976	283	80	127	76	60	63
1977	270	61	130	79	61	47
1978	379	80	153	146	95	52
1979	335	73	136	126	93	54
1980	377	96	147	134	91	65
1981	306	81	135	90	67	60
1982	577	139	282	156	55	49
1984	601	107	336	158	47	32
1986	608	114	345	149	43	33
2000	426	94	230	102	44	41
2000[a]	612	147	321	144	45	46

[a] Population estimate for all of Birch Creek basin.

Minor depredations on hay and grain crops are common during summer, but most are tolerated by landowners when they receive assistance from the Idaho Department of Fish and Game. Major depredation complaints are received during extremely dry years when pronghorn congregate on irrigated fields. Under these conditions the Department has been forced to authorize additional depredation hunts and to pay for crop and fence damage.

There were 555 hunting permits available in 2000 for antelope in the Closed Basins. Hunters harvested 362 antelope in 2000 for a 65% success rate.

Big Horn Sheep

The Closed Basins supported Rocky Mountain big horn sheep populations historically. By the early 1900s bighorn sheep were eliminated from most of the area and severely reduced in the remaining habitats. Vegetative changes due to livestock use on winter ranges, loss to disease and indiscriminate harvest by settlers and miners probably were the main causes of big horn sheep declines.

Habitats are diverse, generally mountainous types, with bighorn sheep summering mostly at higher elevations on alpine and subalpine ranges. The winter ranges are mostly sagebrush-grass or curlleaf mountain mahogany types where precipitation is low. The U.S. Forest Service (USFS) generally administers summer ranges, whereas the Bureau of Land Management (BLM) primarily manages the winter ranges.

Changes in land and livestock management practices have resulted in improved range conditions for bighorn sheep. Improved grazing management, water developments, controlled burns on bighorn sheep ranges, and closing or changing domestic sheep allotments to eliminate domestic-bighorn sheep contact could further improve conditions for bighorn sheep in this area.

Subsistence and indiscriminate harvest of bighorn sheep by early settlers and pioneering travelers was greatly reduced after establishment of the Idaho Department of Fish and Game in 1937. Some general bighorn sheep hunts were authorized through 1970, but since then all bighorn sheep hunts have been by permit only. Bighorn sheep in the Little Lost River basin and the Birch Creek basin are not hunted. Two permits are available to harvest bighorn sheep in the Lost River Range, which includes the Big Lost River basin. The hunting restrictions, along with improved habitat and re-introductions, have all contributed to increased bighorn sheep numbers.

In March 2001, five ewes ages 1.5 (4) and 4 (1) years old were sampled for disease infection on the Little Lost River basin side of the Lemhi Range. Preliminary results indicate 4 of the 5 sheep tested positive for Pasteurella infection and all 5 tested positive for lungworm (average 22, range 5-51, larvae/2.5 grams). All 5 sheep were radio marked and are being monitored periodically.

Populations of bighorn sheep in much of the Closed Basin subbasin are the result of previous transplanting efforts to replace populations extirpated several decades ago. Forty-five big horn sheep, trapped from the Whiskey Mountain, Wyoming, were released in Jaggles Canyon and Elbow Canyon of the Big Lost River basin in 1978 and 1980. Forty-one bighorn sheep trapped from Whiskey Mountain, Wyoming, were released in Badger and Uncle Ike Creeks in the Little Lost River basin in 1983 and 1984. Forty-one bighorn

sheep trapped from Panther Creek, Idaho, were released into Long, Skull, and Bloom Canyons of Birch Creek basin in four transplants between 1976 and 1982.

Aerial counts of the population in the Lost River Range (Table 26) include big horn sheep outside of the Big Lost River basin. Aerial counts of populations in the Little Lost River basin (Table 27) and the Birch Creek basin (Table 28) have generally been made in conjunction with aerial surveys for other big game animals. Ground observations have been reported on several occasions.

Table 26. Summary of Big Horn Sheep Populations in the Lost River Range, 1982-99.

			Rams					Legal	Total	Lambs:	Rams:
Year	Ewes	Lambs	I	II	III	IV	Uncl.	Rams	Sheep	100 Ewes	100 Ewes
1982-83	90	16	14	7	7	2	0	9	136	18	33
1983-86			No data collected								
1986-87	100	22	7	8	17	6	4	23	164	22	38
1987-91			No data collected								
1991-92	38	1	2	3	3	0	0	3	47	3	21
1992-93			No data collected								
1993-94	54	4	5	8	7	6	0	13	84	7	48
1994-99			No data collected								

Table 27. Summary of Rocky Mountain Bighorn Sheep Population Data for Little Lost River Valley, 1989-1999.

			Rams					Legal	Total	Lambs:	Rams:
Year	Ewes	Lambs	I	II	III	IV	Uncl.	Rams	Sheep	100 Ewes	100 Ewes
1989			No data collected								
1990			No data collected								
1991			No data collected								
1992			No data collected								
1993[a]	14	7	5[b]				0	0	26	50	36
1994			No data collected								
1995[c]	11	7	4[b]			4[b]	0	4	26	64	73
1996			No data collected								
1997			No data collected								
1998			No data collected								
1999			No data collected								
2000[d]	4	1	2								
2000[e]	5	2	1	5	3	0	0	3	14	40	140

[a] Incidental to aerial elk sightability counts, winter 1992-1993.
[b] Rams classified to sublegal and legal only.
[c] Incidental to aerial mule deer sightability survey, winter 1994-1995. The entire bighorn winter range was not surveyed.
[d] Only the area from South Creek around to the first canyon east of East creek was surveyed.
[e] Incidental to helicopter mountain goat survey of the entire Lemhi Range August 1-5, 2000.

Table 28. Summary of Rocky Mountain Bighorn Sheep Population Data for Birch Creek Valley, 1989-1999.

Year	Ewes	Lambs	Rams				Uncl.	Legal Rams	Total Sheep	Lambs: 100 Ewes	Rams: 100 Ewes
			I	II	III	IV					
1989	No data collected										
1990	No data collected										
1991	No data collected										
1992	11	6		5[b]		1[b]	0	1	23	55	55
1993[a]	14	8					12[c]		34	57	86
1994	No data collected										
1995[d]	27	16		6[b]		11[b]	0	11	60	59	63
1996	No data collected										
1997	No data collected										
1998	No data collected										
1999	No data collected										
2000[d]	8	0			6[c]						
2001[d]	4	0	7	0	6	0	0	6	17	0	325

[a] Ground classification of bighorn sheep coming onto bait - Goddard Face, winter 1992-1993.
[b] Rams classified to sublegal and legal only.
[c] Rams not classified, but some were legal.
[d] Incidental to aerial mule deer sightability surveys. The entire bighorn winter range was not surveyed.

Moose

Moose are widely scattered in the Closed Basins with few moose in the Birch Creek drainage to many moose in the Medicine Lodge creek area. In 1980, six moose were released near the North Fork of the Big Lost River. Reproduction has occurred, and additional transplants have augmented this population. Most transplants in the Closed Basins are incidental to moving a moose that was causing depredations on crops or creating a human safety concern in residential areas.

Habitats vary widely in the Closed Basins. The Big Lost drainage has extensive willow bottoms that provide good summer and winter habitat. Also, the moose population appears to be increasing and ranging throughout the coniferous zone in summer. Moose habitat in the Little Lost river valley and Birch creek valley are limited to discontinuous willow riparian areas. Habitat in the Medicine Lodge creek and Beaver/Camas creeks consists primarily of conifer/sagebrush ecotones and aspen. Riparian areas are limited and discontinuous. Habitat extends down major drainages that have willows. Improving riparian zone management would increase habitat quality and quantity in this area.

Population surveys usually are not conducted specifically for moose in the Closed Basins. Moose are counted incidentally (Table 29) during deer and elk sightability survey flights. However, an aerial survey for moose in the Camas Creek area (Table 30) was conducted during 1990-92. Incidental count information indicates moose populations are stable to increasing throughout the Closed Basins.

Table 29. Aerial survey results for moose in Medicine Lodge Creek.

Year	Bulls:Cows:Calves	Total
1984	No data	64
1991-92[a]	No data	117
1993-94[a]	No data	95
1994[b]	44:100:54	179
1999-2000[a]	No data	90

[a] Moose counted incidentally during elk sightability surveys.
[b] Survey flown specifically for moose.

Table 30. Aerial survey results for moose in Camas Creek area.

	1990 to 1991		1991 to 1992	
Inclusive Location	**Bulls:Cows:Calves**	**Total**	**Bulls:Cows:Calves**	**Total**
Humphrey to Spencer	73:100:55	25	---	14
Spencer to Rattlesnake Creek	25:100:75	24	---	23
Corral Creek to Spring Cr	5:100:47	29	---	7
West Camas Drainage	---	14	---	29
East Camas Drainage	---	9	---	4
Total		**101**		**77**

Complaints involving concerns for public safety or damage to haystacks, standing crops, and ornamentals occur throughout the year. Moose are hazed from areas if suitable moose habitat is readily accessible to the moose. Moose are tranquilized and moved to suitable moose habitat when moose are creating a human safety concern or continuously cause depredations.

Idaho Fish and Game offered 28 permits in the Closed Basin hunt areas in 2000. Hunters harvested 26 moose (all males) in 2000. Permits and harvest figures are considered a minimum count since hunting units overlap the Closed Basins subbasin and the Henry's Fork subbasin. Some harvested moose may have been reported in the Henry's Fork sub-basin summary.

Mountain Goats

Four distinct populations of mountain goats occur in the Closed Basins. These include the Pioneer Mountains, South Lemhi Range, Red Conglomerates, and Italian Peaks.

Mountain goats occupy the higher elevation peaks and ridges. Habitat in the Pioneer Mountains is discontinuous and appears less productive than other occupied mountain goat habitat in the Closed Basins. The two habitat components that are most limited are alpine meadow summer range and mountain mahogany stands for winter range. Tracks observed on aerial surveys indicate mountain goats in the Pioneer Mountains, either

solitary or in small groups, shift several miles to find suitable habitats following winter storms. Water may also be limiting in some parts of the summer range.

A helicopter survey was last conducted in the Pioneer Mountains during late August 1999 (Table 31). The total number of mountain goats counted in this area was nearly identical to the total accounted for on the next most recent survey (49 in 1992), but was only 54% of the total counted on the 1985 survey (92). However, the kid:adult ratio had improved to 25:100.

Table 31. Summary of Mountain Goat Surveys in Pioneer Mountains, 1982-Present.

Year	Hunt Area	Inclusive Location	Adults	Kids	Unknown	Total	Ratio Kid:100 Adult
1982[a]	Closed	Area[b]	13	3	0	16	23
1985[a]			9	2	0	11	22
1992[a]			13	0	0	13	0
1999[a]			26	4	0	30	15
1982[a]	50	Area[c]	37	8	0	45	22
1985[a]			66	20	6	92	30
1992[a]			45	4	0	49	9
1999[a]			40	10	0	50	25

[a] Helicopter survey.
[b] That portion of Unit 50 north and west of the Trail Creek Road and south and west of U.S. Highway 93.
[c] That portion of Unit 50 south and east of the Trail Creek road and south and west of U.S. Highway 93.

A population survey was flown in the Lehmi Range in the first week of August 2000. A total of 157 mountain goats with a kid:adult ratio of 26:100 was counted (Table 32). This total represents the historical high count for the area and was 105% higher than the next most recent count of 61 in 1992.

Population surveys were last conducted in the Red Conglomerates in late July 1994 (IDFG, 2001). The observed kid:adult ratio was 79:100, and no twin sets were identified. The 25 mountain goats counted represent a decrease of 46% from the previous survey (1986).

The Italian Peaks survey resulted in a total count of 128 mountain goats with 39 kids:100 adults (four sets of twins identified). This total represents an increase of 44% from the next most recent survey (1991) and is the most mountain goats ever counted in this area.

Idaho Fish and Game offered 11 hunting permits in Hunt Areas 51, 59, and 59A in 2000. Hunters harvested 10 mountain goats.

Table 32. Summary of Mountain Goats Surveys in Units 51, 59, and 59A, 1982-Present

Year	Hunt Area	Inclusive Location	Adults	Kids	Unknown	Total	Ratio Kid:100 Adult
1982[a,c]	51	Lemhi Range South of the	75	22	0	97	29
1986[a]		Big Timber Creek drainage	68	15	17	101	22
1987[b]			100	30	0	130	30
1992[a]			54	7	0	61	13
2000[a]			125	32	0	157	26
1986[a]	59	Red Conglomerates	32	14	0	46	44
1994[a]			14	11	0	25	79
1982[a]	59A	Italian Peaks	46	13	0	59	28
1986[a]			10	3	0	13	30
1991[b]			61	24	4	89	39
1994[a]			92	36	0	128	39

[a] Helicopter count.
[b] Ground count.
[c] Census results combined for Hunt Areas 51-1 and 51-2.

Elk

The Closed Basins sub-basin is comprised of portions of four (Pioneer, Lemhi, Beaverhead, and Island Park) Idaho Fish and Game's elk management zones (Figure 20). Management objectives vary with each zone. Elk management for the Island Park zone is reported in the Henry's Fork sub-basin summary and is not reported here.

The objective for the Pioneer zone is to stabilize elk herds at slightly reduced levels (about 4,200 cows and 1,350 bulls) to maintain herd productivity and to minimize potential impacts on mule deer. This zone will continue to be managed to produce very high bull:cow ratios (30-35 bulls: 100 cows postseason) and many mature bulls (18-22 age 3+ bulls:100 cows preseason).

The objectives for the Beaverhead Zone within the sub-basin (Hunt Units 58, 59, and 59A) are to maintain current herd levels (about 1,300 cows and 350 bulls). Herds will be managed to maintain 14-18 mature bulls:100 cows in Units 58, 59, and 59A. The objectives for that portion (Hunt Unit 51) of the Lemhi zone within the sub-basin are to maintain current herd levels (about 600 cows and 160 bulls). Herds will be managed to maintain 14 to18 mature bulls:100 cows in Unit 51.

Elk were in low abundance in the sub-basin through much of the 20th century. However, as has occurred over much of the west, elk herds have expanded dramatically since the mid-1970s.

About 4,000 people have hunted in the Pioneer Zone since adoption of the dual-tag zone system in 1998. Conservative bull harvest management has produced exceptional bull:cow ratios and a reputation for large mature bulls. The controlled bull hunts in this zone have become very desirable; rifle permits are in high demand and difficult to draw.

The area's reputation for many mature bulls has also made this zone a very attractive archery hunt.

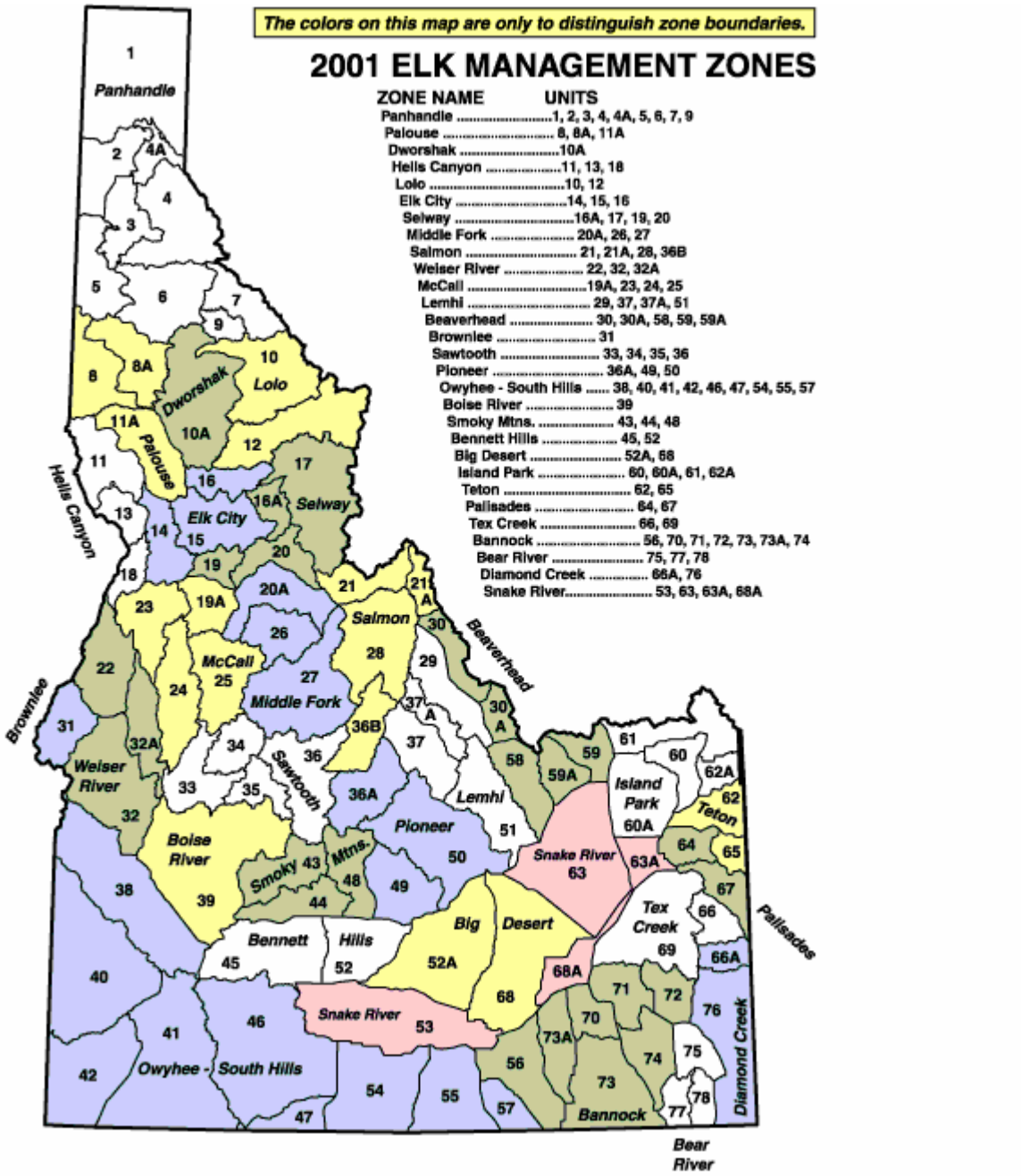

Figure 20. Idaho Hunting Units and Elk Hunt Zones, 2001.

Most of the Lemhi zone has been managed for decades under very conservative controlled hunt strategies. In 1993, Unit 51 changed from general any-bull management to general hunting for spike bulls with controlled any-bull permits.

In 1991, Units 58, 59, and 59A changed from general any-bull management to general hunting for spike bulls with controlled any-bull permits. Traditionally, elk in Units 58, 59, and 59A summered in Idaho and wintered in Montana; however, since the early half of the 1980s more elk are wintering in Idaho. In recent years, high elk densities have become a controversial issue with landowners and livestock grazers in both states.

Cattle ranching, livestock grazing, and recreation are the dominant human uses of the landscape in the sub-basin. The sub-basin is in a generally arid region where forage production can be strongly influenced by growing season precipitation. During drought years, high elevation mesic habitats are more heavily utilized by elk while low elevation riparian areas and wet meadows are more heavily utilized by cattle. Elk depredations on agricultural crops are common and are especially pronounced in dry years.

In some areas elk winter in mature stands of mountain mahogany, which appears to have become relatively stagnant and unproductive. Forests are slowly encroaching into shrub and grassland communities. The spread of noxious weeds such as knapweed and leafy spurge could ultimately have significant impacts on winter range productivity.

Changes in land ownership in Hunt Unit 50 are making it difficult to manage depredation problems. Elk wintering on windswept ridgetops in Hunt Units 59 and 59A are periodically subject to Oxytropis poisoning. Expanded irrigated agriculture, passage of legislation authorizing depredation payments, and legislation authorizing depredation hunts combined with increasing elk populations have led to more depredation complaints in Hunt Unit 51.

Recruitment measured through sightability surveys in the Pioneer zone indicate most populations are reproducing at moderate levels (30-40 calves:100 cows). In addition to high elk productivity, bull:cow ratios remain at very high levels (35+ bulls:100 cows).

Hunt Units 58, 59, and 59A show relatively stable populations. Calf production and bull:cow ratios have remained strong in this zone. Unit 51 elk herds remained stable in numbers and productivity through the most recent surveys (1993 and 1994).

Elk harvest within the Closed Basin Hunting Units averages more than 30%; that is, one out of every three hunters harvests an elk (Table 33).

Table 33. 2000 Elk Harvest Statistics for the Hunt Units within the Closed Basin Subbasin.

Unit	Total Harvest	# Hunters	Total Days Hunted	Avg Days/ Hunter	% Success[A]	# Bulls	% Spikes	% 6+ Pts.
50	603	1,488	8,264	5.6	40.5%	144	68%	5%
51	231	773	4,115	5.4	29.9%	53	63%	13%
58	112	317	2,002	6.3	35.4%	66	70%	0%
59	344	1,031	5,140	5.0	33.3%	73	100%	0%
59A	73	264	1,110	4.2	27.5%	33	100%	0%

[A] % Success = Total Harvest/#Hunters

Current high elk densities may be having some impact on deer populations. When elk numbers are high, as they are currently, livestock operators often perceive elk to be strong competitors for range forage and impacting of riparian areas. However, elk generally remove a minor portion of the forage compared to livestock, and elk tend to use different habitats and different forage species than livestock. During some winters elk move into Unit 63 and cause haystack depredations in the Monteview, Cedar Butte, and Beaver Creek areas.

Black bear densities appear to be low and stable, and have little impact on elk. Mountain lion densities are low to moderate and appear to have increased in recent years, probably due in part to increased elk densities. Coyotes are common, but not known to have much impact on elk populations. Wolves reintroduced by the USFWS in central Idaho in 1995 have become established in the Pioneer Zone. They may become a significant factor in elk distribution and population demographics and may displace other predators through competitive interactions.

No feeding of elk occurs in the Closed Basins.

Impacts of elk on mule deer winter range are occurring and may be a limiting factor for mule deer populations. The most productive elk herds are those maintained at a level well below carrying capacity (at which point recruitment equals mortality and there is no harvestable surplus). Better information is needed to identify the appropriate elk densities, which will maintain optimum productivity and harvest. Additionally, if wolves become a significant factor in elk ecology, better information regarding impacts to hunting opportunity would be beneficial. Better information on elk migration patterns is also needed.

Mule Deer

Idaho Department of Fish and Game's objectives for deer in the Closed Basins are to maintain a minimum of 15 bucks per 100 does in post-hunting season surveys and to maintain at least 30% four-point bucks in the harvest.

The BLM and Forest Service manage most of the land in the Closed Basins. Private lands are mostly restricted to the valley bottoms. Cattle ranching, livestock grazing and recreation are the dominant human uses of the land. The area is generally an arid region where forage production and deer harvest can be strongly influenced by growing season precipitation. Habitat ultimately determines deer densities and productivity. However, specific limiting factors within the habitat are poorly understood. In some areas, deer winter in mature stands of mountain mahogany, which appear to have become relatively stagnant and unproductive. Elk and livestock may have removed much of the mahogany canopy within reach of deer. Forests are slowly encroaching into shrub and grassland communities. The spread of noxious weeds such as knapweed and leafy spurge could ultimately have significant impacts on winter range productivity.

Traditionally, deer in the Italian Peaks, and Medicine Lodge area concentrate on winter ranges at the south end of the Beaverhead Range. Heavy snows in the late 1960s placed tremendous pressure on very narrow portions of these units, killing many browse plants. Winter range habitat condition is still poor to fair for may of the bitterbrush and mountain mahogany stands important to wintering deer.

Management objectives for the Birch Creek and Medicine Lodge area are not being met. (a minimum of 15 bucks per 100 does post-season and at least 30 percent of the buck harvest being ≥ 4 point). Composition counts resulted in an estimate of 11 bucks per 100 does and the percent ≥ 4 points in the buck harvest for 1998-00 was 26. Idaho Fish and Game began monitoring winter mortality of fawns in the Reno Point area during 2001.

Deer harvest in the Closed Basin Subbasin hunt units is skewed toward bucks (Table 34).

Table 34. 2000 Deer Harvest Data from the Closed Basin Subbasin Hunt Units.

Unit	Estimated # Harvest+C4	Male	Female	%4+ Pts	%5+ Pts	Rifle	Muzzle	Archery	% Whitetails
50	544	525	12	0	0	514	4	17	0
51	116	108	7	0	0	100	0	15	0
58	124	124	0	0	0	119	1	1	0
59	182	176	2	0	0	168	0	6	0
59A	73	73	0	0	0	69	0	1	0

Deer-elk interactions do not appear to be a problem in the Medicine Lodge and Birch Creek area. Deer and elk appear to use different winter and summer ranges. However, deer and elk interactions are not well understood. White-tailed deer, a potentially strong competitor, are mostly restricted to private agricultural lands along the major riparian areas. In some limited areas, mountain goats and mule deer may be competing for the same mountain mahogany winter ranges. Antelope and bighorn sheep also share the range but generally overlap little with mule deer. Livestock rangeland grazing, another potential source of competition, has generally been reduced in recent years, but is still a concern on the southern winter ranges.

Black bear densities appear to be low and stable and do not significantly impact deer numbers. Mountain lion densities are low to moderate. Coyotes are common and have an unknown impact on deer populations. Bobcats, red fox, and golden eagles also occur in the area but are not thought to cause significant predation on deer. Wolves recently introduced into central Idaho may become established in the Closed Basins and have some affects on other predators and on deer.

Survey data on mule deer herd sex and age composition and trends in deer numbers have been inadequate but are improving. Better information is needed to identify the appropriate deer densities to maintain optimum productivity and harvest. Although strong interstate movements have been suspected, very little information exists on migration patterns. Monitoring by telemetry of fawns in the Reno Point area will provide information on movement patterns of deer from this winter range.

Black Bear

The Idaho Department of Fish and Game's 2000-2010 Black Bear Management Plan set management objectives to maintain harvest levels (Table 35) consistent with the moderate

Table 35. Idaho Department of Fish and Game Black Bear Harvest for Years 1998 & 1999

Spring 99

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
50	5/31/99	F	6	RIFLE	NO	BAIT
50	6/7/99	M	3	RIFLE	NO	HOUND
50	6/6/99	M	3	RIFLE	NO	HOUND
51	6/2/99	M	3	PISTOL	NO	HOUND
58	5/31/99	F	2	RIFLE	NO	STALK
58	5/18/99	M	3	PISTOL	NO	BAIT
59A	6/4/99	M	0	MUZLDR	NO	BAIT

Fall 99

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
50	9/26/99	M	No data	RIFLE	NO	HOUND
50	10/19/99	M	No data	RIFLE	NO	INC
50	9/21/99	M	No data	BOW	NO	BAIT
50	9/15/99	M	No data	RIFLE	NO	STALK
51	10/30/99	F	No data	RIFLE	NO	INC
51	10/11/99	M	No data	RIFLE	NO	INC
58	10/10/99	M	No data	RIFLE	NO	INC
59	10/23/99	M	No data	RIFLE	NO	INC

Spring 98

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
50	6/4/98	F	0	PISTOL	YES	HOUND
50	6/7/98	M	0	RIFLE	NO	STALK
50	6/4/98	F	0	RIFLE	NO	INC
50	9/22/98	F	0	BOW	NO	BAIT
50	9/22/98	M	0	BOW	NO	INC
50	5/19/98	M	3	RIFLE	YES	HOUND
50	5/20/98	M	3	RIFLE	YES	HOUND
50	5/23/98	M	6	PISTOL	NO	HOUND
50	5/28/98	F	4	RIFLE	NO	BAIT
50	6/1/98	M	11	RIFLE	NO	BAIT
50	5/21/98	M	4	BOW	NO	HOUND
50	6/7/98	M	2	PISTOL	NO	HOUND
51	6/9/98	F	0	RIFLE	NO	STALK
51	5/30/98	F	17	RIFLE	YES	HOUND
51	5/31/98	M	6	RIFLE	YES	HOUND
51	5/20/98	F	2	BOW	NO	BAIT
51	5/31/98	F	10	BOW	NO	BAIT
51	6/7/98	M	1	BOW	NO	BAIT
51	6/7/98	M	2	RIFLE	NO	BAIT
58	6/4/98	F	3	RIFLE	NO	STALK
59	6/6/98	M	0	PISTOL	NO	BAIT

Fall 98

UNIT	DATE	SEX	AGE	WEAPON	GUIDE	METHOD
50	10/5/98	F	1	RIFLE	NO	INC
50	9/22/98	F	2	BOW	NO	BAIT
50	9/22/98	M	2	BOW	NO	INC
50	10/10/98	F	13	RIFLE	NO	INC
51	9/28/98	M	2	BOW	NO	BAIT
59	10/31/98	M	6	RIFLE	NO	BAIT
59	10/1/98	F	3	RIFLE	NO	STALK

harvest targets of 25-35% age 5+ black bears in the male harvest and 30-40% females in the total harvest over a three year running average. However, harvest criteria do not apply in the Closed Basins due to the low average annual harvest (<30 bears).

The sub-basin contains relatively dry black bear habitats where timber stands are generally distributed on moister north and east aspects. These habitats are marginal for black bear because they grow few berry producing shrub Black bear populations are vulnerable to harvest because the limited habitat is often isolated from adjacent black bear habitat.

Mountain Lion

The Little Lost valley (Hunt Unit 51), Birch Creek (Hunt Unit 58), Medicine Lodge (Hunt Unit 59 and 59A), and Camas Creek (portion of Hunt Unit 61) of the sub-basin supports few or no mountain lions. However, the Big Lost drainage (Hunt Unit 50) supports a moderate level mountain lion population.

Idaho Fish and Game manages harvest (Table 36) of mountain lions in the sub-basin under a general either sex take season between August 30 and March 31st. The take season is closed once 4 female mountain lions are harvested in Units 50 and 51 combined, and Units 58, 59, and 59A combined. If the quota is met before March 31, the remainder of the season becomes a pursuit only, dog-training season. Lions rarely, if ever, occur in Camas Creek (IDFG 2000).

Table 36. Summary of Closed Basin Mountain Lion Hunts and Harvest, 1973 - 2001

	Unit						SEASON
Year	50	51	58	59	59A	TOTAL	FRAMEWORK
73/74	0	0	0	0	0	0	GH
74/75	0	0	0	0	0	0	GH
75/76	0	0	0	0	0	0	GH
76/77	0	0	0	0	0	0	GH
77/78	0	0	0	0	0	0	GH
78/79	3	0	0	0	0	3	GH
79/80	1	0	0	0	0	1	GH
80/81	1	0	0	0	0	1	GH
81/82	3	2	0	0	0	5	GH
82/83	0	0	0	0	0	0	GH
83/84	1	0	0	0	0	1	GH
84/85	4	1	0	0	0	5	GH
85/86	0	0	2	0	0	2	GH
86/87	3	1	2	0	1	7	GH
87/88	5	2	1	0	0	8	GH
88/89	1	1	1	0	0	3	GH
89/90	7	4	0	0	0	11	GH
90/91	7	1	1	0	0	9	GH, Quota (3)
91/92	5	1	3	0	0	9	GH, Quota (3)
92/93	6	0	1	0	1	8	GH, Quota (3)
93/94	3	0	0	0	1	4	GH, Quota (3)
94/95	5	0	1	0	0	6	Quota (7)
95/96	4	1	2	1	1	9	Quota (7)
96/97	5	3	2	0	0	10	Quota (8)
97/98	6	0	4	0	2	12	Quota (9)
98/99	2	3	0	0	1	6	Quota (11)
99/00	4	3	1	1	0	9	Quota (20)
00/01	4	1	1	1	1	8	Quota (20)
Unit Total	80	24	22	3	8	137	

= No Take Season Offered

GH = General Hunt

Birds

Sage Grouse

Connelly (2001) recently summarized the past decade of sage grouse research in Idaho (Appendix D). Unless stated otherwise, information in this section comes from the Idaho Sage Grouse Task Force (1997). In 1996, the number of sage grouse in Idaho was at a record low. Management efforts directed at this native grouse are often fragmented between different agencies and landowners without common goals or direction. To provide improved cooperation among affected parties, in 1996 the Idaho Fish and Game

Commission sponsored development of a comprehensive, ecosystem-based plan for Idaho's sage grouse.

The Idaho Sage Grouse Task Force developed the Idaho Sage Grouse Management Plan. The task force was comprised of representatives from natural resource agencies and agricultural, sportsman, and conservation organizations. The Plan is designed as a framework for local working groups (LWGs) to develop site-specific programs to improve local sage grouse populations. This plan is expected to be in place until population goals are met in all Management Areas. It will be reviewed by the Statewide Sage Grouse Task Force at least annually and updated and revised as new information becomes available.

Sage grouse are dependent on large acreages (i.e., hundreds of thousands of acres) of sagebrush/grassland habitats that have a 15 to 25% sagebrush canopy cover and good grass and forb (flowering herbaceous plants) cover. Generally, sagebrush habitats provide critical winter range for sage grouse (i.e., grouse depend on these habitats exclusively during the winter and loss of these habitats will cause a loss of the sage grouse population). Similarly, sagebrush/grassland habitats provide critical breeding range for sage grouse and their loss will result in a loss of sage grouse. Meadows, riparian areas, alfalfa fields and other moist areas provide important summer range for sage grouse, but grouse will use a variety of habitats at that time of year. Sage grouse populations decline when sagebrush/grassland habitat is altered or fragmented by reducing or eliminating sagebrush canopy cover, seeded to introduced grass species, converted to agriculture dominated by annual grasses (e.g., cheatgrass), or altered in any way that results in significant reduction of the native grass/forb understory.

Sage grouse habitat quality and quantity has declined throughout southern Idaho and coincided with declines in sage grouse numbers. The reasons for habitat loss vary from site to site but include wildfire, agricultural expansion, herbicide treatments, prescribed fire and rangeland seedings. Data collected by the Interior Columbia Ecosystem Management Project (Quigley et al. 1997) shows that the amount of historical shrub-steppe habitat present in southern Idaho has declined dramatically. This loss of habitat has been especially large in the Upper Snake Ecological Reporting Unit (ERU) of eastern Idaho where 57% of the big sagebrush and 47% of the mountain big sagebrush habitat has been lost. The actual habitat for sagebrush-dependent wildlife has declined in about 78% of the Upper Snake ERU and 80% of the Snake Headwaters ERU.

Interested parties may form local working groups to develop local management programs on how to meet the needs of sage grouse and sage grouse habitat in their area. An important part of solving the habitat management problems is to work together closely so that all landowners and land managers are aware of the needs of local populations and how to meet them. A local working group is developing a plan that covers portions of the Closed Basins subbasin.

In Idaho, seventeen lek routes were counted in 2000; 12 in the Closed Basins in the Idaho Department of Fish and Game's Upper Snake region (Compton 2001; Table 37). Two of these routes were new in 1997 and 2 were new in 1998. Of the nine traditional routes, 5 had more grouse than 1999. The number of grouse counted on routes fluctuates from year to year due to previous year's production and other factors (such as weather conditions) relative to counting. Although most routes are showing an increase in grouse

since the early 1990s, two routes, lower Birch Creek and upper Birch Creek, have consistently had fewer grouse than historical counts. The reduced number of grouse counted on the Birch Creek routes may be due to a reduction in winter habitat caused by land conversion to agricultural crops in the Reno Point to Monteview area. The Lidy route is also being impacted by agricultural encroachment. Eight of the 16 leks on the Lidy route have been cleared of sagebrush since the early 1980's; the leks are now in alfalfa or fallow. The Jacoby route, which lost all the leks that existed in 1983, has had an increase of grouse since 1993. This suggests that the sagebrush habitat in the area lost in the extensive 1982 Sheep Station wildfire is beginning to meet sage grouse nesting/brood rearing needs.

Table 37. Sagegrouse Lek counts in the Closed Basin, 1991 – 2000.

Route		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	10-Year Average
Lower Birch Cr.	d	56	28	18	29	18	6	16	25	37	30	26
Medicine Lodge	e	71	67	25	67	50	35	32	96	129	159	73
Little Lost	f	126	87	57	57	79	48	77	67	131	157	89
Lidy	e	230	67	100	80	62	26	72	71	110	210	103
Upper Birch Cr.	d	3	0	0	0	4	8	13	11	17	19	7
Crooked Cr.	e	106	90	58	120	105	61	120	112	132	181	109
Sheep Station	e					83	88	131	110	162	213	131
Table Butte	b, e							70	185	129	165	137
INEEL	a,d					18	15	26	58	117	70	51
Tractor Flat	a,d					75	54	77	103	113	135	93
Lower Big Lost	c,f								62	74	50	62
Antelope Cr.	c,f								31	24	29	28
Totals		592	339	258	353	494	341	634	931	1,175	1,418	909
Average per route counted		99	57	43	59	55	38	63	78	98	118	76

a New routes established in 1995.
b New routes established in 1997.
c New routes established in 1998.
d Closed to hunting.
e 7 days 1 grouse per day season
f 23 days, 2 grouse per day season

Starting in 1996, sage grouse hunting season has been divided into three areas to study the affects hunting may have on populations. Lek route counts indicate that populations have

increased slightly in all 3 areas over the past 5 years. Check station data since 1995 reflects the reduced bag/possession limits with fewer hunters and fewer grouse harvested on opening weekend (Table 38).

Table 38. Check Station counts and telephone survey results for sagegrouse, 1991 – 2000

Check Station							Telephone Survey		
Year		**Bag and Possession Limit**	**Hunters**	**Birds**	**Birds Per Hunter Day**	**Hours Per Bird**	**Hunters**	**Birds**	**Birds Per Hunter Day**
1991	[a]	3-6	2,250	1,944	0.86	5.51	4,385	10,593	1.07
1992	[a,b]	3-6	1,561	1,121	0.72	7.10	3,660	4,990	0.63
1993	[a]	3-6	1,565	889	0.57	8.66	6,586	10,979	0.58
1994	[a]	3-6	1,634	1,131	0.69	7.22	3,765	8,728	0.76
1995	[a]	3-6	1,133	492	0.43	10.74	3,148	5,422	0.60
1996	[c]	1-2 & 2-4	432	202	0.47	7.56	1,543	2,536	0.59
1997	[c]	1-2 & 2-4	455	248	0.55	7.28	[d]		
1998	[c]	1-2 & 2-4	524	336	0.64	6.53	[d]		
1999	[c]	1-2 & 2-4	526	424	0.81	4.54	[d]		
2000	[c]	1-2 & 2-4	573	387	0.68	5.58			
10 Year Average			1,065	717	0.67	7.07			

[a] Season extended from 16 to 30 days.

[b] A toxic chemical spill on I-15 on opening day 1992 resulting in some hunters being missed at the Sage Junction check station.

[c] Season closed area 1; 7-day season area 2, bag-possession limits 1-2, 23- day season area 3, bag-possesssion limits 2-4.

[d] Telephone Survey data were not collected on the 1997, 1998, 1999 or 2000 seasons.

Area 1: Closed. Include all areas currently closed as well as parts of the Big Desert and Birch Creek.
Area 2: Seven day hunting season, 1 grouse per day and 2 grouse possession limit.
Area 3: Twenty-three day hunting season, 2 grouse per day and 4 grouse possession limit.
Statewide Falconry: Any areas without a gun season are also closed to falconry hunting.

Sharp-tailed Grouse

Sharp-tailed grouse wintering in the Camas Creek drainage were only recently discovered in the late 1990's. These are the only known sharp-tailed grouse to occur in the sub-basin. Surveys and monitoring for sharp-tailed grouse leks, nesting, brood rearing, and winter habitats and populations are needed.

Other game birds

Other native upland birds found in the Closed Basin are ruffed grouse and blue grouse. No data are available on populations or harvest for these species. Introduced game birds include Hungarian (Gray) partridge and pheasant. No data are available on populations or harvest for these species.

Waterfowl and Colonial Nesting Waterbirds

Camas National Wildlife Refuge, and the Idaho Department of Fish and Game Wildlife Management Areas at Mud Lake and Market Lake, provide nesting and migratory habitat for waterfowl and other waterbirds. Although Market Lake is in the Headwaters Subbasin, its proximity to Mud Lake and Camas make all three areas combined a significant refuge complex.

Camas NWR supports several pairs of nesting trumpeter swans and usually produces several cygnets annually. Mud Lake WMA currently has no nesting trumpeter swans, but potential exists for swans to start nesting there. Camas NWR has hosted as many as 100,000 pintails during spring migration. Camas NWR is an important nesting area for redheads, whereas Mud Lake WMA is the most important area for migrating snow geese in southeastern Idaho. As many as 40,000 snow geese spend over a month there each spring. Lesser numbers also use the area during fall migration. A wide variety of other waterfowl species use these areas for nesting and during migration including Canada geese and colonial nesting birds.

Colonial nesting species include white-faced ibis, snowy egret, great blue heron, black-crowned night heron, Franklin's gull, Forster's tern, black tern, and eared, western and Clark's grebes. Nesting shorebirds include killdeer, willet, black-necked stilt, American avocet, Wilson's phalarope, and long-billed curlew. Both areas support several pairs of breeding sandhill cranes and several hundred cranes stage at both sites each fall prior to migration. The riparian areas at Camas and Mud Lake attract large numbers of migrating songbirds in spring and fall.

Other Birds

Camas NWR attracts birds seldom seen elsewhere in Idaho (see Appendix E); the first records for several species of songbirds in Idaho were from Camas NWR. Because of the many songbirds and high concentrations of waterfowl and colonial nesting birds these areas attract large numbers of birder watchers. Both areas are designated as Important Bird Areas. Similarly, the Idaho National Engineering and Environmental Laboratory is a Nationally Important Bird Area, particularly because of its high number of nesting sagebrush obligates: Sage Sparrow, Brewer's Sparrow, and Sage Thrasher. The INEEL has had an aggressive program to monitor birds since 1985 when thirteen breeding bird survey routes were established. Generally over 5000 individual birds are observed, representing between 55 and 60 species, each year (Belthoff and Ellsworth, 2000). Mid-

winter raptor surveys (Table 23) have been conducted on the INEEL and throughout Clark and Butte Counties as part of the National USGS Mid-Winter Bald Eagle Survey.

Amphibians and Reptiles

Amphibians known or suspected to inhabit the Little Lost River drainage include the tailed frog (*Ascaphus truei*), Northern Leopard frog (*Rana pipiens*), Western toad (*Bufo boreas*), Pacific Chorus frog (*Pseudacris regilla*), Spotted frog (*Rana pretiosa*), and Long-toed salamander (*Ambystoma macrodactylum*). Tailed frogs are present and abundant in many streams within the study area (LLRITAT, 1998). In good water years, the Spadefoot toad (*Spea intermountana*),occurs in great numbers at the Big Lost River Sinks (Reynolds et al., 1986). Eleven species of reptiles are found on the INEEL (Table 39).

Exotics

Although exotic species are not a major factor in the Closed Basin, various exotic species (ie. starling, feral cat, red fox, raccoon) thrive in the sub-basin and directly displace native species by predation, and competing for nesting sites. There has been only limited success in introducing pheasants, partridge, and turkeys to expand hunting opportunities.

Table 39. Amphibians and Reptiles recorded at the Idaho National Engineering and Environmental Laboraotry

(Reynolds et al., 1986 and Cooper and Peterson, 1997)

ANURA
- Pelobatidae
  - Great Basin Spadefoot Toad, *Spea intermontana*[1]

SQUAMATA
- Iguanidae
  - Leopard Lizard, *Gambelia wislizenii*[2]
  - Short-horned Lizard, *Phrynosoma douglassi*
  - Sagebrush Lizard, *Sceloporus graciosus*
- Scincidae
  - Western Skink, *Eumeces skiltonianus*
- Boidae
  - Rubber Boa, *Charina bottae*
- Colubridae
  - Desert Night Snake, *Hypsiglena torquata*
  - Desert Striped Whipsnake, *Masticophis taeniatus*
  - Gopher Snake, *Pituophis melanoleucus*
  - Racer Snake, *Coluber constrictorr*
  - Western Garter Snkae, *Thamnophis elegans*
- Viperidae
  - Western Rattlesnake, *Crotalus viridis*

[1] Collins et. al. (1978) list this as *Scaphiophus intermontanus*
[2]. Collins et. al. (1978) place this in the genus *Crotaphytus*

Habitat Areas and Quality

Van Kirk (2001) developed a scheme for assigning conservation priorities and strategies for waters within the Greater Yellowstone Ecosystem (Table 40). The Beaver-Camas watershed is the only watershed in the Closed Basin Subbasin addressed. It is given a priority of 5 and a strategy to enhance scenic, recreational, and ecological values (Van Kirk, 2001).

Table 40. Criteria for assigning conservation priority and strategy to waters in the Greater Yellowstone Ecosystem

(Van Kirk, 2001).

Native salmonid status	Existing salmonid status	Hydrologic integrity	Priority	Strategy
good/fair	good/fair	good	1(p)	Preserve and protect
good/fair	good/fair	fair/poor	1(r)	Rehabilitate & restore ecological processes
poor	good	good	2	Preserve and protect
poor	good	fair/poor	3	Rehabilitate & restore ecological processes
poor	fair/poor	good	4	Maintain scenic, recreational, & ecological values
poor	fair/poor	fair/poor	5	Enhance scenic, recreational, & ecological values

Medicine Lodge and Beaver-Camas Creek

Unless stated otherwise, this section is from USDA BLM & USDA FS, 2001.
Based on *An Assessment of Ecosystem components in the Interior Colombia Basin and Portions of the Klamath and Great Basins, Volume III* upland areas across the basin have seen substantial changes in the fire regime, and invasion and spread of exotic plants from the historical conditions to the current situation A decline of approximately 42% of the Mountain Big Sage (*Artemisia tridentata vaseyana*) cover type has occurred, due to an increase in exotic forbs and the conversion to agricultural cover types (Quigley, et al 1997). Drought years in the Upper Snake ERU have been documented to occur less frequently (only 15% of the time for 1895-1994). As a consequence, the potential for restoration activities in the Upper Snake ERU is higher. The Medicine Lodge Subbasin has experienced trends consistent with these ICBEMP findings. Over the last 100 years, the invasion and spread of exotic plants has been noteworthy. Leafy spurge and knapweed have spread across all ownerships within this subbasin.

The rangelands in the Medicine Lodge and the small portion of the Beaver-Camas Subbasin are in relatively in good condition. Weed species are present throughout the subbasin, but for the most part do not occupy large acreages. Medicine Lodge Canyon and Deep Creek watersheds do have large infestations of weed acreages. The main noxious weed species present in the subbasin are: leafy spurge (*Euphorbia esula*), spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), russian knapweed (*Acroptilon repens*), canada thistle (*Cirsium arvesis*), scotch thistle (*Onopordum acanthium*), and black henbane (*Hyoscyamus niger*).

Vegetation in this subbasin has an overall sagebrush *(Artemesia spp*.) dominance in both visual aspect and percent ground cover. The particular species of sagebrush is dependent upon on-site soils, with low sagebrush (*A. arbuscula*) being found on shallow

and rockier soils, and big sagebrush (*A. tridentata* subspecies) being found on deeper and more productive soils. Where conifers are the dominant aspect, Douglas fir (*Pseudotsuga menziesii*) is the most common species.

The following upland plant species are some of the more commonly occurring species: four-wing saltbush (*Atriplex canescens*); winterfat (*Ceratoides lanata*); bitterbrush (*Purshia tridentata)*; crested wheatgrass (*Agropyron cristatum*); western wheatgrass (*Pascopyrum smithii*); bluebunch wheatgrass (*Pseudoroegneria spicata*); orchard grass (*Dactylis glomerata*); Idaho fescue (*Festuca idahoensis*; junegrass (*Koeleria cristata*); Indian ricegrass (*Oryzopsis hymenoides*); Nevada bluegrass (*Poa nevadensis*); Kentucky bluegrass (*Poa pratensis*); Sandberg bluegrass (*Poa secunda*; squirreltail (*Sitanion hystrix*); Columbia needlegrass (*Stipa columbiana*); and needle-and-thread grass (*Stipa comata*). Many annual and perennial forbs, too numerous to mention, would also receive grazing pressure.

Although present to some degree in the subbasin, cheatgrass (*Bromus tectorum*) is not considered to be a concern for spread due to total yearly precipitation (over 12 inches). This factor does not permit annual vegetation to overtake and dominate a site.

No plant species listed under the Endangered Species Act occur in the Medicine Lodge and Beaver Camas Subbasin. The following state and BLM sensitive plant species are found within the watershed: Two groove milkvetch (*Astragalus bisulcatus*), Drummond's milkvetch (*Astragalus drummondii*), blue grama (*Bouteloua gracilis*), Idaho sedge (*Carex parryana* ssp. *idahoa*), Centennial rabbitbrush (*Chrysothamnus parryi* ssp *montanus*), sepal-tooth dodder (*Cuscuta denticulata*), Yellowstone draba (*Draba incerta*), Giant helleborine (*Epipactis gigantea*), Green needlegrass and (*Stipa viridula*).

Significant Wetland Habitat Complexes

Camas NWR & Mud Lake WMA Complex--(Source: Southeast Idaho Wetland Focus Area Working Group, 2001)

This area includes the Camas and Beaver Creek drainages through Camas National Wildlife Refuge (NWR) to Mud Lake Wildlife Management Area (WMA). Mud Lake WMA is owned and managed by the Idaho Department of Fish and Game, while the Mud Lake Irrigation District owns the water. Camas NWR is owned and managed by the U. S. Fish and Wildlife Service. Camas NWR has water rights for groundwater pumping and withdrawal from Camas Creek.

Both areas have large areas of seasonal and wet meadow wetlands. Camas NWR and Mud Lake WMA are palustrine habitats consisting of a mix submergent and emergent vegetation. Mud Lake WMA is primarily submergent bed, while Camas NWR is primarily emergent. Both areas also have riparian strips of willow and cottonwood along wetland margins. Riparian areas along the banks of Camas and Beaver Creek are present, but typically only where they are owned and managed by public agencies. The Refuge and WMA both freeze over the winter and thus do not support wintering waterfowl. However, these areas are highly important for nesting and migratory birds (e.g., trumpeter swans and mallards) in the spring and fall.

Chilly Slough/Thousand Springs

The 5000 acre Chilly Slough/Thousand Springs wetland complex is located approximately 15 miles above Mackay Reservoir near the confluence of Sage Creek and the Big Lost

River. More than 130 bird species can be found here, half of them shorebirds and waterfowl, including Sandhill Cranes and trumpeter swans. The area also provides habitat for the rare rush aster, swamp willow-wort and marsh felwort. The nature conservancy purchased 1300 acres of private land within the complex. These lands were eventually transferred to BLM or Idaho Fish and Game for management. At lease 27 species of mammals, 6 species of reptiles, 3 species of amphibians, and 3 fish species inhabit Chilly Slough.

Watershed Assessment

Regional Scale Assessments

Regional-scale assessments of ecological or watershed conditions have been conducted recently in the Intermountain area that include the Closed Basin Subbbasin. These include highly detailed ecological analyses by federal land managers (the US Forest Service and Bureau of Land Management) during the Interior Columbia Basin Ecosystem Management Project (ICBEMP; Quigley1997) and a smaller Forest Service effort called the Inland West Watershed Initiative (IWWI). The ICBEMP evaluated current ecological conditions and trends at multiple spatial scales across the entire Columbia River Basin east of the Cascade Mountains of Oregon and Washington. Information provided by ICBEMP is now being used in support of a new cycle of federal land management planning. The IWWI effort assessed watershed and fish status at the sub-watershed level to construct spatial databases that could be used to examine patterns important to future conservation or restoration efforts. Unfortunately, this assessment seems to have lost direction and thrust and the data are not accessible. The ICBEMP assessment concluded that historic development of the ICRB over the last 150 years has greatly altered the ecological setting and processes to the detriment of many native species of fish and wildlife. Land and water use practices contributing to these changes included unrestricted or little-restricted livestock grazing, road construction, timber harvest and fire management, certain intensive agricultural practices, placer and dredge mining, dam construction, and stream channelization and dewatering. These watershed disturbances have caused risks to ecological integrity by reducing biodiversity and threatening riparian-associated species across broad geographic area. Findings relevant to the Closed Basin Subbasin concluded:

- aquatic diversity and resilience are dependent on the maintenance of complex habitats and networks of those habitats at multiple spatial scales
- conserving the remaining watersheds and habitats that have a high value for aquatic species is key to maintaining system integrity
- designated wilderness and roadless areas are important building blocks for aquatic restoration throughout the ICRB
- restoring or maintaining the integrity of river corridors bordered by private lands will be particularly important to conserving migratory salmonids because these corridors are essential to assuring habitat and population connectivity between areas of high integrity on federal lands

The Greater Yellowstone Coalition has conducted two significant regional-scale assessments encompassing all or part of the Headwaters Subbasin:

- Noss, Reed; Wuerthner, George; Vance-Borland, Ken; Carroll, Carlos. 2001. *A Biological Assessment for the Greater Yellowstone Ecosystem: Report to the Greater Yellowstone Coalition*. Bozeman, MT. This report will not be available until fall, 2001.
- Van Kirk, Rob. 1999. *Status of Fisheries and Aquatic Habitats in the Greater Yellowstone Ecosystem*. Project Completion Report for the Greater Yellowstone Coalition, Bozeman, MT.

The Beaver-Camas watershed is the only watershed in the Closed Basin covered by this report. Portions of the executive summary for this report follow:

> *The Greater Yellowstone Ecosystem (GYE) contains the headwaters of the Missouri, Snake and Green Rivers. Average annual discharge from the GYE into these rivers totals 16.2 million acre- feet (5,280,000,000,000 gallons). Furthermore, the rivers and lakes of the GYE are internationally famous for their recreational and scenic values. However, trends in aquatic species status and watershed condition in the GYE have not been quantified. The purpose of this study is to compile and analyze existing ecosystem-scale data on the condition of aquatic and riparian habitats and salmonid fishes. The specific objectives are to:*
>
> - *define the specific watershed units that comprise the GYE:*
> - *develop an ecosystem-wide database of watershed and aquatic resource information,*
> - *quantify the relative amount of existing information on watersheds in the GYE,*
> - *quantify the current status of native and nonnative salmonid populations in the GYE,*
> - *quantify the current status of aquatic habitat and watershed integrity in the GYE, and*
> - *develop strategies and priorities for conserving and restoring watersheds in the GYE.*
>
> *The GYE was defined to be the area centered around Yellowstone National Park that is bounded on the east by western edge of the Wyoming Basin ecoregion, on the south and west by the 4,900-foot elevation contour and the boundary of the Middle Rockies ecoregion, and on the north by an approximate east-west line running from the Jefferson-Madison-Gallatin confluence to the Yellowstone River confluence with Clarks Fork. The study area included all watersheds that lie partially or wholly within this area.*
>
> *Data from existing sources were compiled into a database. A percentile-ranked quantitative scale assessed the amount of information generated by seven different regional and national data collection projects in each of the study watersheds. The status of native and nonnative salmonid populations was evaluated with an index of biotic integrity quantifying distribution and abundance of trout and grayling in the GYE. Aquatic habitat and watershed status was evaluated with a percentile-ranked aquatic and riparian habitat index. Finally, conservation strategy and priority were determined based on the concepts that existing native species should be protected where they already exist in viable*

populations, that restoration be undertaken first in areas where it is possible to return species assemblages to historical condition without unreasonable efforts, that large high-integrity watersheds can act as sources of native species to recolonize adjacent second-tier watersheds as they are restored, and that some watersheds will never be restored to historical condition with any reasonable amount of effort. Results indicate:

- *Habitat quality is negatively correlated with percentage of the watershed comprised of cropland.*
- *Composite watershed integrity is highest in the core watersheds and decreases with distance east or west away from the core.*
- *The highest conservation priority for aquatic resources in the GYE is preservation and restoration of the core watersheds.*
- *Significant restoration opportunities exist for Yellowstone and Bear River cutthroat populations in the Upper Yellowstone, Salt, Teton, Idaho Falls, Willow Creek, Central Bear and Bear Lake watersheds.*

The study produces several ecosystem scale recommendations:

- *Conduct a more thorough ecosystem-scale study of the watersheds of GYE that includes large-scale assessment of riparian areas, an expanded invertebrate community inventory, an amphibian inventory, assessment of non-salmonid fishes, quantification of hydrologic alteration, and analysis of correlation among ecological integrity and land and water use.*
- *Develop an ecosystem-scale plan for preservation and restoration of native trout in the GYE.*
- *Work with agencies and other conservation organizations to preserve and restore the core watersheds of the GYE.*
- *Provide assistance to state and federal agencies in the GYE in the form of financial resources and facilitation of landowner involvement and interagency collaboration to implement on- the-ground restoration projects.*
- *Work with state and local governmental entities and community groups to develop and implement cost-effective conservation and restoration projects to benefit ecologically and economically important nonnative fisheries, low-elevation riparian habitats, and recreational, scenic and water quality resources near urban centers.*

Assessments Within the Subbasin

Several agencies have conducted assessments within the subbasin for different purposes and at different scales.

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality (DEQ) is responsible for assessing waters of the state. The Clean Water Act and EPA regulations direct that the state monitor and assess the physical, chemical, and biological integrity of water bodies. To accomplish this, DEQ has developed the Beneficial Use Reconnaissance Project (BURP) (Clark, 2001), and the Water Body Assessment Guidance (WBAG) (Grafe et al., 2000) program. Waters identified as impaired also undergo a more rigorous water quality subbasin assessment that incorporates all available information and focuses on the cause and extent of impairments for development of a Total Maximum Daily Load (TMDL) if necessary.

The purpose of the BURP program is to consistently provide the physical, chemical, and biological data necessary to assess the integrity and quality of waters. It relies heavily on macroinvertebrate sampling, habitat evaluation and measurement, bacterial sampling, and fish sampling. The BURP protocol closely follows EPA's *Rapid*

Bioassessment Protocols for Use in Streams and Rivers (Plafkin et al. 1989). BURP data also documents existing uses, which must then be designated and protected under Idaho's water quality standards. It is the goal of the state to re-monitor water bodies on a rolling five year schedule.

The WBAG was designed to use BURP data to answer questions about stream integrity, water quality, and beneficial use support status. It originally consisted of multi-metric indices for macroinvertebrates and habitat, qualitative and quantitative fisheries assessments, and evaluation of criteria exceedances. Assessments of BURP data collected from 1993 through 1996 were conducted to generate the 1998 list of impaired waters required under section 303(d) of the CWA. Revisions to the assessment methodology are currently underway that would allow the use of more types of data, revise the macroinvertebrate and habitat indexes, add a multi-metric fish index, revise the salmonid spawning beneficial use assessment, and add an interpretation of criteria exceedances in the assessments. The revised water body assessment methodology is expected to be completed in 2001 for use in the next 303(d) and 305(b) reporting cycles, and in ongoing TMDL sub-basin assessments.

IDEQ has completed the Little Lost River Subbasin Assessment (Essig et al., 1998) and the Little Lost River Subbasin TMDL: An Allocation of Nonpoint Source Pollutants in the Water Quality Limited Watersheds in the Little Lost River Valley. The former document, a required precedent to the latter, described physical, biological, cultural, watershed and stream characteristics; water quality concerns and status; and pollutant sources within the watershed. Following is a shortened version of the Executive Summary for the TMDL document:

> *Water quality, native fish populations and riparian habitat conditions have been an issue of concern in the Little Lost River watershed since the combined effects of flooding, wildfires, warm season grazing, introduction of exotic species and man-caused channelization and diversion have combined to alter sediment deposition, fish populations, and riparian vegetation along Sawmill Creek, Wet Creek and the Little Lost River. These surface waters are identified within the watershed as not supporting the beneficial uses of salmonid spawning and coldwater biota, and as important components of the Little Lost River bull trout recovery unit.*
>
> *Assessments by the Idaho Department of Environmental Quality (DEQ) have identified that water quality has been limited by deposition of sediment and elevated stream temperature due to streambank erosion and reduction of riparian vegetation. Previous assessments by the Bureau of Land Management (BLM) and U.S. Forest Service (USFS) have also identified the problems associated with water quality in the Little Lost River watershed.*
>
> *BLM and USFS management practices have been altered since the early 1980s to improve water quality and habitat conditions along the major streams in the watershed. Water quality and habitat conditions have shown improvement and it is expected that with continued riparian management beneficial uses will continue to be supported in Sawmill Creek and Wet Creek, and will ultimately be fully supported in the Little Lost River.*
>
> *The Clean Water Act requires that the state of Idaho identify water quality limited surface waters and develop a plan to restore beneficial use support to these waters. The Endangered Species Act requires that conservation plans be*

developed and implemented to restore bull trout populations to levels that insure their persistence in the Little Lost River Watershed.

DEQ has developed recommendations for the reduction of streambank erosion that would ultimately result in beneficial use support through improving streambank stability and subsequently riparian vegetation to reduce temperature. Sediment load reductions are quantified through streambank erosion inventories that estimate streambank erosion based on streambank conditions documented along several reaches of each stream. Instream sediment targets have been identified from literature values that are supportive of salmonid spawning and coldwater biota. These target values will be used to track the progress of streambank recovery and determine the need for additional management practices to improve water quality.

Streambank erosion must be reduced by an average of 61%, 62%, and 80% on the Little Lost River, Wet Creek and Sawmill Creek. This reduction of streambank erosion should result in a reduction of streambed fine sediment smaller than 6.35 mm (0.25 in) to the target level of 28% in areas suitable for salmonid spawning. These reductions incorporate an implicit margin of safety to assure restoration of beneficial uses and equate to streambank erosion rates expected at 80% streambank stability, which is considered natural background erosion within this TMDL. Monitoring will be conducted by land management agencies to determine the adequacy of reductions and management practices.

Figure 21 provides a snapshot of the TMDL document.

Water Body	Pollutants Addressed
Little Lost River	*Sediment, Temperature*
Sawmill Creek	*Sediment, Temperature*
Wet Creek	*Sediment, Temperature*

Hydrologic Unit Code	17040217
1998 Water Quality Limited Segments	Little Lost River, Sawmill Creek Wet Creek
Beneficial Uses Affected	Cold Water Biota Salmonid Spawning
Pollutants of Concern	Sediment, Temperature
Major Land Uses	Forestry, Agriculture
Sources Considered	Streambank/Road Erosion, Direct Solar Radiation
Area	963 sq. miles
Human Population (1990)	325

Figure 21. Little Lost River TMDL at a glance.

The Nature Conservancy

The Nature Conservancy has conducted conservation assessments of the "Vanishing Rivers" – the Big Lost River, Little Lost River, and Birch Creek Drainages in the Closed Basin which identified (a) conservation targets and goals, (b) threats to the conservation targets, and (c) potential strategies to abate these threats (Goodman, 1999).

USDI Bureau of Land Management and USDA Forest Service

These agencies combined resources to develop the Draft Medicine Lodge Subbasin Review (USDI BLM & USDA FS 2001). The purpose of this review was to effectively manage risks to the ecosystem and capitalize on opportunities to conserve and restore them. The review identifies management issues and characterizes resource attributes based on their status (condition), risks and opportunities within the watershed. The review prioritizes watersheds, and identifies where more detailed analysis (i.e. watershed analysis, site specific project, or NEPA Plan Amendment) is needed. The review defines recommendations that should initiate projects on high priority watersheds.

The objectives of this review were to:

- Assess resource status (conditions) and risks and opportunities.
- Understand how subbasin review area fits into the broad-scale, and prioritize for finer scale analysis needs.
- Identify resource data gaps at the mid-scale or finer scale.
- Use a collaborative interagency approach that prioritizes by consensus. A Core Team (internal BLM and USFS specialists) and a Collaborative Team (Points of Contact of the Core Team, other agencies and interested stakeholders) can be used. The Core Team combines the dual agency resource specialists to review the resource attributes over all BLM and FS lands together. The Collaborative Team advises, reviews and steers the Core Team in issue identification, resource attribute choices and the method of and final prioritization. The Core Team provides the science and empirical knowledge base, while the Collaborative Team ensures the issues and resource attribute lists are adequate and that desired priorities and recommendations are carried forward.

Several significant concerns were identified (Table 41).

Table 41. Significant Medicine Lodge Watershed Resource Issues

Resource Heading	Attribute	Issue
Human Uses	Recreation Use	Public interaction with bison on public land
Human Uses	Motorized Access	Demand is increasing for motorized access on public lands
Riparian and Wetland Veg./Stream Channel	Riparian-Wetland/Stream Channel Functionality	Streams and riparian-wetland functions have been altered
Watershed and Water Quality	Water Quality	Degraded stream channels and streambanks along some streams continue to impair water quality
Fisheries	Fishery Habitat Integrity	The composition, distribution, density and status of fish populations have changed significantly over the 20th century
Fisheries	Competition from Exotic Species	Special Status Species, e.g., Yellowstone Cutthroat Trout, are declining due to rainbow and brook trout
Wildlife	Wildlife Disturbance	Open roads and trails and the recreational use during critical seasons affect wildlife
Wildlife	Wildlife Connectivity/Core Habitat	Core wildlife habitat, at least one half mile or greater from motorized access or development is critical to some species
Wildlife	Special Status Species	Special status species do exist in this subbasin
Soils	Soil Erosion and Loss	Accelerated soil erosion occurs through water and wind erosion
Soils	Soil Erosion and Loss	Soils prone to mass wasting occur and are active in the watershed
Soils	Soil Erosion and Loss	Soil compaction occurs in the watershed, especially when soils are moist
Rangeland/Weeds	Rangeland Health Condition	There has been an overall reduction in herbaceous species
Rangeland/Weeds	Rangeland Health Condition	There has been an increase in decadent stands of sagebrush
Rangeland/Weeds	Weeds	There has been an expansion of existing noxious weeds
Rangeland/Weeds	Weeds	There is a high potential for invasion by new weed species
Forest	Forest Stand Condition	Tree density has increased
Forest	Change in Forest Ecosystem Disturbance Regimes	Structural diversity has decreased
Forest	Change in Forest Ecosystem Disturbance Regimes	Growth rates have decreased

USDI Bureau of Land Management, USDA Forest Service, and Idaho Department of Fish & Game

Several agencies cooperated to produce comprehensive document: History and status of fishes in the Little Lost River Drainage, Idaho (Gamett 1999). This includes a compilation of information formerly in agency files and other unpublished literature. The purpose of this was to present a complete description of the history and status of fish populations in the Little Lost River drainage in one publication so that information is easily accessible to resource managers. The abstract of this document follows:

> *Data relating to fish populations in the Little Lost River drainage were gathered between 1992 and 1999. During this time, fish population data were gathered from 171 stream sections. One-hundred-thirty-five sites were sampled by electrofishing, 27 by visual observation, 6 by a combination of electrofishing and visual observation, 2 by hook and line, and 1 by snorkeling. Four-hundred-ninety-one km of perennial stream, 40 km of perennial stream/marsh, 2,453 km of intermittent stream, 17 lakes, 1 reservoir, 3 dysfunctional reservoirs, and several private ponds were found in the drainage.*
>
> *Literature reviews and field work indicate 11 species of fish and 2 hybrids have been documented in the Little Lost River drainage. These include bull trout Salvelinus confluentus, brook trout Salvelinus fontinalis, rainbow trout Oncorhynchus mykiss, cutthroat trout Oncorhynchus clarki, rainbow trout x cutthroat trout Oncorhynchus mykiss x Oncorhynchus clarki, brook trout x bull trout Salvelinus fontinalis x Salvelinus confluentus, grayling Thymallus sp., shorthead sculpin Cottus confusus, guppy Poecilia reticulata, green swordtail Xiphophorus helleri, amelanic convict cichlid Cichlasoma nigrofasciatum, Mozambique tilapia Tilapia mossambica, and goldfish Carassius auratus. Mountain whitefish Prosopium williamsoni have not been found in fish collections completed in the drainage. However, local residents indicate whitefish were present in the Little Lost River in the early 1900's. Although brown trout Salmo trutta have not been documented in the basin, they have reportedly been caught by anglers in the lower end of the drainage. A single introduction of golden trout Oncorhynchus aguabonita did not establish a population.*
>
> *Although bull trout are widely distributed in the drainage, their distribution is fragmented. Data collected during the present study indicate bull trout occupy approximately 164 km of stream and are the only salmonid present in approximately 32 km of stream. Both resident and fluvial populations are found in the drainage. Threats to bull trout populations in the drainage include high stream temperatures; hybridization, competition, and predation by exotic brook trout; disruption of migratory corridors; sediment; loss through irrigation ditches; artificial migration barriers; angler harvest; and loss of cover and habitat complexity.*
>
> *Rainbow trout are the most widely distributed fish species and were found in most streams in the drainage. Although brook trout are widely distributed in the drainage, they are only abundant in a few stream reaches. Although cutthroat trout are present in mountain lakes, only 2 fish captured from streams during the study appeared to be pure cutthroat trout.*

The shorthead sculpin appears to be the only sculpin species present in the drainage. It appears some factor or combination of factors (possibly high stream gradient) is limiting their distribution. With the exception of Williams Creek and Horse Creek, shorthead sculpin were absent from streams not currently connected to the drainage net.

Little Lost River Interagency Technical Advisory Team

Prepared for the local citizens groups, including the citizens of Howe, the Little Lost River Key Watersheds Bull Trout Problem Assessment (Little Lost River Interagency Technical Advisory Team, 1998) was mandated by the governor's Bull Trout Conservation Plan. (Batt, 1996). The executive summary of the assessment follows:

The purpose of this Bull Trout Problem Assessment for the Little Lost River and its tributaries is to characterize present conditions with regard to bull trout and the habitat that this species utilizes and to identify the threats to populations in key watersheds. The Problem Assessment is based on existing data compiled by land and resource management agencies and facilitated by private landowners. The status of bull trout populations is characterized according to their strength and potential in relationship to the environment where they are found.

Identification of the best remaining habitats and populations strengths facilitates protection and restoration of bull trout in the Little Lost Key Watershed through identifying threats from past land use activities, and potential future land use. Management practices are recommended that will protect the best populations and habitats that remain. Population and habitat combinations that can be enhanced to make the best contributions to existing populations are identified and recommendations are made to strengthen the overall health of bull trout populations in the key watershed while ensuring the econimic viability and diversity of the region.

Significant threats to bull trout populations include connectivity of important spawning and rearing tributaries with the main Little Lost River and the presence of brook trout that compete directly with bull trout for scarce resources. Additionally, habitat for spawning and rearing of bull trout has been impacted by increased sedimentation and warming of stream temperatures beyond the optimal range of tolerance.

Management practices with regard to land and resource use as well as structural and maintenance improvements to diversions exist to improve conditions for bull trout in the Little Lost watershed. This Bull Trout Problem Assessment has the potential to fucus (sic) the efforts of the land management agencies and private land owners to facilitate additional improvements on a cooperative and voluntary basis. The objective is to effectively improve conditions for native bull trout, however aquatic species including resident rainbow trout would also benefit from improved management practices that benefit bull trout.

U.S. Geological Survey,

One of the aspects which relates the Closed Basin Subbasin to the rest of the Upper Snake River province is the underground connection via the Snake River Plain Aquifer. The US Geological Survey at the Idaho National Engineering and Environmental Laboratory has had a program to evaluate the aquifer and impacts of the DOE operations

on the aquifer for over 50 years. A bibliography of USGS publications at the INEEL is in Appendix F. The USGS effort is summarized in: Geohydrology of the Idaho National Engineering and Environmental Laboratory, Eastern Snake River Plain, Idaho (http://water.usgs.gov/pubs/FS/FS-130-97/), repeated below.

Background

In 1949, the U.S. Atomic Energy Commission, which later became the U.S. Department of Energy, requested that the U.S. Geological Survey (USGS) describe the water resources of the area now known as the Idaho National Engineering and Environmental Laboratory (INEEL; Figure 22). The purpose of the resulting study was to characterize these resources before the development of nuclear-reactor testing facilities. The USGS since has maintained a monitoring network at the INEEL to determine hydrologic trends and to delineate the movement of facility-related radiochemical and chemical wastes in the Snake River Plain aquifer. This fact sheet, summarized from two published reports (Anderson and others, 1996; Bartholomay and others, 1997), describes the geohydrology of the eastern Snake River Plain at the INEEL.

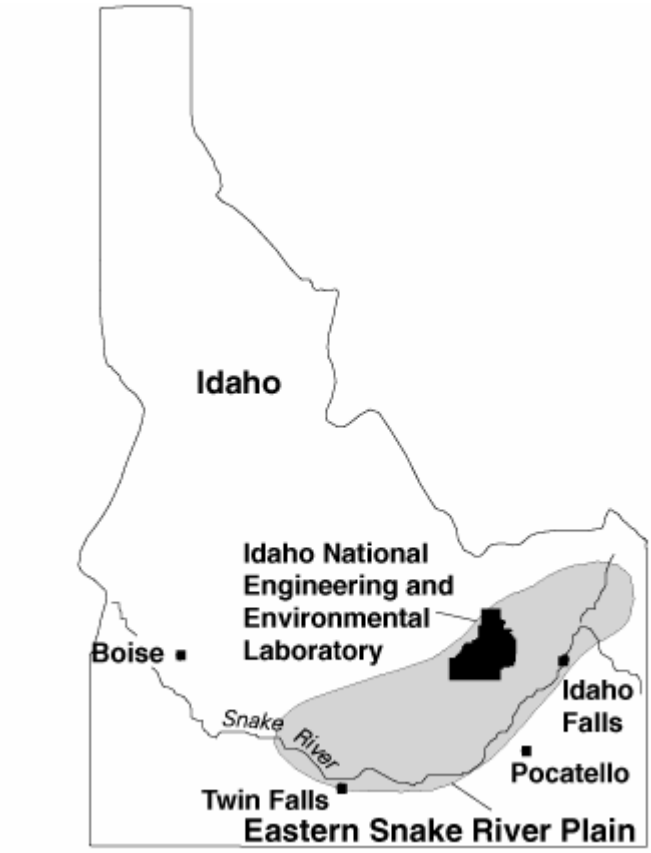

Figure 22. Location of the INEEL and Eastern Snake River Plain.

Recharge

The Snake River Plain aquifer is one of the most productive aquifers in the United States (U.S. Geological Survey, 1985, p. 193). Recharge to the Snake River Plain aquifer is principally from infiltration of applied irrigation water, infiltration of streamflow, and ground-water inflow from adjoining mountain drainage basins. Some recharge may be from direct infiltration of precipitation, although the small amount of annual precipitation on the plain (8 inches at the INEEL), evapotranspiration, and the great depth to water (in places exceeding 900 feet) probably minimize this source of recharge.

The Big Lost River (Figure 23) drains more than 1,400 square miles of mountainous area that includes parts of the Lost River Range and Pioneer Range west of the INEEL. Flow in the Big Lost River infiltrates to the Snake River Plain aquifer along its channel and at sinks and playas at the river's terminus. To avoid flooding at the INEEL facilities, excess runoff has been diverted since 1958 to spreading areas in the south-western part of the INEEL, where much of the water rapidly infiltrates to the aquifer. Other surface drainages that provide recharge to the Snake River Plain aquifer at the INEEL include Birch Creek, Little Lost River, and Camas Creek.

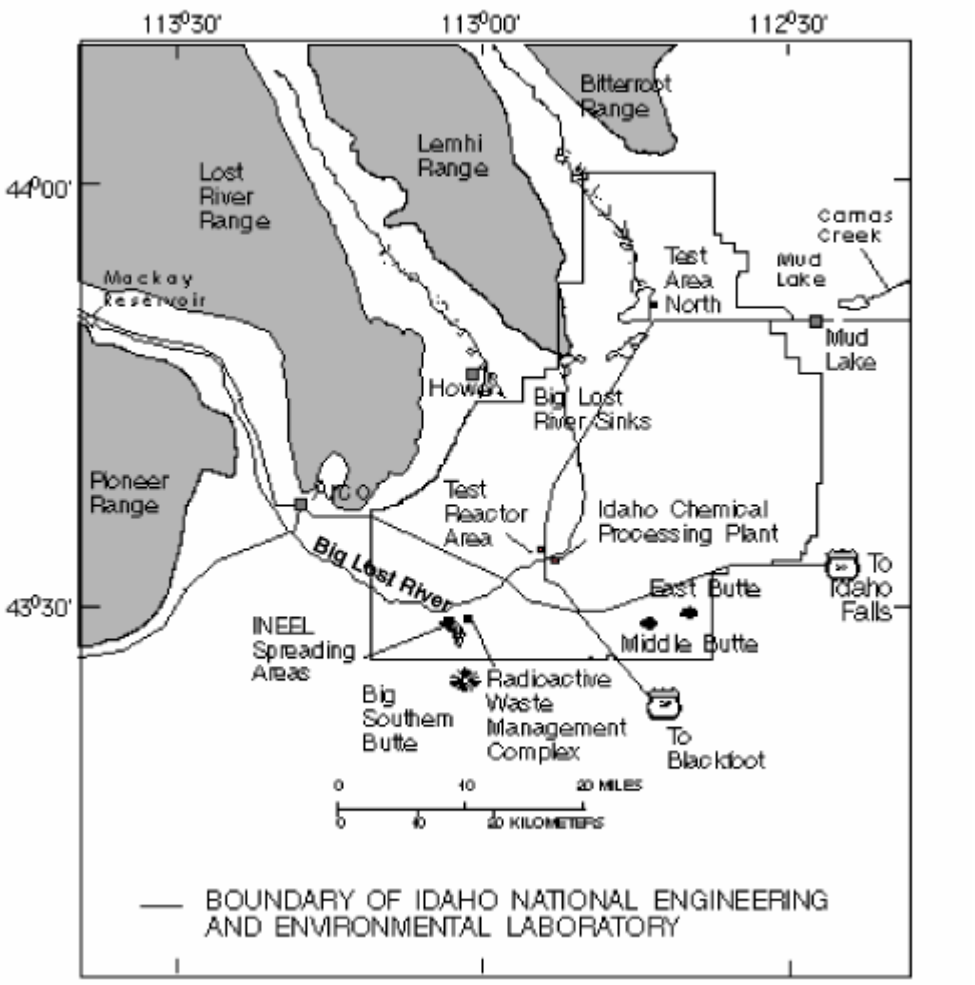

Figure 23. Location of various geological features and facilities on and near the INEEL.

The average streamflow in the Big Lost River below Mackay Reservoir (Figure 23) for the 79-year period of record (water years 1905, 1913-14, and 1920-95) was 222,900 acre-feet per year (Brennan and others, 1996, p. 217). During 1992-95, streamflow in the Big Lost River below Mackay Reservoir ranged from 125,900 acre-feet (56 percent of average flow) during the 1992 water year (Harenberg and others, 1993, p. 178) to 310,000 acre-feet (139 percent of average flow) during the 1995 water year (Brennan and others, 1996, p. 217). Streamflow recorded for the Big Lost River near Arco during 1993 and 1995 was 10,610 and 84,880 acre-feet per year, respectively.

Before 1989, recharge to the Snake River Plain aquifer downstream from Arco was substantial because of infiltration of streamflow from the Big Lost River channel, diversion areas, sinks, and playas. For example, measured infiltration losses at various discharges ranged from 1 to 28 cubic feet per second per mile (Bennett, 1990, p. 1). Combined discharge in the Big Lost River below the INEEL diversion near Arco and the INEEL diversion at its head near Arco was 7,777 acre-feet per year in 1993 (Harenberg and others, 1994, p. 210, 212) and 80,080 acre-feet per year in 1995 (Brennan and others, 1996, p. 221, 223). No streamflow occurred in the Big Lost River downstream from Arco during 1992 and 1994.

Geologic Framework of the Snake River Plain Aquifer

The Snake River Plain aquifer consists of a thick sequence of basalts and sedimentary interbeds filling a large, arcuate, structural basin about 200 miles long and 50 to 70 miles wide in southeastern Idaho. The INEEL is on the west-central part of the eastern Snake River Plain. The INEEL is underlain by hundreds of basalt flows, basalt-flow groups, and sedimentary interbeds; basalt makes up about 90 percent of the volume of deposits in the unsaturated zone and the aquifer in most areas. A basalt flow is a solidified body of rock that was formed by a lateral, surficial outpouring of molten lava from a vent or fissure (Bates and Jackson, 1980). A basalt-flow group consists of one or more distinct basalt flows deposited during a single eruptive event (Kuntz and others, 1980). All basalt flows of each group erupted from the same vent or vents and have similar ages, paleomagnetic properties, potassium contents, and natural-gamma emissions (Anderson and Bartholomay, 1995). The basalt flows, which locally are altered (Fromm and others, 1994), consist mainly of medium- to dark-gray vesicular to dense olivine basalt. Individual flows are as much as 100 feet thick and in places are interbedded with cinders and thin layers of sediment. Sedimentary interbeds, which are most abundant between flow groups, accumulated on the ancestral land surface for hundreds to hundreds of thousands of years during periods of volcanic quiescence. Sedimentary interbeds are as much as 50 feet thick and consist of well to poorly sorted deposits of clay, silt, sand, and gravel. In places the interbeds contain cinders and basalt rubble.

Ground-Water Flow

The basalt and sediment underlying the INEEL are saturated at depth and together form the Snake River Plain aquifer. Depth to water at the INEEL ranges from about 200 feet below land surface in the northern part to about 900 feet in the southern part (Ott and others, 1992); the general direction of ground-water flow is northeast to southwest at an average hydraulic gradient of about 4 feet per mile. The effective base of the aquifer at the INEEL generally coincides with the top of a thick and widespread layer of clay, silt, sand, and altered basalt that is older than about 1.6 million years

(Anderson and Bowers, 1995). The top of this layer ranges in depth from 815 to 1,710 feet below land surface in the western half of the INEEL. The effective saturated thickness of the aquifer ranges from about 600 feet near Test Area North to about 1,200 feet near the Idaho Chemical Processing Plant and the Radio-active Waste Management Complex (fig. 2). Saturated thickness in the eastern half of the INEEL may be greater than 1,200 feet. Hydraulic properties of the aquifer differ considerably from place to place depending on saturated thickness and the character-istics of the basalt and sediment. In places, the basalt and sediment in the uppermost part of the aquifer yield thousands of gallons per minute of water to wells, with negligible drawdown (Ackerman, 1991). Hydraulic data for the basalt, sediment, ash, and tuff underlying the aquifer are sparse, but data from a deep test well indicate that these deposits are relatively impermeable compared with the aquifer (Mann, 1986). Localized zones of perched ground water, the upper which are attributed mainly to infiltration of water from unlined percolation ponds and recharge from the Big Lost River, are present in basalt and sediment overlying the Snake River Plain aquifer (Cecil and others, 1991).

Water in the Snake River Plain aquifer moves prin-cipally through fractures and interflow zones in the basalt. A significant proportion of the ground water moves through 200 to 800 feet of basaltic rocks (Mann, 1986, p. 21). Ackerman (1991, p. 30) reported a range of transmissivity of basalt in the upper part of the aquifer from 1.1 to 760,000 feet2 per day. The hydraulic conductivity of underlying rocks is 0.002 to 0.03 feet per day, several orders of magnitude smaller (Mann, 1986, p. 21).

Ground water moves southwestward from the INEEL and eventually is discharged to springs along the Snake River downstream from Twin Falls, 100 miles southwest of the INEEL. About 3.7 million acre-feet of ground water was discharged to these springs in 1995.

U.S. Department of Energy and INEEL M&O Contractors

The Idaho National Engineering and Environmental Laboratory has produced many environmental assessments, mostly driven by the NEPA process, and related to construction or industrial activities. These have little bearing on the Closed Basin fish and wildlife and habitat resources.

Other agency assessments within this subbasin include:

- Hansen, P. et al, 1993-1999. Unpublished Riparian Inventories and Health Assessments. Reports for the BLM–Idaho Falls Field Office located at Idaho Falls, ID, the University of Montana, Missoula, MT, and at rwrp@forestry.umt.edu.
- Hansen, P. 1997. A Preliminary Riparian Habitat Type Classification System for the BLM Districts in Southern and Eastern Idaho. University of Montana, Missoula, MT. 381pp.
- Hansen, P., R.D. Pfister, K. Boggs, B.J. Cook, J. Joy and D. Hinckley. 1995. Classifcation and Management of Montana's Riparian and Wetland Sites. Montana Forest and Conservation Experiment Station, School of Forestry, Missoula, MT. 646pp.
- IDFG, 1989. Federal Aid in Fish Restoration, Job Performance Report, Project F-71-R-12. Region 6 Rivers and Streams Investigations, Big Lost and Little Lost Rivers, and Birch Creek and Medicine Lodge Creek Surveys. Idaho Department of Fish and Game. 79pp.

- Traher, Elliott, 2001. Unpublished Private Land Stream Inventories within the Medicine Lodge Watershed: Stream Visual Assessment Summaries, Proper Functioning Condition and Stream Erosion Control Inventories.
- USDA-FS, 1996. Status of the Interior Columbia Basin, Summary of Scientific Findings. Gen. Tech. Rpt. PNW-GTR-385. Portland, OR. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station.
- USDI-BLM, 1985. Medicine Lodge Proposed Resource Management Plan and Final EIS. Idaho Falls District, Idaho. U.S. Government Printing Office #1985-0-593-051/25,000. 120pp.
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- USDI-BLM and USDA-FS, 1999. Lemhi River Subbasin Review. Upper Columbia-Salmon Clearwater District, Lemhi Resource Area and Salmon-Challis National Forest, Leadore Ranger District. 130 pp.
- Gamett, B.L. 1999. The history and status of fishes in the Little Lost River Drainage, Idaho. Idaho Department of Fish and Game, Idaho Falls, Idaho.
- Little Lost River Interagency Technical Advisory Team. 1998. Little Lost River key watershed bull trout problem assessment.
- Lost River Ranger District. 1997. Sawmill Canyon watershed analysis. Lost RiverRanger District, Mackay, Idaho.
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- Patla, S., K.K. Bates, M. Bechard, E. Craig, M. Fuller, R. Howard, S. Jefferies, S. Robinson, R. Rodriguez, and B. Wall. 1995. Habitat Conservation Assessment and Strategy for the northern goshawk for the State of Idaho.
- Dolan, P.M. Saving all the pieces. Idaho Interagency Conservation/Prelisting Effort. Common Loon, *Gavia immer*, Habitat Conservation Assessment (HCA) and Conservation Strategy (CS). Idaho Department of Fish and Game, U. S. Fish and Wildlife Service, U.S. Forest Service.
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Major Limiting Factors

Within the Subbasin

Habitat

The ICBEMP (Quigley 1997) which focuses primarily on rangeland health, lists soil loss through water and wind erosion as the primary concern for the Upper Snake ERU. Salty soils, alkaline and clayey soils are not a problem in this particular subbasin. Macrobiotic surface crusts are present but not a lot is known about the surface management relationships with these crusts. The Draft Medicine Lodge Subbasin Review (USBLM & USFS, 2001) identified several significant soil-related factors:

- Mass wasting is a potential on certain soils within certain watersheds.
- Water erosion on soils is greater than 5 tons/acre/year, especially on burned areas and the steep slopes of the subbasin's drainage areas.
- Wind erosion on soils is greater than 5 tons/acre/year on the southern sandy soil near Mud Lake.
- Soil compaction on roads and livestock trails, especially when soils are moist, is significant.

Another serious issue throughout the subbasin is the presence and potential for increased noxious weed infestation. The main noxious weed species present in the subbasin are: leafy spurge (*Euphorbia esula*), spotted knapweed (*Centaurea maculosa*), diffuse knapweed (*Centaurea diffusa*), russian knapweed (*Acroptilon repens*), canada thistle (*Cirsium arvesis*), scotch thistle (*Onopordum acanthium*), and black henbane (*Hyoscyamus niger*)

Other significant concerns (mostly related to nearly a century of fire suppression) related to forested lands include:

- Tree density (number of trees per acre) has increased.
- Structural diversity has decreased.
- Growth rates have decreased.

The Natural Resource Conservation Service, which focuses mostly on agricultural sustainability and production, has encountered many limiting factors despite efforts to preserve and improve habitat through various programs (Weaver, In litt.). One of the programs, the USDA Conservation Reserve Program (CRP), has provided and improved habitat for upland game birds and wild life. Agriculture practices tend to create monoculture type food sources with limited seasonal availability. Although these croplands often provide high value food sources, they are only available for a portion of the year. Tillage practices and installation of sprinkler systems for improved irrigation water management has reduced the availability of year-round food supply and security in some wildlife habitats. Habitat limitations include:

- Unscreened irrigation delivery systems.
- Sedimentation, upland and instream habitat disturbances.

- Loss and degradation of functional riparian areas and wetlands.
- Elevated summer water temperatures.
- Increased developments in agriculture areas resulting in habitat fragmentation,
- Reduced streambank vegetation and stability.

In years of low snowpack, instream flows and reservoir storage is used to fulfill irrigation water rights impacting the quality and quantity of water. Drought conditions affect bank stability and habitat quality. The invasion of noxious weeds often displaces desirable vegetation and provides less nutrition and cover for wildlife.

Aquatic Resources

Primary factors which affect or threaten aquatic resources in the Little Lost River (Gamett, in litt).

- Habitat degradation and fragmentation. Major factors contributing to habitat degradation and fragmentation include livestock grazing, water development (irrigation and hydropower), and roads and trails.
- Exotic species. Brook trout have replaced at least two bull trout populations and appear to be replacing at least two more populations. If brook trout are able to invade additional streams, the consequences for bull trout could be catastrophic.
- Whirling Disease. Major declines in several fish populations have occurred in the last 15 years despite significant improvements in fish habitat. Whirling disease is a likely cause.
- Housing Development. Although this is not currently a problem in the Little Lost River basin, it could easily become one in the near future.

Several factors appear to affect the distribution and/or abundance of bull trout in the Little Lost River drainage. These include high stream temperatures; hybridization, competition, and predation by exotic brook trout; disruption of migratory corridors; sediment; loss through irrigation ditches; artificial migration barriers; angler harvest; and loss of cover and habitat complexity. Significant threats to bull trout populations include connectivity of important spawning and rearing tributaries with the main Little Lost River and the presence of brook trout that compete directly with bull trout for scarce resources. Additionally, habitat for spawning and rearing of bull trout has been impacted by increased sedimentation and warming of stream temperatures beyond the optimal range of tolerance (LLRITAT, 1998).

A more detailed explanation of limiting factors follows:

- High stream temperatures appear to be the most significant factor (Gamett 1999). Rieman and McIntyre (1993) found that water temperatures greater than about 15°C appear to limit bull trout distribution. Stream temperature data collected in 1997 in the Little Lost streams indicates that approximately 50% of all fish bearing streams had stream temperatures exceeding 15°C for 50 days or more (Gamett 1999).
- Exotic brook trout appear to pose a significant threat to bull trout in the Little Lost River drainage. Hybridization, predation, and competition between bull trout and introduced species can negatively impact bull trout populations (Rieman and McIntyre 1993). These authors believed that hybridization between brook trout and bull trout could lead to the elimination of bull trout (Gamett 1999).

- Migratory corridors are stream reaches that connect mainstem adult habitat reaches to headwater spawning and nursery streams. The most important migratory corridors in the Little Lost River drainage are the Little Lost River between Summit Creek and Smithie Fork, and Wet Creek from the Little Lost River to Big Creek. Bull trout appear to be using both of these reaches to move between the mainstem and headwater streams. Diversions and other instream alterations have disrupted these corridors in past (Gamett 1999).
- Loss of bull trout through irrigation ditches may negatively affect populations. In the Little Lost River drainage, there are numerous diversions that divert all or a portion of the stream for irrigation and/or hydroelectric uses. However, the number of bull trout lost through irrigation ditches is not known (Gamett 1999).
- Angler harvest has likely impacted bull trout populations in the Little Lost River drainage. Prior to 1994, anglers could harvest up to 6 bull trout per day. In 1987, bull trout comprised 53% of the fish caught by anglers in the Sawmill Creek reach of the Little Lost River (Corsi and Elle 1989). Seventy-one percent of the bull trout caught were harvested. In 1994, bull trout harvest was closed in the drainage. However, illegal angler harvest may still be impacting bull trout populations. Bull trout and brook trout can be difficult to distinguish. This likely results in anglers accidentally harvesting bull trout (Gamett 1999).
- Bull trout require a high level of stream channel complexity, complex cover being an important element (Rieman and McIntyre 1993). Stream channels and cover in most headwater streams appear to be moderately to highly complex. Headwater tributary streams such as Smithie Fork have particularly complex cover and stream channels, large woody debris being an important component. On the Little Lost River between Warm Creek and Summit Creek past channelizing, heavy grazing, stream bank erosion, and stream meandering have led to a relatively homogeneous stream channel with little to no cover.
- Sediment is likely impacting bull trout spawning success in some streams. R1/R4 stream habitat data indicates that surface fines are less than 25% in most bull trout spawning streams (Gamett 1999). However, some bull trout spawning streams such as Redrock Creek, Wet Creek upstream from the old diversion above Hilts Creek, and Badger Creek above Bunting Canyon Creek had surface fines of 65%, 52%, and 37%, respectively. This level of sediment is likely having a negative impact on bull trout spawning success. In addition, other streams that could potentially support bull trout spawning also have high sediment levels. For example, bull trout were not found in Basin Creek and juvenile bull trout were not found in Quigley Creek. Basin Creek (which also has high stream temperatures) had 68% surface fines and Quigley Creek had 32% surface fines (Gamett 1999)

The Little Lost River Key Watershed Bull Trout Problem Assessment (LLRITAT 1998) concluded:

- Elevated stream temperatures are likely the most limiting factor for bull trout currently in the Little Lost River Key Watershed.
- Brook trout compete for resources and hybridize with bull trout.

- Current fishing regulations are adequate, but are not always correctly followed. Many anglers may have trouble correctly identifying bull trout.
- Current monitoring programs have produced much information. However, much additional data is needed. The expansion of monitoring efforts, especially long term monitoring, is needed.
- Culvert barriers exist in the Little Lost River Key Watershed and are a limiting factor (distribution, forage, genetic) to bull trout. More potential culvert barriers than have been identified in this problem assessment are suspected.
- Fine sediment is the primary physical pollutant of concern in the Little Lost River Key Watershed.
- Forestry BMPs have been effective in protecting stream side vegetation, reserve tree quality and quantity and minimizing excessive temperature in streams in the upper most reaches of the watershed.
- Grazing BMPs should be implemented over a wider area, particularly within riparian areas. Allotment reviews are a good process to assess livestock compatibility with bull trout.
- Monitoring of grazing forage and riparian habitat has been limited in the Little Lost River key watersheds. Residual vegetation in upper Sawmill Canyon should be increased to reduce overland erosion.
- Grazing livestock is having significant impacts to streams in the Little Lost River Key Watershed, particularly with regard to stream bank stability and riparian vegetation.
- Riparian restoration efforts must be expanded throughout the watershed.
- In roaded areas within the Little Lost River Key Watershed BMPs must be implemented to reduce sedimentation of streams.
- Introduced hatchery fish pose a minimal disease risk to bull trout.
- Overwintering habitat is critical to bull trout persistence.
- Recreation activities have had some effect on bull trout populations and habitat. Wet unsurfaced roads are particularly vulnerable to activities such as, hunting, fishing, and other recreation.
- Removal or modification of existing barriers will reconnect good habitat.
- Roads contribute sediment to streams in the Little Lost River Key Watershed, and insufficient maintenance exacerbates the problem.
- If irrigation diversions are increased in bull trout areas, increased negative impacts will occur to bull trout.
- Only voluntary and cooperative projects will be evaluated through the Little Lost River Bull Trout Problem Assessment with regard to private property issues including conservation easements, improved irrigation efficiency projects and improved irrigation diversion structure implementation.

Primary factors which affect or threaten aquatic resources in the Big Lost River (Gamett, in litt) include:

- Habitat degradation and fragmentation. Major factors contributing to habitat degradation and fragmentation include livestock grazing, water development (irrigation and hydropower), and roads and trails.

- Whirling Disease. Major declines in several fish populations have occurred in the last 15 years despite significant improvements in fish habitat. Whirling disease is a likely cause.
- Housing Development.

Primary factors which affect or threaten aquatic resources in the Medicine Lodge Drainage (USDI BLM & USDA FS, 2001) include:

- Streams and riparian-wetland functionality have been altered. This affects water quality, soil erosion, availability of ground water reserves, flash flood potential, fish and wildlife habitat, especially Yellowstone cutthroat trout and other sensitive species which have the potential of being listed under the Endangered Species Act. Functionality of streams also affects livestock forage and water, recreational opportunities, archeological and cultural resources and educational opportunities. Riparian-wetland functionality is important for the health of the overall watershed, natural vegetative communities, tribal treaty interests and the long term economic stability of the Medicine Lodge area.
- Degraded stream channels and streambanks along some streams have in the past, and continue to, impair water quality. The extensive change in stream riparian/wetlands from beaver-dominated systems to degraded stream channels and banks, accompanied by more intensive land management activities, have lowered water tables, stressing and limiting riparian/wetland vegetation and has increased sediment delivery and water quality pollutants primarily through streambank erosion.
- The composition, distribution, density and status of fish populations in the watershed have changed significantly over the 20th century. This is due in part to dramatic changes in entire riparian and wetland community types as the result of land use activities in the subbasin. Aquatic habitat degradation appears to be a direct result of the general transition from "wet" community types to the drier facultative wetland and upland community types. This transition has resulted in reduced channel stability and subsequent channel incisement. This reduced channel stability has in turn caused aquatic/fishery habitat degradation resulting in changes in fish population dynamics.
- Special status species. The Yellowstone cutthroat trout was petitioned for listing as threatened under the Endangered Species Act in 1998. Interbreeding and competition with introduced species (i.e. rainbow trout and brook trout) is clearly a key factor in the decline and current status of Yellowstone cutthroat trout within the Medicine Lodge Subbasin. Griffith (1988) reported that cutthroat trout are less likely to coexist with brook trout than any other non-native salmonid. Brook trout populations are expanding within the Medicine Lodge Subbasin.

Wildlife

Camas-Mud Lake Wetland Complex

The two prevalent conservation issues in the Camas-Mud Lake Complex consist of water quantity and water quality. Water supply is the main issue facing the long-term conservation of wetland habitats in this complex. The majority of surface water within Camas Creek, as well as in the surrounding Snake River Basin, is primarily dedicated for

irrigation of agricultural lands. This limits the amount of surface water that the Refuge can use for maintaining wildlife habitat. Hence, the Refuge relies heavily on pumping groundwater to the surface to supply wetlands with water. However, ground water pumping above Camas NWR may be lowering the water table on the Refuge, making it difficult to maintain wetlands within the bounds of budget and water rights. At Mud Lake WMA, uncontrollable and unseasonable flow surges are resulting in periodic flooding of emergent wetland areas, wet meadows, and grasslands. These areas are heavily used for nesting and the high flows frequently damage or destroy nesting attempts in these areas.

Water quality is slowly degrading within Camas Creek. This is primarily from upstream channelization, erosion of stream banks, and subsequent deposition of silt within Camas NWR wetlands. Wetlands are natural sediment filters. However, excessive sediment loading can result in the filling of deeper wetlands essential for diving waterfowl.

Another issue is the spread of noxious weeds. Invasive plant species (especially Russian Knapweed) are degrading many wet meadow habitats in Camas NWR and Mud Lake WMA.

Throughout the Closed Basin Subbasin

- Habitat Loss, Degradation, and Fragmentation -- Changes in wildlife habitat may limit some wildlife species and/or allow non-native wildlife species to increase. Conversion of native habitats to agricultural fields, urban and rural human population areas, non-native vegetation (ie. converting sagebrush range to non-native grasses) decrease or eliminate wildlife habitat in quality and quantity. Roads, powerlines, residential development, agricultural development, and wildfires fragment or remove habitat. Forest habitats are changing due to lack of natural fire regimes. Noxious weeds are displacing native plant species. In some areas, non-native plantings (ie. conservation reserve program fields) do provide habitat for some wildlife species (sharp-tailed grouse). Studies are necessary to determine if native habitats are declining in productivity. Over abundance of livestock grazing and grazing by native species may be degrading native habitats.
- Species Competition, and Exotic/Non-native Species -- Various exotic species (ie. starling, feral cat, red fox, raccoon) thrive in the sub-basin. Exotic species directly displace native species by predation, and competing for nesting sites. Change in habitats (conversion of native ranges to agriculture and urban areas) support non-native species (ie. red fox and raccoon). Wildlife and livestock interactions create conflict by direct competition for resources, potential disease transmissions, and through public perception. Game farms pose potential disease transmission to wild animals.
- Water Quality, Stream Flows, Ground Water -- Water quality can be a limiting factor for amphibians. Regulated stream flows affect riparian corridors (Merigliano 1996) that provide wildlife habitat. Shape of flows released from dams may increase sediment movement and streambank erosion, as well as displace and increase the mortality of young of the year fish. Pumping of water from the aquifer may be diminishing ground water levels and impacting spring flows. Development of springs, piping of small streams, and development of hydropower on small streams have decreased or eliminated riparian and fish habitat.

- Recreation -- The number of people, type of use, and amount of time, using wildlife habitat for recreational purposes are increasing in the sub-basin. Disturbance by recreational activities may displace wildlife. Recreational disturbance may include but not limited to, motorized and non-motorized use, winter recreation, and water related recreation.

The Draft Medicine Lodge Assessment (USDI BLM & USDA FS, 2001) identified two significant limiting factors applicable throughout the subbasin:

- Motorized access routes or developments should be at least one-half mile from core wildlife habitat, including forest, range and riparian components.
- Open road and trail use by recreationists, including relative cross country snowmobile use levels, especially during critical seasons will affect wildlife species.

Outside the Subbasin

Without question, the most significant factor which will continue to affect all natural resources within the Columbia Basin is the bourgeoning human population in the Pacific Northwest.

Artificial Fish Production

The Idaho Department of Fish and Game has nearly two dozen fish hatchery operations throughout the state (Figure 24). The Mackay hatchery is the only one located in the Closed Subbasin (Figure 25).

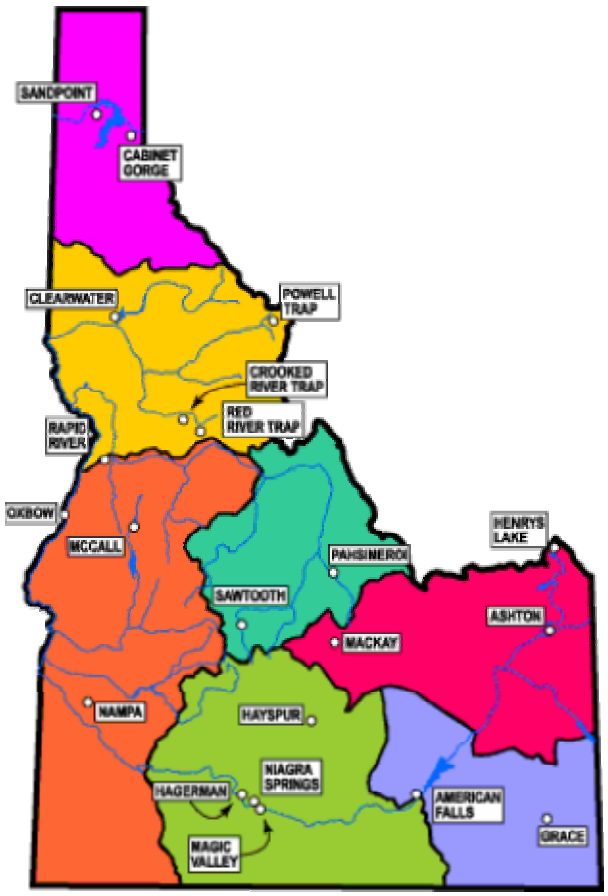

Figure 24. Idaho Department of Fish and Game Fish Hatcheries in the State of Idaho.

Anadromous species

There is no artificial production of anadromous species in the Closed Basin.

Non-anadromous fish production

The Mackay Fish Hatchery is a fish production facility located approximately 16 miles north of Mackay, in Custer County, Idaho (Figure 25). The hatchery produces fish of various species and strains from 1 to 16 inches in length, for statewide distribution. These include:

Rainbow Trout (*Oncorhynchus mykiss*)

- Arlee (Ennis NFH, MT) 3 year classes
- Kamloops (Troutlodge, WA)
- Eagle Lake (Troutlodge, WA)
- Fish Lake (Troutlodge, WA)
- Hayspur sterile (Hayspur SFH) (2 year classes)

Cutthroat trout *O. clarki*

- Henry's Lake (Henrys Lk. SFH) 2 year classes
- Yellowstone (Jackson NFH, WY) 2 year classes
- Rainbow x cutthroat trout hybrids
- Henry's Lake cutthroat females x Hayspur SFH rainbow males

Kokanee salmon *O. nerka kennerlyi*

- Early (Deadwood Res) 2 year classes
- Early (Strawberry Res, UT)
- Late (Blue Mesa Res, CO)

Grayling *Thymallus thymallus*

Figure 25. Location of the Mackay Fish Hatchery.

Water for hatchery production is provided by three collection springs in an artesian area at the hatchery. The water volume available for hatchery production remains consistent from year to year. Flows range from 18 to 24 cubic feet per second (cfs). Lowest flows occur during February, while highest flows occur during July. Since the 1983 earthquake, temperatures have varied between the three different springs supplying the hatchery; but average around 52° F. Fish from this and other state hatcheries are stocked in various Closed Basin Streams (Appendix H).

Existing and Past Conservation Efforts

BPA Funded

To date, no mitigation or other BPA funds have been invested in conservation efforts in the Closed Basin.

Non-BPA Funded

Conservation Easements

Protected areas include lands which, due to legal status or formalized conservation arrangements, are secure from degradation, uncontrolled development, and other threats. Areas in the Closed Basin are protected by agency designations (e.g. Reserves, Wildlife Management Areas, etc.) addressed above under Major Land Uses – Protected Areas, and

private actions, mostly through the conservation efforts of non-profit organizations such as the Teton Regional Land Trust and The Nature Conservancy.

Teton Regional Land Trust

The Teton Regional Land Trust (TRLT) works with large properties to protect priority fish and wildlife habitats. Stream corridors in the Beaver/Camas Creek, Medicine Lodge Creek and Birch Creek drainages are of premium fish and wildlife value owing to the relatively arid nature of the landscape. The large, undeveloped shrub steppe and forested habitat support high numbers of elk, deer, antelope, and moose. Sage grouse and sharp-tailed grouse are species of special concern within the area. Very significant populations of these species area found in the area. Many other wildlife species are also found here, including some species one might not suspect, such as rare bats that roost in isolated sink holes and caves.

To date TRLT has protected nearly 3,400 acres in this area. We will continue to focus on these large landscapes as strongholds for fish and wildlife, and as important migration corridors. It is vital to protect these large open areas from development or habitat altering land uses. The best of these lands should be conserved through conservation easements and fee acquisition to insure that they continue to function as habitat.

The Nature Conservancy

The Nature Conservancy (TNC) has actively conserved lands in the Closed Basin for a decade, to preserve unique wildlife, plant, aquatic and open space values.

- Birch Creek Valley

  Between the Beaverhead and Lemhi Mountains, over 50 pristine springs merge to form a fen wetland at the Birch Creek Preserve. In cooperation with the Bureau of Land Management (BLM), the Conservancy has protected 1,160 acres of this rare high desert spring ecosystem. The globally rare alkali primrose, marsh felwort and Kelsey's phlox, along with several endemic mollusks can be found here. Birch Creek's clear waters also support wild rainbow trout and sculpin populations. In 1995, TNC purchased 1160 acres located within the Birch Creek fen north of Lone Pine. TNC transferred 1080 acres of the property to BLM through a series of land exchanges and retained ownership of 80 acres. In 2000, TNC purchased 315 acres contiguous to our existing 80-acre ownership along with an adjacent BLM and USFS grazing permit and state lease (approximately 15k acres). TNC and BLM manage these lands for their unique wildlife, plant, aquatic, open space and recreational values. The alkali primrose (*Primula alcalina*) along with five other rare plants are found in the wetland. Endemic snails such as the Birch Creek springsnail and the rustic pondsnail also live in the alkaline wetland. The rare and endemic species found at this site define the Birch Creek fen as a B1 site: “critically imperiled because of extreme rarity or because some biological factor makes species especially vulnerable to extinction.” A principal goal underlying these acquisitions is to preserve, enhance and restore the unique alkali wetlands and associated endemic plants and plant communities, including the globally rare alkali primrose. TNC's intent is to retain control of the federal grazing permits and state lease for the purpose of enhancing natural values on these public lands as well as leveraging additional conservation by working with other grazing permittees in the valley through some form of rest/rotation or "grass banking" scheme.

- Little Lost River Valley

Summit Creek, an isolated headwater tributary of the Little Lost River between the Lemhi mountains and the Lost River Range. Unusual hydrological features at Summit Creek have created conditions for unique plants, such as the rare marsh felwort and alkali primrose. In addition, the stream provides habitat for a genetically isolated population of bull trout. In 1997, The Nature Conservancy (TNC) purchased 625 acres on Summit Creek, which joins Sawmill Creek to form the Little Lost River. TNC manages the property for its unique wildlife, plant, aquatic and open space values. The property also provides habitat for alkali primrose and federally listed bull trout. TNC is using the property as a platform to develop additional conservation opportunities in the valley. They are currently working with a contiguous landowner and the agricultural extension agents from Custer and Butte Counties to develop and implement a rest/rotation grazing system utilizing the property. Upper Summit Creek is classified as a B1 site.

- Big Lost Valley

Located within a wild mountain valley on the western slope of the Lost River Range, Chilly Slough habitat to more than 130 bird species can be found here, half of them shorebirds and waterfowl, including Sandhill Cranes and trumpeter swans. The area also provides habitat for the rare rush aster, swamp willow-wort and marsh felwort. Since 1991, TNC has assisted in protecting over 1300 acres of private lands through direct purchase within the 5000-acre Chilly Slough/Thousand Springs wetland complex. These lands were eventually transferred to BLM or Idaho Fish and Game. TNC's efforts have been part of a larger partnership involving the US Fish and Wildlife Service (through the North American Wetlands Conservation Act), BLM, ID Fish and Game, Ducks Unlimited, and the Rocky Mt. Elk Foundation. TNC does not own property in the valley currently, but is using its past work at Chilly Slough as a platform to pursue conservation easement acquisitions on private lands along the main stem of the Big Lost River. Over 130 species of birds, Chilly Slough has a B2 biodiversity ranking ("Imperiled because of rarity or because other factors demonstrably make species very vulnerable to extinction").

- Medicine Lodge

The Nature Conservancy recently (Summer, 2001) conserved a shrub-steppe unit in the Crooked Creek Drainage of the Medicine Lodge Watershed. This parcel includes 2,640 acres fee with 35,000 acres of allotments.

Intermountain West Joint Venture

The Intermountain West Joint Venture (IWJV) is a public/private partnership, under the leadership of Ducks Unlimited, organized to build a cooperative management framework and to extend that framework to implementing on-the-ground wetland conservation projects that protect, enhance, and restore wetland and associated upland habitats (Southeast Idaho Wetland Focus Area Working Group, 2001). The IWJV is a far-reaching, collaborative effort and all stakeholders in wetland issues are encouraged to join in this conservation effort. Established in 1994, the IWJV involves portions of the eleven western states, including Idaho, and responsible for organizing wetland conservation efforts at the regional and local levels.

Present Subbasin Management

Existing Plans, Polices and Guidelines

Cooperative among agencies

Upper Continental Divide Coordinated Weed Management Area Plan.
Medicine Lodge Resource Management Plan (USDI-BLM, 1985).

Federal Government

USDA Forest Service

The management of National Forest lands in the Closed Basin Subbasin is guided by the *Land Resource Management Plan for the Challis National Forest.* Additional direction is provided by various biological assessment, biological opinions, allotment management plans, and watershed analyses.

USDI Bureau of Land Management

Much of the Closed Basin under BLM management is governed by older management framework plans:

- Big Desert MFP, 1981
- Big Lost MFP, 1983
- Little Lost-Birch Creek MFP, 1981
- Medicine Lodge Resource Management Plan, 1985

Natural Resource Conservation Service (NRCS)

NRCS is an agency of the U.S. Department of Agriculture with professionally staffed field offices in Butte, Clark , Custer and Jefferson counties. The agency's major purpose is to provide consistent technical assistance to private land users, tribes, communities, government agencies, and conservation districts. NRCS assists in developing conservation plans, provides technical field-based assistance including project designs, and encourages the implementation of conservation practices to improve water quality and fisheries habitat. Programs include Conservation Reserve Program (CRP), Public Law 566 (P.L. 566 Small Watershed Program), River Basin Studies, Forestry Incentive Program (FIP), Wildlife Habitat Improvement Program (WHIP), Environmental Quality Incentives Program (EQIP), and Wetlands Reserve Program (WRP).

State Entities

Idaho Department of Environmental Quality

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

The nonpoint source program in Idaho is administered on a watershed basis and includes provisions for public education and technical protocol development. Project emphasis is placed on management effectiveness, beneficial use monitoring, public awareness, antidegradation, and endangered species issues.

The Idaho Department of Environmental Quality has been developing sub-basin assessments of the water quality and TMDLs where appropriate for each of the fourth order HUCs in the basin. The water pollutants addressed in these assessments and TMDLs are nutrients, bacteria, and sediment. Sediment is the most widespread pollutant in the basin. Sub-basin assessments have been completed for the Palisades (17040104), and Little Lost (17040217). Sub-basin assessments are being developed for the Willow Creek (17040205), Idaho Falls (17040201), Big Lost (17040218), and Medicine Lodge (17040215) sub-basins.

Idaho Department of Fish and Game

Fisheries

Idaho Department of Fish and Game objectives and programs for fisheries management in waters of the Closed Basin is detailed below and summarized in (Table 42) (IDFG 2001).

- **Objective: Improve angler success in Antelope Creek and the Upper Big Lost River**.
  Program: Continue stocking of Snake River Yellowstone cutthroat trout, monitor and evaluate for success.
- **Objective: Improve water quality conditions in Mud Lake by maintaining higher year-round pool levels for stable fish populations and increased fishing opportunity**.
  Program: Work with irrigation storage space-holders and private fishing organizations to facilitate enhanced winter lake volumes.
- **Objective: Continue to provide for balanced quality and general harvest-oriented fishing opportunity**.
  Program: Continue wild trout management for Medicine Lodge Creek drainage to protect isolated cutthroat trout populations and maintain wild trout fishing opportunity.
  Program: Continue to manage Camas Creek drainage and Birch Creek under general regulations for consumptive fishing opportunity.
  Program: Evaluate the adequacy of current fishing regulations and management direction for the Big Lost River fishery below Mackay Reservoir to satisfy public angling desires.

<u>Bull Trout Management</u>

Bull Trout Conservation Plan (Batt, 1996). Developed by the Governor's office, this mission of this plan is to *maintain and/or restore complex interacting groups of bull trout populations throughout their native range in Idaho*. Specific goals are:

- Maintain the condition of those areas presently supporting critical bull trout habitat;
- Institute recovery strategies that produce measurable improvement in the status, abundance, and habitats of bull trout. Concentrate resources and recovery efforts in areas which will produce maximum cost-effective, short-term returns and which will also contribute to long-term recovery;

- Establish a secure, well-distributed set of sub-watersheds within key watersheds to achieve a stable or increasing population and to maintain options for future recovery; and
- Achieve the above goals while continuing to provide for economic viability of Idaho's industries.

Phase 1 is a problem assessment, completed in 1998 (LLRITAT, 1998). Phase 2 is development of a Conservation Plan (in progress), and Phase 3 is implementation of the Conservation Plan.

Table 42. Idaho Department of Fish and Game objectives and programs for fisheries management in waters of the Closed Basin.

Water	Miles/acres	Fishery			Management Direction
		Type	Species present	Management	
Big Lost River within Idaho National Engineering and Environmental Laboratory (INEEL) property	5/	Coldwater	Rainbow trout Brook trout Whitefish	Closed	All access and fishing closed by INEEL. System seasonally de-watered.
INEEL boundary to Moore Diversion	22/	Coldwater	Rainbow trout Brook trout Whitefish	General	System de-watered in short water years. Good fishery potential during sustained wet years.
Moore Diversion to Mackay Dam	20/	Coldwater	Rainbow trout Brook trout Whitefish	General	Maintain wild trout populations. Supplement with catchable rainbow trout in areas of high effort to maintain catch rates of 1.0 fish/hr. Evaluate returns of catchable rainbow trout. Winter whitefish and winter no-harvest rainbow trout season.
Mackay Reservoir	/1,000	Coldwater	Rainbow trout Kokanee	General	Put-and-take fishery for rainbow trout. Manage for catch rate of 0.6 fish/hr.
Mackay Reservoir to Chilly Bridge	15/	Coldwater	Rainbow trout Brook trout	General	Seasonally de-watered through diversions and natural sinks. Winter whitefish and winter no-harvest rainbow trout season.
Chilly Bridge upstream to West Fork	45/	Coldwater	Rainbow trout Brook trout Whitefish	General	Catch rates of 1.0 fish/hr. Winter whitefish and winter no-harvest rainbow trout season.
Tributaries: including North Fork, West Fork, Upper East Fork, Wildhorse, and Summit creeks	232/	Coldwater	Rainbow trout Brook trout Whitefish	General	Maintain wild trout populations to produce catch rates of 1.0 fish/hr. Use supplemental put-and-take stocking in areas of high use. Evaluate success of cutthroat trout supplementation. Winter whitefish and winter no-harvest rainbow trout season.
Little Lost River and tributaries	110/	Coldwater	Rainbow trout Bull trout Brook trout	Wild trout Conservation General	Maintain wild trout populations to provide catch rates of 1.0 fish/hr. Manage bull trout population under statewide no-harvest regulation. Encourage brook trout harvest.
Birch Creek and tributaries	32/	Coldwater	Rainbow trout Brook trout	General	Put-and-take rainbow trout fishery to supplement wild trout populations. Maintain catch rates of 1.0 fish/hr.
Medicine Lodge Creek and tributaries	64/	Coldwater	Rainbow trout Brook trout Cutthroat trout	Wild trout General Quality	Maintain populations of wild trout. Upper Snake restricted harvest for cutthroat trout. Maintain catch rates of 1.0 fish/hr.
Mud Lake	/7,000	Mixed	Yellow perch Largemouth bass Tiger muskie Lahontan cutthroat trout	General	Provide warmwater fishery primarily supported by perch. Stock Lahontan cutthroat trout for viable coldwater fishery. Stock tiger muskies every three years to provide trophy fishery.
Camas Creek from Mud Lake to Camas National Wildlife Refuge	4.5/	Coldwater	Lahontan cutthroat trout	General	Put-and-take fishery to provide spring catch rates of 0.5 fish/hr.
Camas National Wildlife Refuge (Camas Creek and ponds)	9/600	Warmwater	Yellow perch Largemouth bass	Closed	Closed for waterfowl sanctuary. Evaluate fishery in refuge waters and develop plan to allow limited angler entry.

Water	Miles/acres	Fishery			Management Direction
		Type	Species present	Management	
Remainder of Camas Creek and tributaries	70/	Coldwater	Rainbow trout Brook trout Brown trout	General General	Maintain present wild trout populations to provide catch rates of 1.0 fish/hr.
Beaver Creek from mouth to Spencer	22/	Coldwater	Rainbow trout Brook trout Cutthroat trout	General Quality	De-watered seasonally.
Beaver Creek and tributaries above Spencer	18/	Coldwater	Rainbow trout Brook trout Cutthroat trout	General Quality	Provide catch rates of 0.6 fish/hr. Supplement with catchable rainbow trout stocking in areas of high use.
Alpine Lakes	/290	Coldwater	Rainbow trout Cutthroat trout Brook trout Golden trout Grayling	General	Maintain present fishery by use of hatchery fry where needed. Expand use of golden trout and grayling to meet public demand in suitable lakes. Identify lakes to receive golden trout. These lakes should receive no supplemental stocking with alternate species. Adjust stocking rates and frequency to correspond to lake size, productivity, natural production and public use.

Predation Management

On August 24, 2000, the Idaho Department of Fish and Game adopted a Policy for Avian and Mammalian Predation Management. The purpose of this policy is to provide the Department direction in managing predator populations consistent with meeting management objectives for prey species populations. The Department recognizes predator management to be a viable and legitimate wildlife management tool that must be available to wildlife managers when needed. Because the Department has a responsibility to preserve, protect, perpetuate and manage all wildlife in the state and to provide continued supplies of such wildlife for hunting, fishing and trapping, the Department must efficiently and effectively manage populations of predators as well as populations of prey species to meet management objectives.

- Predator populations will be managed to assure their future recreational, ecological, intrinsic, scientific, and educational values, and to limit conflicts with human enterprise and values.
- Where there is evidence that predation is a significant factor inhibiting the ability of a prey species to attain Department population management objectives and the Department decides to implement predation management actions, the management actions will ordinarily be directed by a predation management plan.
- Predator populations will be managed through habitat manipulation and/or predator removal as appropriate.
- Idaho Code provides that predatory wildlife (i.e., coyotes, jack rabbits, skunks, starlings, and weasels) may be taken by any legal means at any time.
- The Department will cooperate with the Animal and Plant Health Inspection Service (APHIS) Wildlife Services Program to address specific areas and species, particularly on private lands, in a manner consistent with the approved interagency Memorandum of Understanding.
- Predator management may occur but is not limited to the following circumstances:
    - In localized areas where prey populations are fragmented or isolated, or where introductions or transplants of potentially vulnerable wildlife species (e.g., bighorn sheep, wild turkeys, sharp-tailed grouse, and others) has occurred or is imminent. Control may be intensive and of sufficient duration to allow transplanted animals and their progeny to become established and to become self-sustaining, or selective with removal efforts directed at specific offending animals.
    - In specific areas where managers are unable to meet management goals and objectives for prey populations due to predation. For example, in areas where survival or recruitment of game animal populations is chronically low and management plan objectives have not been or cannot be met and where there is evidence that predation is a significant factor, predator control may be initiated.
    - On wildlife management areas, especially those which are managed primarily to provide for production of specific species (e.g., waterfowl), provision of critical winter range, and those acquired and managed to provide specific mitigation for wildlife losses elsewhere.

Predation management plans will be prepared using the following outline:

- Definition of the problem. This definition must include a rationale for the proposed action. Such a rationale may include:
    - a proposed management action (such a the introduction of a small number of animals into suitable but unoccupied habitat) that may be adversely affected by the presence and predictable actions of predators,
    - a finding that approved wildlife management objectives are not being met due in large part to the actions of predators, or
    - evidence that wildlife recruitment or populations has been or will be adversely impacted by the presence of predators.
- Risk Assessment. A discussion of the ramifications of the program, including potential effects on:
    - predator populations (i.e., will removal of avian roosting trees near a waterfowl production area affect non-targeted species, such as bald eagles? Will removal of specific individual animals result in vacant home ranges that will be especially attractive to transient predators of the same species?)
    - prey or benefiting species,
    - sportsmen and wildlife-associated recreational opportunity,
    - landowners in or near the impacted area, and
    - groups that will strongly favor or oppose the proposed action.
- Program. A discussion of the specific proposed treatment, including:
    - clearly-defined boundaries,
    - the species of predator(s) affected,
    - the prey or other species to benefit from any proposed action,
    - the method or techniques identified to address identified concerns, including habitat manipulation where appropriate and the method(s) of predator removal (if removal is a component of the program),
    - the objective and measure of success used to determine whether that objective has been achieved,
    - date of initiation of actions,
    - measurable objectives and monitoring plans to access program effectiveness,
    - and budget.

All predator management plans will be reviewed by the chief of the Bureau of Wildlife and regional supervisor. Predator management plans must be approved by the director. Predator management plans will be reviewed and evaluated annually.

Species Specific Management Plans

The following list comprises the Idaho Department of Fish and Game Management Plans for most species and activities under its purview.

- Idaho Department of Fish and Game. 2001. Fisheries Management Plan 2001 – 2006.
- Idaho Department of Fish and Game. 1990. A Vision for the Future: Idaho Department of Fish and Game Policy Plan 1990 – 2005.
- Idaho Department of Fish and Game. 1988. Wildlife Depredation Plan 1988 – 1992.
- Idaho Department of Fish and Game. 1990. Furbearer Management Plan 1991 – 1995.

- Idaho Department of Fish and Game. 1990. Waterfowl Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1990. Upland Game Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1997. Idaho Sage Grouse Management Plan.
- Idaho Department of Fish and Game. 1990. Bighorn Sheep Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1990. Mountain Goat Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1999. Elk Management Plan.
- Idaho Department of Fish and Game. 1999. Mule Deer Management Plan.
- Idaho Department of Fish and Game. 1999. White-Tailed Deer Management Plan.
- Idaho Department of Fish and Game. 1991. Mountain Lion Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1991. Nongame and Endangered Wildlife Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1998. Black Bear Management Plan.
- Idaho Department of Fish and Game. 1990. Moose Management Plan 1991 – 1995.
- Idaho Department of Fish and Game. 1991. Pronghorn Antelope Management Plan 1991 – 1995.
- Ullman, M.J., A. Sands, and T. Hemker. 1998. Conservation Plan for Columbian sharp-tailed grouse and its habitats in Idaho. Prepared for Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, Idaho.

Idaho Soil Conservation Commission

The Idaho Soil Conservation Commission (SCC) was created in 1939 from Idaho legislation originated to deal with the soil erosion crisis of the Dust Bowl. Today the Commission's purpose is to provide support and service to Idaho's 51 Soil Conservation Districts (SCDs) for the wise use and enhancement of soil, water and related resources. The Commission consists of five members appointed to five-year terms by Idaho's Governor. The Commission has a 25-member staff responsible for water quality program delivery and administrative programs. Most staff work through a District in the field, providing technical assistance directly to Idaho landowners and assisting with projects. The SCC manages the Water Quality Program for Agriculture (WQPA), Resource Conservation and Rangeland Development Loan and Grant Program (RCRDP), Agricultural Pollution Abatement Plan (APAP) and Grazing Lands Conservation Initiative (GLCI). SCC is the designated agency for the Natural Resources (Conservation Income Tax Credit (63-3024B Idaho Code) and for Idaho Water Quality Law for grazing activities and agricultural activities (39-3602 Idaho Code; Idaho Soil Conservation Commission, 2000).

Local Governments

Soil and Water Conservation Districts

Soil and water conservation districts (SCDs) are non-regulatory subdivisions of Idaho State government authorized (Title 22, Chapter 36 Idaho Code). A board of five or seven supervisors, who are local residents, and who serve without pay, governs each. All

supervisors are elected officials and must be landowners (including urban property owners located with district boundaries) or farm operators in the district to which they are elected. Soil and water conservation districts develop and implement programs to protect and conserve natural resources primarily on privately owned lands. Districts organize technical advisory groups for projects and call upon local, state, tribal and federal agency specialists, industry representatives, and interested individuals. Districts in the Upper Snake, Closed Subbasin include Butte SWCD, Clark SWCD, Custer SWCD, and Mud Lake. Districts receive limited funds from local (county) and state (general fund) government, and may receive other funds for local project work through the Water Quality Program for Agriculture program (ISCC) and other funding agencies, institutions or organizations. Working cooperatively with other entities, SCDs provide technical assistance to agriculturists and other private landowners based on long-standing agreements with the USDA Natural Resources Conservation Service, Idaho Soil Conservation Commission and other federal and state agencies. (Idaho Soil Conservation Commission 2001)

Butte Soil and Water Conservation District

The Butte SWCD develops a 5-Year Resource Conservation Plan to prioritize resource issued and manage conservation efforts throughout the district. The plan is updated every year. Primary interests and objectives of the Butte SWCD include: improve agricultural and grazing lands, seek technical and financial assistance to re-establish functioning riparian areas along the Big Lost and Little Lost Rivers; work with local, state and federal agencies on resource conservation issues; participate in the Lost Rivers Coordinated Weed Management Area and Idaho's TMDL process on the Little Lost River to protect bull trout. The District is an active partner in the establishment of a USDA Forest Service National Learning Site.

Clark Soil and Water Conservation District

The Clark SWCD coordinates resource conservation on private and public lands in Clark County. A 5-Year Resource Conservation Plan is updated annually identifying and prioritizing assistance to conservation resource issues. The Clark SWCD has collaborated with a myriad of agencies and groups on the Sheridan Creek Restoration Project. The District is lead for the Medicine Lodge TMDL assessment and implementation plan and provides support to the Continental Divide WAG. The District is also part of a tri-county integrated weed management area and regularly provides funding for the control of noxious and invading weed species.

Custer Soil and Water Conservation District

Since 1992 the Custer SWCD has been a partner in the Upper Salmon Basin Watershed Project (USBWP) program. The USBWP includes the area from the Middle Fork of the Salmon River to the headwaters of the Salmon River in the Stanley Basin, in Custer County. Combining the Districts resources with the USBWP, Lemhi Soil and Water Conservation District, Bonneville Power Administration and other natural resource agencies the CSWCD has been instrumental in assisting local landowners put conservation projects efficiently and effectively on the ground. Among the CSWCD top four objectives is "addressing fisheries, wildlife, water quality and water resource conditions within the boundaries of the CSWCD". The CSWCD continues to work within the USBWP, and with

the recent expansion of the USBWP boundaries, the CSWCD can now assist the USBWP in conservation projects throughout Custer County.

Mud Lake Soil and Water Conservation District

The Mud Lake SWCD is located in northwest Jefferson County. Annually the district updates it's 5-Year Resource Conservation Plan and prioritizes conservation resource needs. The District's focus is on improving irrigation water management, integrated weed management, and public outreach. The District is a participant in the High Desert Wind Erosion EQIP area and the Continental Divide WAG.

Resource –based Groups

Southeast Idaho Wetland Focus Area Working Group. This Group has developed the southeast Idaho Wetland Focus Area Conservation Plan. The purpose of this plan is to foster communication and partnership development to implement wetland conservation projects. The Plan is intended to be used primarily to identify potential project areas, to develop a communication network, and foster long-term partnerships that will work towards addressing and solving the myriad of issues and problems facing the future conservation of southeastern Idaho's wetland ecosystems. Active partners include Ducks Unlimited, the US Fish and Wildlife Service, the Nature Conservancy, Teton Regional Land Trust, Idaho Department of Fish and Game, Natural Resource Conservation Service, and the Bureau of Land Management. The plan focuses on Priority Waterfow:

> *North America has 43 species of ducks, geese, and swans that typically use habitats in at least two or more countries during their annual life cycle. During the 1900s waterfowl population numbers have fluctuated, sometimes significantly, throughout North America. In the early 1930s the public began to take notice of changing waterfowl numbers. Waterfowl numbers reached their peak last century in the 1970s. This peak is the basis for the population goals outlined in the NAWMP. The North American Plan calls for a sustainable population level for ducks, geese, and swans. For ducks, the goals are for a breeding population of at least 62 million and a fall flight of at least a 100 million. For geese and swans, the total combined winter population goal is approximately 6 million birds. Several goose populations are considered too high; however, others are in steady decline and are facing possible listing as a threatened or endangered species. Swan populations goals include a slight reduction in tundra swan numbers and a doubling of current trumpeter swan numbers continent wide.*
>
> *The Priority Waterfowl species identified for the Southeast Idaho Wetland Focus Area are in many cases similar to those identified in the NAWMP. The following species were selected Southeast Idaho WFA priority species for several reasons including being common breeders, common wintering birds, declining breeding numbers, substantial reliance on WFA habitats for migration, rarity, recreational importance, and/or overall declining numbers in the WFA because of habitat loss.*
>
> *Trumpeter swan: Trumpeter swan population goals outlined in the NAWMP call for a doubling of the continent's numbers. The Southeast Idaho WFA hosts trumpeters migrating from several areas in the Rocky Mountains. However, the Rocky Mountain Population, considered by many as a separate population, are the birds of concern for the WFA. These birds nest in the Greater*

Yellowstone Ecosystem and will typically winter only short distances from their breeding grounds. Wintering habitat quality and quantity, as well as disturbances during nesting, are the major concerns for this species in the southeast Idaho.

Pintail: Pintails are the duck species of highest concern for NAWMP. This species' North American population has continued to decline when other similar species populations have increased. Pintail populations (breeding and wintering) in southeast Idaho are no exception, although the decline may be stabilizing. Pintails are a High Priority Species identified in the NAWMP.

Mallard: The most important duck species in southeast Idaho. The mallard is the most numerous duck in southeast Idaho throughout the year and is also highly prized by bird watchers and hunters alike. The mallard is a High Priority Species identified in the NAWMP.

Redhead: Most of Idaho's redhead production habitat is located in the southeast corner of Idaho. Agricultural conversion and other habitat loss threatens the amount of redhead breeding areas. Deep water habitats with sufficient buffering are located in only a few locations. Wetland conservation projects associated with these habitat characteristics should consider redhead habitat requirements. Redheads are a High Priority Species in the NAWMP

Canada goose: Canada geese are the most important waterfowl species in southeast Idaho for recreational purposes and economic benefits. Some of the highest quality hunting grounds for Canada geese are located in the American Falls Complex. This very common species uses southeast Idaho wetlands for breeding, wintering, and during migration.

Conservation Organizations

The Nature Conservancy

In February 1999, the Nature Conservancy of Idaho completed a conservation analysis of the Big Lost River, Little Lost River, and Birch Creek drainages which identified (a) conservation targets and goals, (b) threats to the conservation targets, and (c) potential strategies to abate these threats. A summary of that effort follows:

- Targets, Goals and Threats
    - Bull Trout -- Ensure the viability of self-sustaining populations of bull trout in the Little Lost River by increasing population size and improving habitat quality and connectivity in the Little Lost River Watershed. Threats include thermal and physical impediments to fish passage, loss of riparian and instream habitat, hybridization with brook trout, loss of water volume, and degradation of water quality.
    - Sage Grouse -- Achieve goals established in ID Fish and Game's 1997 Idaho Sage Grouse Management Plan for populations identified within this area. Threats include habitat degradation, invasion of non-native plant species, and unchecked wildfire.
    - Alkali Wetlands and Springs -- Maintain aerial extent and improve habitat quality of alkali wetlands, including fens, springs, and riparian areas, and ensure long-term viability of endemic species. Threats include habitat

fragmentation and degradation, competition with non-native species, and reduced water tables.

  - Riparian Habitat and Cottonwood Gallery Forests -- Maintain or restore the quantity and quality of riparian vegetation along main streams and tributaries within the area. Maintain the current aerial extent of cottonwood gallery forests and ensure active regeneration for cottonwoods through natural hydrologic regimes. Threats include altered hydrologic cycles, habitat fragmentation and degradation, and invasion of non-native species.

- Significant sources of threats identified included the following:
  - Incompatible livestock grazing
  - Road construction/expansion
  - Incompatible ORV use
  - Incompatible residential development and subdivision
  - Conversion of native habitat for agricultural or residential purposes
  - Invasive, non-native plant species
  - Incompatible irrigation and hydroelectric power practices
  - altered fire regimes
- The following lists possible conservation strategies, in no particular order.
  - Subbasin-wide assessment of highest quality sage steppe habitat on public and private lands and development of conservation plans for protecting these areas.
  - Development and implementation of a federally-funded conservation easement acquisition program for the preservation of working agricultural lands with significant wildlife habitat.
  - Secure appropriations to fund rangeland conservation practices and compensate permittees for targeted federal grazing allotment buy-outs and/or reductions.
  - Development and implementation of landowner incentive and stewardship programs for the protection, enhancement and restoration of key habitat areas.
  - Development and implementation of "grass banks" for the enhancement and restoration of public lands grazing allotments and associated wildlife habitat.
  - Secure special designations for ecologically significant public lands (i.e., ACEC, RNA).
  - Restoration and enhancement of sage steppe and riparian habitats through plantings, fencing projects, seeding, weed control, and reintroduction of ecologically desirable fire regimes.

- Restoration and maintainance of desired flow regimes in targeted waterways. Secure increased technical and financial support for efforts to preserve bull trout habitat through tributary reconnections, diversion enhancements, irrigtation improvements and other projects.

Existing Goals, Objectives, and Strategies

Federal

Interagency Programs

The Draft Medicine Lodge Subbasin Review (USDI BLM and USDA FS, 2001), presents detailed (1) drainage-specific goals and (2) program specific priorities and assigns agency responsibilities for fish, wildlife, and habitat resources. Examples of both follow in Table 43 and Table 44, respectively.

Table 43. Edie Creek/Cole Canyon Priority Watershed #170402150501, Medicine Lodge Subbasin Review -- Final Actions and Recommendations, Medicine Lodge Subbasin Review.

Resource Program	Actions/Recommendations	Implementation
Human Uses	Update existing road inventory and close unauthorized routes not identified in existing LUP. Maintain existing roads and trails at levels identified in Transportation Plan. Notify the public of bison grazing locations and provide information on how to safely recreate near bison. Monitor recreation use. Acquire road easement across private land. Enforce current Travel Plan regulations. Maintain and reconstruct trails to prevent resource damage and address public safety issues.	BLM FS
Aquatic/Riparian	Maintain Upper Edie Creek Riparian Pasture as an exclosure until at or near PFC. Reduce grazing impacts along Lower Edie Creek through duration and other means to improve PFC and recovery rate. Build and maintain protective fence on Cold Creek; monitor trailing use and improve recovery rate. Harden and maintain water gaps.	BLM
Wildlife	Protect sage grouse brood rearing and migration habitat through implementation of fire restrictions, appropriate fire control procedures and response levels. The goal is to reduce wildfire disturbance to less than 2000 acres per occurrence. Monitor Canadian lynx, elk and mule deer habitat for human use disturbances. Monitor Canadian lynx habitat use and visitor use on existing roads for baseline data.	BLM
Soils	Encourage and retain maximum ground cover and vegetation cover on steep slopes greater than 30% or 25% on fragile soils (Knep and Argora) associated with land slips	BLM

Resource Program	Actions/Recommendations	Implementation
	to reduce water erosion. Discourage controlled burning or any other practice on these slopes, on these fragile soils that may reduce vegetative cover. Areas of particular concern are the Knep and Argora soil series, that are subject to high natural erosion and associated with historic land slips.	
Rangeland/Weeds	Treat invasive plants as per the Upper Continental Divide Coordinated Weed Management Area Plan. Implement grazing system and rangeland improvements for progress towards PFC on Cold and Edie Creeks.	BLM
Forest	Inventory the condition and develop plans for the maintenance and/or improvement of Douglas-fir, lodgepole pine, subalpine fir, and aspen stands. Introduce prescribed fire, tree thinning, and harvesting to help meet forestry, recreation, and wildlife needs.	BLM/FS

Table 44. Program Specific Priorities for the Wildlife, Rangeland/Weeds and Soils Programs in the Table Butte East/West, Mud Lake, Monteview, Small, Deep Creek Bench, Blue Creek, Lidy Hot Springs and Warm Springs Creek Watersheds--Final Actions and Recommendations, Medicine Lodge Subbasin Review.

Resource Program	Actions/Recommendations	Implementation
Wildlife	Protect sage grouse habitat (leks, nesting, brood rearing and migration) through implementation of fire restrictions, appropriate fire control procedures and response levels, and possible OHV restrictions. The goal is to reduce wildfire disturbance of habitat to less than 1,000 acres per occurrence and to maintain OHV use at current levels.	BLM
Rangeland/Weeds	Treat invasive plants as per the Upper Continental Divide Coordinated Weed Management Area Plan. Special emphasis will be placed on the Table Butte East/West and Mud Lake watersheds to contain knapweed, not allowing it to spread into the interior regions. Continue to implement the grazing system and rangeland improvements on the Deep Creek Bench.	BLM
Soils	Encourage and maintain best management practices to retain maximum ground cover and vegetation cover on sandy soils to reduce wind erosion. Discourage controlled burning, improper grazing, plowing or any other practice on these susceptible soils that would cause the reduction in vegetative cover to a level where wind erosion rates exceed 5 tons/acre/year.	BLM

USDA Natural Resources Conservation Service (NRCS)

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

Goal 1. Enhance natural resource productivity to enable a strong agricultural and natural resource sector.

Objective 1.1 Maintain, restore, and enhance cropland productivity

Strategy 1.1.1. NRCS will work with the conservation partnership to:
Strategy 1.1.2. Provide coordinated assistance in watersheds with pervasive soil health problems.
Strategy 1.1.3. Promote conservation planning and management approaches that improve multiple soil factors by focusing efforts on the most serious soil health problems.
Strategy 1.1.4. Help USDA program participants remain in compliance with requirements to protect highly erodible cropland and to take additional steps to improve the land.
Strategy 1.1.5. Help operators examine alternatives to crop production, such as enterprise diversification or conversion to hay or grazing.
Strategy 1.1.6. Provide assistance to landowners and land managers who are removing land from CRP to plan and apply systems with suitable plant materials that adequately control erosion and address other soil health issues.
Strategy 1.1.7. Ensure that small, limited-resource minority farmers and ranchers receive appropriate conservation planning and management assistance.
Strategy 1.1.8. Improve technical capacity and develop and implement a method to determine soil health and monitor changes.
Strategy 1.1.9. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the production benefits of conservation practices.

Objective 1.2.1 Maintain, restore, and enhance irrigated land.

Strategy 1.2.1. NRCS will work with the conservation partnership to:
Strategy 1.2.2. Encourage long-range water management planning to help communities develop strategies to address future water needs for irrigation and municipal and rural water use.
Strategy 1.2.3. Provide coordinated assistance in watersheds with substantial irrigated acreage.
Strategy 1.2.4. Promote comprehensive irrigation and water management systems that increase irrigation efficiency, address nutrient and pest management, and, otherwise, manage irrigation return flow to reduce potential adverse effects.

Strategy 1.2.5. Provide technical assistance to facilitate conversion to alternative crops or to dryland farming systems for those operators transitioning from irrigated agriculture.
Strategy 1.2.6. Provide training to help irrigation equipment suppliers and contractors plan equipment installation and provide services to help operators increase efficiencies in irrigation water delivery and application systems.
Strategy 1.2.7. Use appropriate, targeted communication strategies to educate irrigators, farmers, and others about the importance of water management and the availability of assistance.

Objective 1.3 Maintain, restore, and enhance grazing land productivity.

Strategy 1.3.1. NRCS will work with the conservation partnership to:
Strategy 1.3.2. Promote conservation planning and management approaches that prevent grazing land damage, reduce the impact of drought, and help ensure that resources can remain healthy and productive.
Strategy 1.3.3. Promote grazing practices that provide multiple benefits for operators, including productivity, wildlife, and water quality.
Strategy 1.3.4. Promote cooperative, watershed or regional approaches to grazing lands conservation and reclamation.
Strategy 1.3.5. Strengthen inventory and assessment capabilities throughout NRCS to improve the ability to determine the status and condition of grazing land resources.
Strategy 1.3.6. Increase efforts to develop approaches for suppression of noxious and invasive species.
Strategy 1.3.7. Strengthen assistance to small, limited-resource and minority owned farms and ranches.
Strategy 1.3.8. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about grazing land productivity and water quality benefits of conservation practices.

Objective 1.4 Maintain, restore, and enhance forestland productivity.

Strategy 1.4.1. NRCS will work with the conservation partnership to:
Strategy 1.4.2. Promote conservation planning and management approaches that prevent forestland damage and help ensure that resources can remain healthy and productive.
Strategy 1.4.3. Promote forest management that maintains yield of forest products with protection of watersheds for clean water, wildlife habitat, fiber production, and mixed land uses.
Strategy 1.4.4. Promote cooperative, watershed, or regional approaches to forestland conservation.
Strategy 1.4.5. Strengthen inventory and assessment capabilities to improve the ability to determine the status and condition of forestland.
Strategy 1.4.6. Strengthen assistance to small, limited-resource and minority owners of private, non-industrial forestland.

Strategy 1.4.7. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about forestland productivity and water quality benefits of conservation practices.

Goal 2. Reduce unintended adverse effects of natural resource development and use to ensure a high quality environment.

Objective 2.1 Protect farmland from conversion to non-agricultural uses.

Strategy 2.1.1. NRCS will work with the conservation partnership to:
Strategy 2.1.2. Provide technical assistance to units of government to assist them with development of policies and programs to protect farmland.
Strategy 2.1.3. Complete and implement the Computer Assisted Land Evaluation System to provide a tool for local government units, Tribes, and others to effectively evaluate the potentials and limitations of their land resources relative to proposed uses.
Strategy 2.1.4. Provide training and support to relevant agencies to undertake site assessments in accordance with the Farmland Protection Policy Act requirements.
Strategy 2.1.5. Strengthen local partnerships and other mechanisms to increase the availability of technical assistance in rapidly developing areas.
Strategy 2.1.6. Ensure that local, State, and Tribal governments and non-government organizations have the information on natural resource and environmental issues needed to help guide balanced growth management decision-making.
Strategy 2.1.7. Help individuals and communities, through the locally led process, identify resource concerns and develop and implement watershed-based plans to ensure that their quality of life is protected.
Strategy 2.1.8. Assist Tribal, State, and local governments; non-government organizations; communities; and others to protect their locally important lands through a variety of approaches, including easements, zoning and other growth management strategies.
Strategy 2.1.9. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the natural resource and agricultural production benefits of conserving rural land and other green space.

Objective 2.2 Promote sound urban and rural development.

Strategy 2.2.1. NRCS will work with the conservation partnership to ensure that designated, trained staff are available to provide conservation assistance to communities on soil erosion prevention and control, land use planning, engineering support, open space conservation, floodplain protection, stormwater management, soil survey, and natural resource inventories.

Strategy 2.2.2. Develop specialized training, guidance, and practices for employees and partners.
Strategy 2.2.3. Extend coverage of RC&D areas.
Strategy 2.2.4. Enhance efforts in urban and suburban areas, particularly newly developing areas, to undertake comprehensive watershed planning that addresses the potential offsite impacts of development.
Strategy 2.2.5. Work with long-standing and new partners to promote technologies and improved practice standards for reducing runoff of nutrients, pesticides, and sediment from rural and urban residential and community facility sites.
Strategy 2.2.6. Promote conservation activities that can help address air quality problems in non-attainment areas.
Strategy 2.2.7. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the benefits of conservation for urban and suburban areas.

Objective 2.3 Protect air and water resources from agricultural non-point sources of impairment.

Strategy 2.3.1. NRCS will work with the conservation partnership to provide area-wide planning and coordinated assistance in watersheds with non-point source pollution problems on all non-Federal and Tribal lands.
Strategy 2.3.2. Promote innovative watershed level approaches in areas where the rural-urban interface may constitute unique challenges and offer different opportunities for mixed solutions to locally identified problems.
Strategy 2.3.3. Intensify efforts to protect rivers and streams from the effects of excess nutrient loading and siltation.
Strategy 2.3.4. Intensify efforts to protect rivers and streams from the effects of hydrologic alterations and structural changes to natural geomorphic characteristics, including loss of streamside vegetation, that affect the quality of aquatic habitat.
Strategy 2.3.5. Evaluate the potential to abate sources of air quality impairment and greenhouse gas emissions and increase carbon sequestration on U.S. forest, range, and croplands (e.g., emissions from AFOs, fugitive dust from erosion, agricultural burning).
Strategy 2.3.6. Develop accurate, scientifically validated soil carbon measurement models.
Strategy 2.3.7. Develop economical methods/practices to control erosion and mitigate greenhouse gas emissions on a wide variety of parcel sizes and for landowners and land managers with limited financial resources.
Strategy 2.3.8. Promote streambank restoration and riparian area establishment in locally important watersheds.
Strategy 2.3.9. Support the National Conservation Buffer Initiative to help reduce movement of eroded soil and attached chemicals into waterways.
Strategy 2.3.10. Use appropriate communication strategies to educate the public, landowners, land managers, and government entities about the role of

conservation practices and programs in protecting water and air quality.

Objective 2.4 Enhance animal feeding operations to protect the environment.

Strategy 2.4.1. NRCS will work with the conservation partnership to:
Strategy 2.4.2. Promote innovative watershed level approaches in areas where animal waste is a key concern to consider centralized nutrient accounting, storage and distribution of manure nutrients, and other approaches that can link nutrient-rich and nutrient-poor areas.
Strategy 2.4.3. Provide coordinated assistance in watersheds with AFO concentrations.
Strategy 2.4.4. Invest in development of technology and practice standards to support improved waste management.
Strategy 2.4.5. Foster greater private sector capacity to develop and implement animal waste management and riparian technology.
Strategy 2.4.6. Develop innovative partnerships to advance alternatives for animal waste management.
Strategy 2.4.7. Work with partners to encourage integrator-supported cooperative efforts for waste management and utilization where production is concentrated.
Strategy 2.4.8. Coordinate with EPA, partners, Tribes, individuals, and communities to identify TMDL program requirements and integrate these with NRCS watershed level planning and technical assistance activities.
Strategy 2.4.9. Work with operators to increase adoption of waste management practices that address water and air quality concerns.
Strategy 2.4.10. Strengthen assistance to small, limited-resource and minority owned farms and ranches, and develop and provide low cost alternatives that meet their needs.
Strategy 2.4.11. Use appropriate communication strategies to publicize traditional and alternative solutions for managing animal waste.

Objective 2.5 Maintain, restore, and enhance wetland ecosystems and fish and wildlife habitat.

Strategy 2.5.1. NRCS will work with the conservation partnership, State agencies, other Federal agencies, and private conservation organizations to identify priority wetlands that habitat and wetland-landscape habitat linkages.
Strategy 2.5.2. Work through the locally led process to identify community goals for fish and wildlife and wetland conservation.
Strategy 2.5.3. Conduct functional assessments on wetlands before and after conservation treatment to validate conservation practice effects in support of outcome measurement.
Strategy 2.5.4. Focus efforts on "no-net loss of wetlands" and on the most highly vulnerable areas of the Southeast, South Central, Midwest, and Northeast regions.

Strategy 2.5.5. Integrate multiple use planning in wetland and wildlife conservation approaches that consider recreation and other non-consumptive uses of resources in conservation planning.

Strategy 2.5.6. Provide needed technical assistance for delineation of wetland areas and ensure continued compliance with swamp-buster requirements.

Strategy 2.5.7. Provide coordinated assistance to promote conservation in watersheds with important wildlife populations.

Strategy 2.5.8. Work with partners and private groups to enhance habitat for important game species.

Strategy 2.5.9. Develop and use adapted native plant materials for wetland restoration and improved wildlife habitat.

Strategy 2.5.10. Use appropriate communication strategies to promote the value and benefits of healthy wetlands and fish and wildlife habitat.

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

Objective 3.1 Protect upstream watersheds from flood risk.

Strategy 3.1.1. NRCS will work with the conservation partnership to help watershed project sponsors to evaluate and assess the need to repair, upgrade, or decommission watershed structures.

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

Strategy 3.2.1. NRCS will work with the conservation partnership to promote watershed level planning to address water supply and drought mitigation, including land treatment as well as structural development or enhancement.

Strategy 3.2.2. Help communities assess conditions and needs and develop plans to prepare for and minimize the effects of drought.

- Strategy 3.2.3. Provide science-based information to help individuals and communities plan and undertake proactive mitigation to lessen the potential impacts of drought.

Strategy 3.2.4. Promote cooperative approaches to conservation of ground water resources.

Strategy 3.2.5. Acquire, develop, and transfer applicable technology on plant species that can survive drought conditions and mitigate its impact.

Strategy 3.2.6. Encourage locally led efforts to define water needs and priorities that integrate agricultural needs in the decision-making process.

Strategy 3.2.7. Inform and educate NRCS specialists regarding interpretation of ground water data including rates of decline, recharge, safe yield, and potential for contamination.

Strategy 3.2.8. Strengthen assessment and interpretation capabilities within NRCS to improve ability to determine condition of ground water resources.

Strategy 3.2.9. Evaluate opportunities to improve programs to increase their flexibility for responding to drought emergencies.

Strategy 3.2.10. Use appropriate communications techniques to educate communities about the importance of watershed planning on water conservation and drought preparedness planning.

Goal 4. Deliver high quality services to the public to enable natural resource stewardship.

Objective 4.1 Deliver services fairly and equitably.

Strategy 4.1.1. NRCS will work with the conservation partnership to engage in a continuing review of all agency activities, including program requirement, to ensure that discriminatory aspects do not exist.

Strategy 4.1.2. Increase program flexibility to allow innovative strategies using existing authorities to reach historically undeserved landowners and land managers and seek new authorities.

Strategy 4.1.3. Strengthen ties with minority serving academic institutions and community based organizations to develop and deliver services to meet the needs of minority, undeserved, and nontraditional customers.

Strategy 4.1.4. Encourage incorporation of environmental justice issues and equal delivery of services into annual plans of operation.

Strategy 4.1.5. Work with Tribal governments to establish offices and assistance delivery approaches that meet their needs.

Strategy 4.1.6. Undertake an assessment of the progress made in meeting the Civil Rights Action Team objectives of improving assistance and service to minority, underserved, and nontraditional customers.

Strategy 4.1.7. Encourage innovative strategies using existing authorities to reach historically underserved landowners and land managers and seek new authorities to broaden and strengthen the conservation partnership.

Strategy 4.1.8. Recognize the multilingual and multicultural needs of our customers. Ensure that agency information, tools, and technologies are in formats that can be used effectively.

Objective 4.2 Strengthen the conservation delivery system.

Strategy 4.2.1. NRCS will work with the conservation partnership to strengthen our ability to deliver assistance to our diverse customer base by providing our employees innovative training in cross-cultural relations, outreach, and communication.

Strategy 4.2.2. Accurately identify new or updated technical skills needed by our workforce to deliver sound technical assistance to an increasingly diverse customer base through timely queries of partners, employees, employee groups, and customers.

Strategy 4.2.3. Work with partners to identify incentives and develop a program to retain experienced employees to train and mentor new staff.

Strategy 4.2.4. Provide our workforce the best work environment possible by creating an institutional culture that welcomes diversity, encourages innovation, and rewards creativity and achievement.

Strategy 4.2.5. Ensure adequate investment in employee development to maintain technical excellence in an environment of rapidly expanding knowledge and technology.

Strategy 4.2.6. Enhance communication and coordination within the conservation partnership and with other Federal agencies and the private sector to ensure the availability of adequate technical expertise as the workforce of NRCS and other Federal partners change.

Strategy 4.2.7. Ensure that local conservation district leaders and RC&D councils have the skills and information they need to lead their communities toward effective stewardship.

Strategy 4.2.8. Acquire and deploy the electronic communications and information technology needed to ensure easy, rapid, reliable flow of information within the partnership.

Strategy 4.2.9. Ensure that essential data about resource condition and conservation treatment collected.

Strategy 4.2.9. Ensure that essential data about resource condition and conservation treatment collected and maintained by NRCS are collected according to consistent definitions and methodology and stored in systems that permit merging of data from many sources.

Strategy 4.2.10. Ensure that the public and others have easy, electronic access to agency directives, technical information, and forms.

Strategy 4.2.11. Encourage American Indian and Native Alaskan participation on conservation district boards and RC&D councils.

Objective 4.3 Ensure timely, science-based, information and technologies.

Strategy 4.3.1. NRCS will work with the conservation partnership to strengthen the investment in the agency's technical components to ensure that they are able to provide needed technologies and tools to support conservation.

Strategy 4.3.2. Integrate expertise from the field, partners, and others in the technology development and transfer process.

Strategy 4.3.3. Develop conservation practices designed around traditional methods of Tribes or other minority, underserved, and nontraditional customers to improve their use and acceptability.

Strategy 4.3.4. Complete, update, and maintain soil surveys for all private and non-Federal lands. Complete the production of soils information in digital form.

Strategy 4.3.5. Enhance ability to provide soils information and interpretations by fully populating data in the National Soil Information System.

Strategy 4.3.6. Cooperate with other local, State, and Federal agencies in joint inventory activities and data management agreements to ensure compatibility and consistency of resource information.

Strategy 4.3.7. Ensure that the field staff are provided with the needed technology, tools, and additional technical support to deliver conservation. Field Office Technical Guides (FOTGs) should reflect current technology and knowledge. Make digital orthophoto quads (DOQs) available at the field level for use as a basic conservation planning tool with land users.

Strategy 4.3.8. Develop planning and resource assessment tools and data collection systems for resource planning and to assess resource status, conditions, and trends.

Strategy 4.3.9. Use appropriate communications strategies to publicize new science and technology on natural resource conservation and ensure that new information is widely disseminated within the agency and among the partnership.

State Governments & Agencies

Idaho Department of Fish and Game

Goal 1. Preserve, protect, perpetuate, and manage Idaho's 500+ fish and wildlife species, as steward of public resources.

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

Strategy 1. Protect, preserve, and perpetuate fish and wildlife resources for their intrinsic and ecological values, as well as their direct benefit to man.

Strategy 2. Actively support and participate in efforts to protect or enhance the quality of water in Idaho's lakes, rivers, and streams.

Strategy 3. Advocate land management practices that protect, restore and enhance fish and wildlife habitat, especially habitats such as wetlands and riparian areas that benefit a wide variety of fish and wildlife species.

Strategy 4. Be an advocate for wildlife and wildlife users in legislation, land and water use activities, policies, or programs that result in significant and unwarranted loss of fish and wildlife habitat or populations, and encourage project designs that eliminate or minimize such losses.

Goal 2. Increase opportunities for Idaho citizens and others to participate in fish- and wildlife-associated recreation.

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

Strategy 1. Support hunting, fishing, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.

Strategy 2. Manage fish and wildlife resources for recreational and other legitimate benefits that can be derived primarily by residents of Idaho.

Strategy 3. Manage fish and wildlife to provide a variety of consumptive and nonconsumptive recreational opportunities as well as scientific and educational uses.
Strategy 4. Manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.
Strategy 5. Use the best available biological and social information in making and influencing resource decisions.

Fisheries Bureau
Goal 1. To provide viable fish populations now and in the future for recreational, intrinsic, and aesthetic uses.

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

Strategy 1. Develop and implement statewide fisheries programs.
Strategy 2. Operate fish hatcheries to provide eggs and fish for the angling public.
Strategy 3. Prepare and distribute information to the general public about fishing areas, rules, and techniques for angling.
Strategy 4. Maintain and enhance the quality of fish habitat so natural production of fish can be maintained.
Strategy 5. Provide access sites and related facilities for the boating and fishing public.

Goal 2. To preserve Idaho's rare fishes to allow for future management options.

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

Strategy 1. Provide technical expertise to the Executive and Legislative branches, Idaho Northwest Power Planning Council representatives, Idaho Fish and Game Commission and to the citizens of Idaho.

Strategy 2. Work closely with other regulatory agencies to provide adequate passage for anadromous fish to and from Idaho and the ocean environment.

Strategy 3. Assist in recovery of rare species through captive rearing projects, supplementation, and protection.

Strategy 4. Provide input to land management agencies on how fishery resources may be affected by various proposed activities.

Strategy 5. Conduct periodic surveys of Idaho anglers to determine their preferences and opinions.

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

Strategy 1. Provide technical guidance to land management agencies and private landowners to minimize impacts to aquatic habitats from their activities.

Strategy 2. Coordinate with Natural Resources Policy Bureau, Department of Water Resources, and the Department of Environmental Quality to develop minimum stream flows and lake levels, water quality standards, and riparian habitat standards that maintain or improve habitats.

Statewide Fisheries Management

Idaho's overall goal is to restore and maintain wild native populations and habitats of resident and anadromous fish to preserve genetic integrity, ensure species and population viability, and provide sport fishing and aesthetic benefits.

Objective 1. Wild native populations of resident and anadromous fish species will receive priority consideration in management decisions.

Objective 2. Maintain or enhance the quality of fish habitat.

Strategy 1. Use spatial databases to assist in prioritization of habitat improvement projects.

Strategy 2. Coordinate with other agencies and landowners to develop comprehensive conservation and restoration plans.

Objective 3. Fully utilize fish habitat capabilities by increasing populations of suitable fish species to carrying capacity of the habitat.

Objective 4. Maintain genetic integrity of wild native stocks of fish and naturally managed fish when using hatchery supplementation.

Resident Fish Management

There are two goals for resident fish and aquatic communities: The first is to ensure that native species are well distributed and represented in the aquatic communities of the Closed Basins sub-basin, such that these species are not prone to extinction. The second is to provide abundant, diverse sport fishing opportunities around the sub-basin. The second goal places emphasis on, but is not restricted to, sport fishing opportunities for native and self-sustaining populations of fish. Hatchery programs will also be used to provide opportunities in appropriate waters.

Objective 1. Maintain or restore wild native populations of cutthroat trout, bull trout and resident rainbow trout to ensure species viability and sport fishing opportunity.

Strategy 1. Implement bull trout recovery measures in accordance with Bull Trout Recovery Plan.
Strategy 2. By 2003, ascertain the genetic purity and native fish status of stocks in the subbasin to aid in the prioritization of fishery management decisions.
Strategy 3. Protect, improve and restore degraded habitat.
Action 1. Utilize fish screens on major irrigation diversions to minimize entrainment.
Action 2. Evaluate introgression rates between rainbow trout and Yellowstone cutthroat stocks in the subbasin.

Objective 2. Increase sport-fishing opportunities in Idaho and provide a diversity of angling opportunities desired by the public.

Strategy 1. Develop fishing ponds in areas where stream-fishing opportunity is limited by conservation efforts on native fishes or inefficient use of hatchery fish.
Action 1. Develop one or two catchable trout ponds in the Big Lost River, Birch Creek and Medicine Creek drainages.
Strategy 2. Obtain access sites and conservation easements on the Big Lost River to improve public fishing opportunity.

Objective 3. Where desirable and feasible, some lakes will be maintained as fishless lakes to allow for maintenance of natural conditions for native fauna within alpine ecosystems.

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

Native Salmonid Assessment Research

Goal 1. Protect and rebuild populations of native salmonids in the middle and upper Snake River provinces to self-sustaining, harvestable levels. Associated with this goal are three specific objectives, which are being implemented in phases:

Objective 1. Assess current stock status and population trends of native salmonids and their habitat.

Strategy 1. Coordinate with other ongoing projects and entities to avoid data duplication and to prioritize sampling efforts.
Strategy 2. Use electrofishing and snorkeling to estimate presence/absence and abundance of salmonids throughout the middle and upper Snake River provinces.
Strategy 3. Identify, describe, and measure stream habitat and landscape-level characteristics at the fish sampling sites.

Strategy 4. Collect genetic samples (fin clips) from native salmonids to determine (using microsatellite DNA markers) the purity of populations and the degree of genetic variability among and within populations.

Strategy 5. Develop models that explain the occurrence and abundance of native salmonids based on measurable characteristics of stream habitat and landscape features. Results will identify populations at risk and in need of recovery strategies, and will guide study design for Objective 2.

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

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

Terrestrial Habitats and Wildlife

Forest Carnivores

Objective 1. Monitor marten populations and harvest opportunities.

Objective 2. Improve knowledge through research and monitoring of harvest and populations.

Objective 3. Determine presence/absence of forest carnivores in potential habitats to delineate distribution, size, and isolation of populations.

Strategy 1. Conduct surveys for fishers within areas of unverified presence but having potential occupancy and in potential habitat linkage zones following (Zielinski and Kucera 1994).

Action 1. Develop methodologies for monitoring marten populations and harvest.

Objective 4. Expand marten, fisher, and lynx distribution.

Strategy 1. Prioritize recolonization and augmentation areas.

Objective 5. Manage vegetation consistent with historical succession and disturbance regimes.

Strategy 1. Restore fire as an ecological process.

Action 1. Evaluate historical conditions and landscape patterns to determine historical vegetation mosaics across landscapes through time.

Objective 6. Provide sufficient core and linkage habitats to support will distributed forest carnivore populations throughout their historic range.

Strategy 1. Protect integrity of forest carnivore habitats.
- Action 1. Assess the effects of habitat fragmentation and mortality from roads and highways on lynx population viability.
- Action 2. Determine the effects of open forest roads and associated human use on populations and habitat use.
- Action 3. Determine the size and characteristics of refugia for forest carnivores.
- Action 4. Determine to what extent lynx use shrub-steppe habitats.
- Action 5. Provide a landscape of interconnected blocks of forging habitat.

Strategy 2. Delineate potential habitats.
- Action 1. Map habitats using 1:250,000-1:1,000,000 scale maps with attributed coverages at the drainage, subdrainage, and stand scales.
- Action 2. Identify connectivity and core habitats for priority protection and conservation.

Strategy 3. Identify habitat linkage zones connecting regional populations demographically and genetically.
- Action 1. Manage linkage zones as primary conservation areas.
- Action 2. Examine roading impacts to linkage habitats and populations.
- Action 3. Identify core areas that possess high quality habitats and high-density populations.

Small Mammals

Objective 1. Survey and identify roost, foraging and hibernacula habitats, individuals and populations of bats, especially Townsend's Big-eared bat.

Objective 2. Protect and conserve pygmy rabbit shrub-steppe habitats from fire, grazing, and agricultural conversion.

Strategy 1. Identify and record population and individual sitings of pygmy rabbits.

Migratory and Resident Birds

Objective 1. Maintain existing distribution and extent of each riparian system.

Objective 2. Implement Idaho Bird Conservation Plan (includes conservation plans for priority bird species and habitats).

Objective 3. Develop and implement monitoring plans for Idaho Fish and Game "sensitive" nongame bird species and their habitats, including but not limited to: American white pelican, great egret, trumpeter swan, harlequin duck, northern goshawk, black tern, yellow-billed cuckoo, flammulated owl, northern pygmy owl, great gray owl, boreal owl, three-toed woodpecker, black-backed woodpecker, and loggerhead shrike.

Objective 4. By 2025, restore at least 10% of the historical extent of each riparian system within each ecoregion subsection, to conditions that would support productive populations of designated focal species.

Strategy 1. Determine the potential bird communities within each riparian ecosystem.
Strategy 2. Determine the habitat requirements and habitat associations of focal and priority species and the effects of management activities and land use.
Action 1. Determine habitat requirements and population trends of focal and priority species using published and unpublished data.
Action 2. Initiate research and monitoring programs for focal and priority species
Strategy 3. Accumulate information on the current and potential distributions of each riparian system.
Action 1. Develop a GIS data repository for riparian associated information.
Action 2. Complete the National Wetland Inventory mapping of riparian habitats for areas not yet completed.
Action 3. Identify areas of potential good quality riparian habitat and areas where restoration should occur.
Strategy 4. Restore riparian habitats based on feasibility, land ownership, size of existing patches, existing land matrix, quality, and habitat connectivity.

Objective 3. Obtain a net increase in the number of acres of non-riverine wetlands in Idaho, focusing on the same types and amounts that historically occurred there.

Strategy 1. Write habitat management recommendations for wetland birds.

Objective 4. By the end of 2009, reverse declining trends of species associated with sagebrush habitats in Idaho, while maintaining current populations of other associated species.

Strategy 1. Assess existing condition and extent of shrub-steppe habitat in Idaho at three levels: statewide, administrative unit, and management unit.

Action 1. Use remote sensing, existing information, and ground data to identify, map, assess, and prioritize shrub-steppe habitats.

Action 2. Prioritize potential restoration sites based on feasibility, land ownership, land management, and existing conditions.

Owls

Objective 1. Develop information on Northern Pygmy, boreal, flammulated, and great grey owl habitat use, population trends, and demographics.

Objective 2. Protect existing and potential habitats from loss and degradation.

Strategy 1. Develop permanent monitoring sites.

Action 1. Establish and conduct owl survey transects and surveys.

Action 2. Erect and monitor nest boxes.

Strategy 2. Retain snags and primary cavity nesters.

Action 1. Protect or implement uneven-aged forest management practices.

Action 2. Retain suitable boreal owl habitat in spruce-fir forests.

Action 3. Restore aspen forests.

Action 4. Retain large snags and habitat near and in riparian areas.

Northern Goshawk

Objective 1. Determine biology and ecology of northern goshawks.

Strategy 1. Use long-term studies to measure nest territory fidelity, home range, habitat use, and metapopulation dynamics.

Objective 2. Determine the abundance and distribution of goshawks.

Strategy 1. Use standardized survey protocols for surveying habitats.

Objective 3. Protect nesting goshawks and foraging habitats in home ranges of nesting goshawks.

Strategy 1. Develop conservation agreements with private landowners.

Action 1. Develop management guidelines that are standardized across regional boundaries for forest cover types, and climates.

Action 2. Manage riparian habitat in mature forest to include buffer zones to protect potential goshawk nesting and foraging habitat.

Sharp-tailed Grouse

Objective 1. Continue monitoring populations and conduct surveys of habitats that may support sharp-tailed grouse.
Objective 2. Implement sharp-tailed grouse conservation management plan.
Objective 3. Identify and map existing sharp-tailed grouse habitat and areas of potential sharp-tailed grouse habitat. Develop local management plans to protect and perpetuate sharp-tailed grouse habitat.

Sage Grouse

Objective 1. Identify, protect, and enhance existing and potential sage grouse habitat within each Management Area.

Strategy 1. Manage nesting and early brood habitats to provide 15-25% sagebrush canopy coverage and about 7 inches or more of grass and forb understory during the May nesting period.
Strategy 2. Manage for late summer brood habitat that includes a good variety of succulent vegetation adjacent to sagebrush escape and loafing cover.
Strategy 3. Manager for winter habitat that provides sagebrush exposed under all possible snow depths.
Strategy 4. Implement grazing management and big game regulations to achieve and maintain sagebrush and riparian/meadow habitats in good ecological condition.
Strategy 5. Do everything possible to protect remaining sage grouse habitats where natural fire frequency is 50-130 years and recent fire has greatly reduced sage grouse habitat.
Strategy 6. Establish priority areas for sage grouse habitat management.
Strategy 7. Implement Upper Snake local working group sage grouse management plan when plan is finalized.
Strategy 8. Monitor the condition and trend of sage grouse habitat.
Action 1. Prepare cover type maps and evaluate habitat conditions using standards methods for key seasonal habitats.
Action 2. Offer conservation easements or acquire critical habitats from willing sellers through land exchange, reserved interest deed, or direct purchase of mapped important sage grouse habitats.
Action 3. Develop strategically placed firebreaks using greenstripping or mechanical removal of fuel.
Action 4. Control noxious weeds along roads.
Action 5. Include forbs and native grasses in seeding mixtures on critical habitat areas.
Action 6. Rehabilitate gullied meadows to raise the water table and restore meadow characteristics.
Action 7. Improve grazing management in sage grouse nesting habitats.

Action 8. Restore riparian habitats through grazing and water diversion management.

Objective 2. Implement the statewide Sage Grouse Management plan. Manage for local populations as outlined in the statewide plan.

Strategy 1. Improve the base of knowledge on the status and distribution of Idaho sage grouse and their habitats.

Strategy 2. Monitor the abundance and distribution of sage grouse.

Action 1. Identify areas of strong sage grouse populations and protect them from habitat loss.

Action 2. Identify areas of good or declining populations of sage grouse and manage habitats to restore or protect them.

Action 3. Determine the population trends of shrub-steppe birds by establishing breeding bird surveys in each Sage Grouse management area.

Action 4. Establish lek route(s).

Amphibians, Reptiles, and Invertebrates

Objective 1. Conduct surveys and monitor populations of western toads and northern leopard frogs.

Objective 2. Provide habitat protection of wetland and riparian areas for western toad and northern leopard frog populations.

Plants and Habitats

Objective 1. Reduce habitat modification to conserve Alkali Primrose.

Objective 2. Monitor trend in populations of Alkali Primrose.

Action 1. Maintain protection of primrose population in Birch Creek .

Objective 4. Assess, conserve, and enhance wildlife habitats.

Strategy 1. Identify and monitor habitats needed to maintain Idaho's wildlife diversity.

Action 1. Determine quantity, distribution, and condition of dominant plant communities and major habitat elements on a basin, physiographic area, and statewide basis.

Action 2. Identify priority habitats of concern and their ecological relationships to native species.

Action 3. Monitor changes and trends in habitats on a basin, physiographic province (ecoregional), and statewide basis, with emphasis on priority habitats.

Strategy 2. Identify and implement habitat conservation and management actions needed to maintain Idaho's wildlife diversity.

Action 1. Identify conservation, restoration, and management needs and opportunities for priority habitats.

Action 2. Take actions to conserve, restore, enhance, or acquire important habitat areas.

Action 3. Promote land use patterns and management practices that conserve, restore, and enhance habitats needed to maintain wildlife diversity.

Action 4. Provide technical information and support to landowners, land managers, and local governmental agencies regarding habitat protection, restoration, and enhancement.

Action 5. Develop incentive and recognition programs to assist in the conservation, restoration, and enhancement of habitats on private lands.

Objective 5. Assess, conserve, and enhance populations of native species at self-sustaining levels throughout their natural geographic ranges.

Strategy 1. Species and Population Status Surveys and Monitoring.

Action 1. Maintain listings of species, populations, and distinct smaller groups that are, or could be, facing extinction or extirpation in Idaho using such categories as: endangered, threatened, and species of special concern.

Action 2. Determine the status of poorly known species and populations.

Action 3. Conduct research to address incomplete information on the taxonomic status of species.

Action 4. Maintain listings of species, populations, groups of species, or distinct smaller groups requiring special attention.

Action 5. Monitor populations of endangered, threatened, and species of special concern and populations of other species requiring special management attention.

Action 6. Develop and establish cooperative survey and monitoring protocols for priority species lacking such procedures.

Action 7. Monitor populations of common species.

Strategy 1. Continue monitoring game species populations and harvest.

Strategy 2. Provide hunting opportunity for game species without a loss of days available for hunting each species.

Action 8. Record verified unusual sightings of rare or unusual wildlife occurrences.

Strategy 2. Identify, establish, and implement management measures to restore threatened and endangered species; preventing species of special concern from qualifying as threatened or endangered; and maintaining or enhancing other species requiring special attention.

Action 1. Conduct research to address incomplete information on species' habitat requirements, limiting factors, population demographics, and effectiveness of species conservation and management programs.

Action 2. Identify measures needed to protect, restore, maintain, or enhance populations of threatened, endangered, and species of special concern, and other species requiring special attention.

Action 3. Implement measures needed to protect, restore, maintain, or enhance populations of threatened, endangered, and species of special concern, and other species requiring special attention.

Action 4. Reintroduce native species or populations where they have been severely depleted or extirpated as may be biologically feasible and ecologically valid.

Action 5. Provide technical information and support to landowners, land managers, and local governmental agencies on species protection, restoration, and enhancement.

Action 6. Promote conservation of species populations and related ecosystems through state and local governmental agencies, landowners, land managers, and the public.

Action 7. Implement Idaho wolf management plan if wolves are placed under state management.

Action 8. Implement Idaho grizzly bear management plan if grizzly bears are placed under state management.

Restore and Enhance Upland, Riparian, Wetland, and In-stream Fish and Wildlife Habitat

Objective 1. Develop comprehensive land management programs including GIS layers identifying important fish and wildlife habitats, habitat quality, and habitat connectivity.

Objective 2. Cost share program or direct construction of fence along upland, riparian, wetland and stream habitat for protection from inappropriate livestock grazing, and/or degradation from human uses. Numerous locations.

Objective 3. Identify important fish and wildlife areas and fund program for conservation easements, exchanges, supplemental payment program, and/or fee title acquisition. Areas would include but not limited to; native grouse habitats, winter ranges and mitigation corridors for big game species, fish spawning streams, and areas used by federal and/or state listed threatened and endangered species, species of special concern, and sensitive species.

Objective 4. Identify important fish and wildlife areas and fund program for habitat improvements. Areas would include but not limited to; native grouse habitats, winter ranges and mitigation corridors for big game species, fish spawning streams, and areas used by federal and/or state listed threatened and endangered species, species of special concern, and sensitive species.

Objective 5. Identify and control noxious weeds and intrusive exotic plants. Fund cooperative weed management area projects, wildlife management areas, public access areas, and local, state, and federal agency programs.

Objective 6. Develop and/or implement management plans for federal and state species of special concern and sensitive species.

Objective 7. Develop and implement comprehensive mitigation program to offset loss of fish and wildlife and their habitats from development, including but not limited to; road development, residential and business development, agricultural development, energy development, mining, water use, and recreation.

Objective 8. Implement management plans developed by local working groups (such as, the Upper Snake sage grouse local working group plan, and Idaho Partner's in Flight.

Identify and address low flow and dewatering problems in lotic and lentic systems.

Objective 1. Develop comprehensive water management plans with water management/user agencies, organizations, and/or individuals to optimize fisheries, irrigation, flood control, and power production. Obtain suitable resource maintenance flows and minimum pool levels.

Objective 2. Acquire water rights for fish and wildlife benefits.

Improvements for hydro-power and/or irrigation facilities

Objective 1. Identify and correct fish passage and entrainment problems.
Objective 2. Develop and implement plans for ramping rates, shape and timing of flow releases.
Objective 3. Develop comprehensive water management plans to obtain appropriate maintenance flows, minimum pool levels, water temperatures, nutrient and sediment levels for fish and wildlife.

Research for Fish and Wildlife

Objective 1. Evaluate potential impacts of private stocking of fish on Yellowstone cutthroat trout.
Objective 2. Evaluate impacts of various ramping rates of flows from dams on fish .
Objective 3. Develop improved hatchery supplementation tools and products.
Objective 4. Evaluate relationships between moose densities and twinning rates.
Objective 5. Quantify relationships between sage brush steppe habitats and associated species that are showing long term declines in productivity, abundance, and distribution.

Strategy 1. Study micro-site habitats of shrub-steppe animal species.
Strategy 2. Study nutritional condition of browse, forb, and grass species.
Strategy 3. Study animal population dynamics related to habitat condition.
Strategy 4. Study cause specific mortality of shrub steppe animal species.
Strategy 5. Study current versus historical faunal and floral composition changes.

Objective 6. Continue sage grouse chick (less than 10 weeks of age) mortality study.

Strategy 1. Begin assessment of microhabitat characteristics and predator populations associated with chick mortality.
Strategy 2. Complete the analysis of juvenile survival and dispersal data.

The Idaho Fish and Game Mud Lake Wildlife Management Area Plan includes the following:

Waterfowl Management
Goal: Maintain or improve current waterfowl production and improve waterfowl nesting and migration habitat on the MDWMA.

Objective: Maintain waterfowl nesting success at or above 30%.

Strategy 1. Monitor waterfowl nesting to determine nest success and MDWMA production

Strategy 2. Continue passive predator control. Implementation of this strategy will depend on future funding and the availability of volunteers.

- Remove rock and brush piles (possible mammalian predator den sites).
- Remove avian predator perch sites from nesting areas.
- Slope dikes when possible to remove potential mammalian den sites.
- Remove unused culverts and water control structures (possible mammalian predator den sites).

Strategy 3. If nest success falls below 30%, develop and implement a predator management plan as directed under the IDFG Waterfowl Management Plan).

Objective: Maintain and improve upland nesting cover on the MDWMA.

Strategy 1. Control and decrease Russian knapweed infestations by using mechanical, chemical, and biological control methods. Weed control methods will be planned on a minimum of 100 acres of knapweed yearly.

Strategy 2. Continue planting grass nesting cover in the upland areas of the East Sloughs. Grass plantings will be planned on a minimum of 20 acres yearly.

Strategy 3. Continue planting grass on the idle area around the irrigation pond as conditions warrant. Plant mammoth wildrye in windblown areas.

Strategy 4. Initiate a grass planting program for nesting cover in the western portion of the West Sloughs (as water conditions allow). Implementation of this strategy will depend on future funding and the development of a proposal to flood portions of the western part of West Sloughs.

Strategy 5. Initiate weed control and grass plantings on North Point and Green Island. Implementation of this strategy will depend on future funding. Current funding levels delegates this strategy to a low priority status.

Strategy 6. Maintain and/or improve fences to protect nesting cover from livestock damage.

Strategy 7. Design future livestock grazing agreements to protect/maintain the vegetative cover of nesting areas. Any livestock grazing on the MDWMA must be consistent with the mission statement of the MDWMA and ultimately benefit wildlife. Livestock grazing must coincide with the IDFG Waterfowl and Upland Bird Management.

Objective: Provide mammalian predator free nesting cover with an electric-fence enclosure in the East Sloughs segment of the MDWMA.

Strategy 1. Maintain, monitor, and evaluate the electric-fence predator exclosure at the East Sloughs. Implementation of this strategy will depend on the availability of volunteers.

Strategy 2. Conduct weed control and grass plantings to improve nesting cover inside the enclosure. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to a low priority status.

Strategy 3. Improve brood exits for the enclosure.

Objective **Enhance over water nesting cover for waterfowl. This objective also provides migration habitat for waterfowl.**

Strategy 1. Continue to flood the eastern portion of West Sloughs.

Strategy 2. Flood East Slough impoundments through pumping as much as ground water as conditions allow.

Strategy 3. Monitor the development of emergent hydrophytes in the East and West Sloughs as nesting cover.

Strategy 4. Coordinate with the local canal company to flood the East and West Sloughs in spring when excess irrigation water may be available in Mud Lake.

Strategy 5. Develop a proposal to flood portions of the western part of West Sloughs. Implementation of this proposal will depend on developing a cooperative agreement with the local canal company.

Strategy 6. Develop a planting program for wetland plants as funding allows. West Sloughs will be a priority for this program.

Strategy 7. Maintain and/or improve fences to protect existing nesting cover from livestock.

Strategy 8. Continue the closure of the west segment of Mud Lake to boating activities during the nesting season.

Objective **Provide nesting structures for ducks and geese.**

Strategy 1. Continue the maintenance and evaluation of goose nesting platforms. (Goose nests on platforms are less susceptible to some types of predation and flooding.) The objective is to maintain a minimum of 100 goose platforms.

Strategy 2. Maintain the existing wood duck nest box program with the assistance of volunteers. The objective is to maintain a minimum of 40 nest boxes. Implementation of this strategy will depend on the availability of volunteers.

Strategy 3. Construct and evaluate artificial islands for waterfowl nesting. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to a low priority status.

Objective **Monitor for waterfowl diseases and attempt to control outbreaks when they occur.**

Strategy 1. Continue monitoring and evaluating avian mortalities and initiate practical control measures when a outbreak occurs.

Strategy 2. Remove all sick, dying and dead birds found in marshes to decrease/prevent a disease outbreak.

Strategy 3. Ship samples of dead birds to the Wildlife Health Laboratory in Caldwell, Idaho and/or the National Wildlife Health Laboratory in Madison, Wisconsin to determine cause of death.

Strategy 4. Provide annual report of waterfowl mortalities to the National Wildlife Health Laboratory for inclusion in the national database.

Objective **Enhance and increase the quantity of goose pasture on the MDWMA. This objective also provides migration habitat for waterfowl.**

Strategy 1. Use, as much as is practical, MDWMA agricultural fields to provide goose pasture. A total of 456 acres are all or partially available for this strategy. Implementation of this strategy will depend on future funding.

Strategy 2. Periodically burn grass and sedge areas on Mackenzie Point to remove mulch and to rejuvenate growth. This strategy will depend on annual vegetation growth, weather, and fire conditions.

Strategy 3. Mow dike roads and ditches to enhance grass as goose pasture. Implementation of this strategy will depend on future funding.

Objective **Maintain or improve waterfowl migration habitat.**

Strategy 1. Monitor migratory waterfowl use of MDWMA. If human disturbances increase to a detrimental level, adjust MDWMA access management accordingly and with public involvement.

Strategy 2. Develop a proposal to flood portions of the western part of West Sloughs. Implementation of this proposal will depend on developing a cooperative agreement with the local canal company.

Strategy 3. Investigate the feasibility of wetland plantings of waterfowl forage plants.

Strategy 4. Develop future MDWMA share-crop agreements to provide some forage for migrating waterfowl. A total of 456 acres are all or partially available for this strategy.

Weed Management

Goal: Control noxious weeds on the MDWMA to enhance wildlife habitat.

Objective **Decrease and control the Russian knapweed infestations on the MDWMA.**

Strategy 1. Control and decrease knapweed infestations by using mechanical, chemical, and biological control methods. Weed control methods will be planned on a minimum of 100 acres of knapweed yearly.

Strategy 2. Continue establishing grass plantings in infested areas as funding allows.

Strategy 3. Continue to grow and harvest alfalfa on some agricultural fields to prevent knapweed seed production and to stress knapweed plants.

Strategy 4. Coordinate with the Jefferson County weed supervisor and Natural Resource Conservation Service to develop weed control plans which implement chemical, mechanical, and biological methods.

Strategy 5. Coordinate with the University of Idaho and Montana State University to develop weed control plans which implement biological methods.

Strategy 6. Conduct controlled burns, as conditions and funds allow, to eliminate mulch material and enhance the effectiveness of other control methods.

Strategy 7. Monitor and evaluate the implemented control methods and develop a dynamic control plan based upon evaluated methods and new information as it becomes available.

Upland Game Management

Goal: Improve upland game habitat on the MDWMA by providing better nesting cover, winter cover, and winter food.

Objective **Provide more high quality nesting cover for upland game.**

Strategy 1. Control and decrease knapweed infestations by using mechanical, chemical, and biological control methods.

Strategy 2. Continue grass plantings for waterfowl nesting, which will also improve upland game nesting and winter cover.

Strategy 3. Maintain and/or improve fences to protect existing nesting cover from livestock damage.

Strategy 4. Design future livestock grazing agreements to protect/maintain the vegetative cover of nesting areas. Any livestock grazing on the MDWMA must be consistent with the mission statement of the MDWMA and ultimately benefit wildlife. Livestock grazing must coincide with the IDFG Waterfowl and Upland Bird Management Plans and be adjusted accordingly.

Objective **Provide winter cover and food plots for upland game.**

Strategy 1. Design future share-crop contracts to include food plots for upland game. A total of 456 acres are all or partially available for this

strategy. Implementation of this strategy will depend on future funding and the availability of volunteers.

Strategy 2. Develop a food plot adjacent to the irrigation pond with the aid of volunteers. Implementation of this strategy will depend on future funding.

Strategy 3. Develop experimental food plots of millet and other wetland plants on Mackenzie Point and along the south shore. Implementation of this strategy will depend on future funding and the availability of volunteers.

Strategy 4. Develop food plots on Green Island. Implementation of this strategy will depend on future funding and the availability of volunteers.

Strategy 5. Develop food plots and shelterbelts/shrub thickets on surrounding private land with willing cooperators through the Department's Habitat Improvement Program.

Strategy 6. Maintain willow/cattail/bulrush winter cover on the MDWMA.

Strategy 7. Develop shelterbelts/shrub thickets on the MDWMA. Implementation of this strategy will depend on future funding and the availability of volunteers.

Strategy 8. Maintain and/or improve fences to protect existing winter cover from livestock damage.

Strategy 9. Design future livestock grazing agreements to protect wintering areas. Any livestock grazing on the MDWMA must be consistent with mission statement of the MDWMA and ultimately benefit wildlife. Livestock grazing must coincide with the IDFG Waterfowl and Upland Bird Management Plans and be adjusted accordingly.

Objective **Reduce predation on upland game.**

Strategy 1. Continue passive predator control. Implementation of this strategy will depend on future funding and the availability of volunteers.

- Remove rock and brush piles (possible mammalian predator den sites).
- Remove avian predator perch sites from nesting areas.
- Slope dikes when possible to remove potential mammalian den sites.
- Remove unused culverts and water control structures (possible mammalian predator den sites).

Objective **Provide nesting, brood rearing and winter habitat for sage grouse.**

Strategy 1. Design future grazing agreements to provide areas of sagebrush with a tall grass understory as nesting cover for sage grouse.

Strategy 2. Maintain sagebrush winter cover for sage grouse on MDWMA.

Strategy 3. Continue monitoring the local sage grouse population by conducting a lek route on the MDWMA and adjacent public land.

Wildlife Appreciation/Outdoor Recreation

Goal: To provide access and opportunity for a variety of wildlife appreciation or outdoor recreational activities.

Objective **Provide high quality waterfowl hunting opportunities.**

Strategy 1. Continue to maintain and improve roads and access areas.
Strategy 2. Work on improving the boat access from the North Boat Ramp.
Strategy 3. Maintain and improve the South Boat Ramp. Develop a cooperative agreement with the Owsley Canal Company to improve the road to the South Boat Ramp.
Strategy 4. Clearly mark and improve IDFG access areas on the south shore of Mud Lake.
Strategy 5. Monitor and evaluate hunter use and harvest.
Strategy 6. Adjust public access to MDWMA, according to public use, to maintain quality waterfowl hunting opportunity and protect the wildlife resource.
Strategy 7. Coordinate with the local canal company and watermaster to try to maintain suitable water levels in Mud Lake during the hunting season.
Strategy 8. If ground water levels are high enough in the fall at the Jernberg well, flood part of the West Slough during the hunting season to provide waterfowl hunting opportunity. Implementation of this strategy will depend on future funding. Current funding levels delegates this strategy to low priority status.

Objective **Provide quality upland game hunting opportunities.**

Strategy 1. Maintain and improve roads and access areas.
Strategy 2. Release game farm rooster pheasants as determined by the Wildlife Bureau according to the Upland Game Management Plan and IDFG Commission direction.
Strategy 3. Monitor and evaluate hunter use and harvest.
Strategy 4. Adjust MDWMA access, according to public use, to maintain quality upland game hunting opportunity and protect the wildlife resource.

Objective **Provide quality big game hunting opportunities.**

Strategy 1. Maintain and improve roads and access areas.
Strategy 2. Monitor and evaluate use and harvest.
Strategy 3. Adjust MDWMA public access, according to public use, to maintain quality big game hunting opportunity and protect the wildlife resource.

Objective **Provide furbearer trapping on MDWMA as opportunity provides and consistent with canal company requests.**

Strategy 1. Continue required registration by trappers interested in trapping on the MDWMA as a way of monitoring trapping activities and harvest.

Strategy 2. Coordinate with local canal company on muskrat and beaver control in canals on MDWMA.

Objective **Provide Access for public fishing.**

Strategy 1. Maintain and improve roads and access areas.

Strategy 2. Maintain and improve boat ramps and picnic areas.

Objective **Provide for a variety of non-consumptive outdoor recreational activities on the MDWMA.**

Strategy 1. Maintain and improve roads and access areas.

Strategy 2. Maintain and improve boat ramps and picnic areas.

Strategy 3. Provide access for cross-country skiing, trail biking, hiking, photography, bird watching and other activities as funding allows. Provide information on non-consumptive recreational opportunities.

Strategy 4. Adjust MDWMA access, according to public use, to maintain a variety of quality outdoor experiences and to protect the wildlife resource.

Strategy 5. Develop one or two blinds for wildlife photography/viewing as funding allows.

Objective **Enhance available wildlife information to the public.**

Strategy 1. Develop interpretive areas as funding allows.

Strategy 2. Develop nature trail and/or auto tour with brochure as funding allows.

Strategy 3. Develop educational brochures on waterfowl/wetlands as funding allows.

Strategy 4. Conduct tours for interested groups.

Wildlife Depredation Management

Goal: To minimize and control wildlife depredations on agricultural lands surrounding the MDWMA.

Objective **Provide alfalfa and small grains on the MDWMA for waterfowl use.**

Strategy 1. Design future North Agricultural fields share-crop contracts to include small grains for waterfowl. A total of 337 acres are all or partially available for this strategy

Strategy 2. Provide goose pasture in existing alfalfa fields. A total of 456 acres are all or partially available for this strategy.

Strategy 3. Provide goose pasture on Mackenzie Point by burning sedge and grass areas. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Objective **Provide alfalfa and other forage on MDWMA for big game use.**

Strategy 1. Use current and future MDWMA share-crop agreements to provide some forage for big game. A total of 456 acres are all or partially available for this strategy.
Strategy 2. Maintain willow stands on MDWMA for big game winter forage. Use cutting and/or burning to rejuvenate stands that are declining.
Strategy 3. Use IDFG's share of baled share-cropped hay in a attempt to hold big game on MDWMA in severe winters.
Strategy 4. When feasible and practical, include big game forage plants in upland grass seedings.

Objective **Provide assistance for depredation problems on private land.**

Strategy 1. Service complaints and repair depredation equipment.
Strategy 2. Monitor and evaluate depredation problems.

Objective **Maintain and improve working relationships with neighboring landowners.**

Strategy 1. Clearly mark boundaries to indicate where public land ends and private land starts.
Strategy 2. Cooperatively control noxious weeds.
Strategy 3. Cooperatively maintain fences to regulate livestock.
Strategy 4. Promote ASK FIRST program to sportsmen and other MDWMA users.
Strategy 5. Attend local meetings (i.e. water users meetings).

Nongame Management

Goal: Maintain or improve nongame wildlife and plant populations and biodiversity on the MDWMA.

Objective **Provide migratory, breeding and/or winter habitat for species with special designations such as threatened and endangered species, and species of special concern.**

Strategy 1. Maintain existing peregrine falcon nesting tower and report sightings of peregrine falcons to the Department's Regional Nongame coordinator.

Strategy 2. Develop trumpeter swan nesting structures. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Strategy 3. Monitor annually for nesting trumpeter swans. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Strategy 4. Continue to monitor bald eagle use of MDWMA and maintain traditional perch sites.

Strategy 5. Monitor breeding populations of white-faced ibis and long-billed curlew on MDWMA. Develop all habitat projects to have negligible negative impacts on these species.

Strategy 6. Develop and implement strategies for future listed threatened and endangered species, and species of special concern, if and when listing occurs.

Objective **Provide migratory and breeding habitat for shorebirds.**

Strategy 1. Maintain saltgrass stands in West Sloughs for nesting shorebirds.

Strategy 2. Manage water levels in West Sloughs to provide fall mud flats for shorebirds.

Strategy 3. Experiment with different vegetation manipulation methods to improve shorebird habitat in South Bay. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Strategy 4. Develop a proposal to flood portions of the western part of West Sloughs. Implementation of this proposal will depend on developing a cooperative agreement with the local canal company.

Objective **Provide migratory, breeding and winter habitat for nongame species.**

Strategy 1. Construct and maintain nesting boxes for kestrels, saw-whet owls, bluebirds, swallows, wrens, and bats. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Strategy 2. Construct and maintain nesting structures for raptors and grebes. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Strategy 3. Design, plant, and maintain nongame wildlife habitat projects. Implementation of this strategy will depend on future funding and the availability of volunteers. Current funding levels delegates this strategy to low priority status.

Big Game Management

Goal: Provide habitat to maintain big game populations on MDWMA and reduce depredations on surrounding private lands.

Objective Maintain current big game habitat on MDWMA.

Strategy 1. Use current and future MDWMA share-crop agreements to provide forage for big game as practical. A total of 456 acres are all or partially available for this strategy.
Strategy 2. Maintain willow stands on MDWMA for big game winter forage.

Idaho Department of Environmental Quality

Included in the mission of Idaho DEQ are:

- Restoration, protection, and maintenance of spawning and rearing areas of salmonid fishes through implementation of sediment control measures in TMDL Implementation Plans.
- Refinement of aquatic life beneficial use monitoring and assessment methods to better focus restoration efforts. These mission items are subsumed as a single goal. Restore Cold Water Biota and Salmonid Spawning beneficial uses to full support.

Objective 1. Complete TMDL Subbasin Assessments, Pollutant Reduction Allocations, and Implementation Plans for Impaired Water Bodies.

Strategy 1.Maintain current schedule for TMDL development.
Strategy 2. Complete development of TMDL implementation plans within 18 months of TMDL approval through coordination with appropriate agencies, advisory groups, and interested parties.

Objective 2. Effectuate actions identified in TMDL implementation plans to restore aquatic life beneficial uses.

Strategy1.Seek funding for projects identified in TMDL Implementation Plan.

Local Collaborative Groups

Butte Soil and Water Conservation District

Goals

- Control flooding and streambank erosion on major water bodies in the district
- Meet the rules and regulations of Idaho Water Quality Law, Federal Clean Water Act and Endangered Species Act
- Improve the management and condition of range resources
- Control of noxious weeds and invading species
- Continue public outreach program

Objectives

- **Assist NRCS in developing contracts for the Continuous CRP Program for improving riparian areas and streambanks.**
- **Participate in Idaho's TMDL process, Little Lost WAG for Bull Trout.**
- **Improve Fish habitat.**
- **Seed financial and technical assistance to improve rangeland.**
- **Participate in Lost Rivers Area Coordinated Weed Management.**

Strategies

- Seek programs to stabilize streambanks.
- Lead the development of agriculture and grazing BMPs for TMDL implementation plan .
- Sponsor meetings, training sessions and tours on range improvement and weed control.
- Develop a natural resource education program

Custer Soil and Water Conservation District

Goals

- Continue a comprehensive information and education outreach program.
- Address condition of fisheries and wildlife resources, encouraging multiple use, and meeting the requirements of the federal Clean Water Act, Endangered Specie Act and Idaho Code 39-3601 on water quality.
- Improve resource conditions of: rangeland, hayland, wetlands, riparian areas and water bodies.

Objectives

- **Co-lead the Upper Salmon Basin Watershed Project efforts to implement projects to enhance habitat for resident fish and wildlife.**
- **Conduct workshops, meetings, and training sessions on priority resources issues.**
- **Review, prioritize and seek financial assistance to improve water quality on 303(d) listed streams.**
- **Improve forage on 5000 acres of pasture and hayland.**
- **Coordinate and collaborate with local groups, local agencies, state agencies and federal agencies on resource issues.**
- **Develop partnerships entities to enhance resources and economics.**

Strategies

- Implement BPA habitat contracts.
- Continue youth and adult environmental program.
- Develop, review and prioritize the implement new resource conservation projects for funding

Jefferson Soil and Water Conservation District

Goals

- Reduce weed infestations in the district.

- Improve irrigation water management.
- Reduce wind erosion.
- Promote improved water quality by complying with Idaho Water Quality Law and Federal Clean Water Act.
- Improve awareness of conservation

Objectives

- **Support South Fork Mitigation Weed control Program.**
- **Improved irrigation water management.**
- **Assist producers with dairy and animal feed operation waste management.**
- **Provide administrative support to the South Fork Watershed WAG.**
- **Continue environmental education program.**

Strategies

- Support high priority areas for weed control, wind erosion control and improved irrigation management with technical and financial assistance.
- Provide technical assistance to landowners with Confined Animal Feeding Operations CAFOs) and Animal Feeding Operations (AFOs).
- Provide conservation programs: conservation tree sale program, conservation windbreaks, workshops, presentations and environmental education in schools.

Local Conservation Groups

Research, Monitoring and Evaluation Activities

BPA-funded

Idaho Department of Fish and Game

The Snake River Native Salmonid Assessment (Project No. 980002) is an ongoing IDFG research project initiated in August 1998 to: 1) assess the current status of native salmonids in the middle and upper Snake River provinces in Idaho, 2) identify factors limiting populations of native salmonids, and 3) develop and implement recovery strategies and plans. The inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. In the third phase, recovery strategies for individual or groups of subbasins will be developed to address the factors most important in limiting the patterns of distribution and abundance of native salmonids.

In the first 3+ years of the project, fish and habitat surveys have been made at a total of 757 sites on private and public lands across southern Idaho in nearly all major watersheds, including the Weiser, Owyhee, Payette, Boise, Goose, Raft, Rock, Bannock, Portneuf, Blackfoot, Willow, South Fork Snake, and Teton. Genetic samples of redband trout and Yellowstone cutthroat trout have been collected at a total of 155 sites, and results

are available for 15 sites. Water temperature has been measured and/or obtained from other agencies at 97 stream sites across the middle and upper Snake River provinces. A comprehensive database has been developed that includes data on native salmonid abundance and distribution, genetic samples, habitat summaries, and herpetofauna observations. This project is also evaluating the effectiveness of electrofishing to remove non-native brook trout as a means of reducing threats to native salmonids; after three years of removal, the brook trout population has not been reduced (Meyer 2000; Meyer and Lamansky 2001, In progress). Other removal techniques (e.g., Young 2001) may be evaluated in subsequent years in an attempt to find a more viable method of removing non-native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

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

Non BPA funded

USDS Forest Service

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Little Lost River basin:

- A study assessing the relationship between summer stream temperature and bull trout distribution and abundance.
- A study assessing the relationship between groundwater temperature and juvenile bull trout distribution in small stream basins.
- A study assessing the feasibility of electrofishing to remove exotic brook trout from small streams.
- A study assessing the relationship between water temperature and brook trout distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish were native to the Sinks Drainages and the manner in which they were established.
- A study to determine the temporal nature of bull trout spawning.
- An assessment of fish entrainment through water diversions.
- An assessment of fish passage barriers (culverts and bridges) associated with roads and trails.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Little Lost River:

- Fish populations
- Fish habitat
- Riparian vegetation
- Depth fines
- Stream temperatures

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Big Lost River basin:

- A study assessing the relationship between water temperature and brook trout distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish was native to the Sinks Drainages and the manner in which they were established.
- An assessment of fish entrainment through water diversions.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Big Lost River:

- Riparian vegetation
- Depth fines
- Stream temperatures

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data. Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment,

the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards. USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists, and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

Idaho National Engineering and Environmental Laboratory -- The Idaho National Engineering and Environmental Laboratory (INEEL) which is operated by the U.S. Department of Energy, is located on the eastern Snake River Plain in southeastern Idaho (Figure 26).

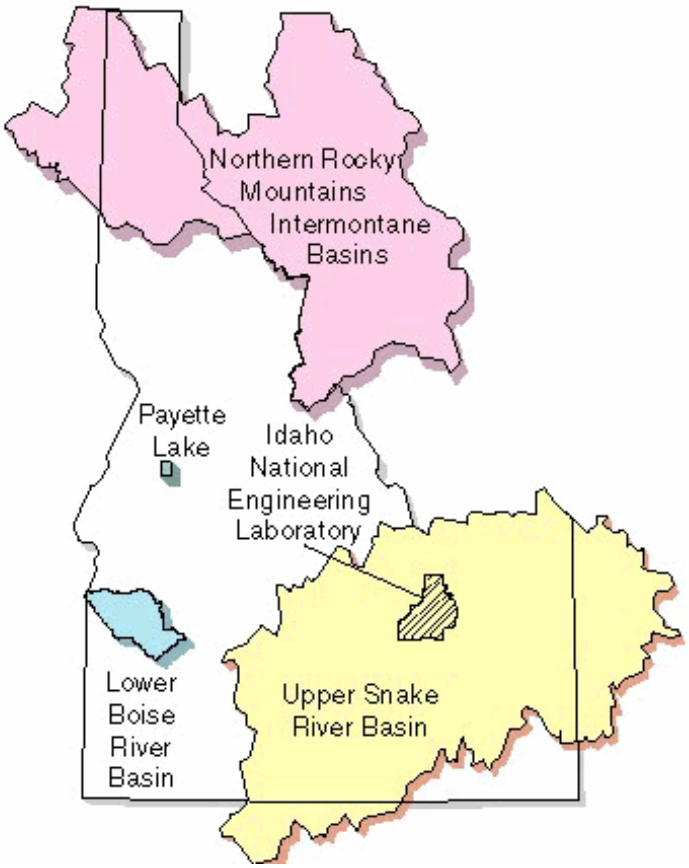

Figure 26. Location of the Idaho National Engineering and Environmental Laboratory in the Upper Snake River Basin.

The USGS has monitored hydrologic conditions in the Snake River Plain aquifer at the INEEL since the early 1950's. A multiphase project began in 1987 to characterize the fate and transport of radioactive and chemical constituents in the aquifer. In the first phase of this project, stratigraphic, geochemical, and hydraulic studies are being incorporated to

define the ground-water flow system at the INEEL. Complementary studies include the use of environmental tracers to provide information about the rate of ground-water flow and geochemical-reaction experiments to evaluate the chemical processes that affect the transport of waste constituents in the subsurface. In the second phase, numerical flow models are developed to simulate the occurrence and movement of water in the aquifer system. These models integrate data obtained from the first-phase studies and are used to evaluate the conceptual model of the flow system. In the third phase, a solute-transport model is developed to test hypotheses about the movement of radiochemical constituents in the aquifer. In addition to the large-scale characterization study, the USGS began a flood-plain study in 1994 to delineate the possible extent, volume, and velocity of floods in relation to INEEL processing and storage facilities. Other USGS activities at the INEEL include regional and local surface geologic mapping and subsurface stratigraphic, isotopic, and paleomagnetic studies to help develop hazard assessments for potential threats from earthquakes and volcanic eruptions for the INEEL and for specific reactor and radioactive-waste storage facilities. An extensive bibliography of USGS publications and reports relative to the INEEL is in Appendix F.

Hydrologic and Water-Quality Data --Idaho has seven major river basins--the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of water resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water-quality data at numerous sites throughout the State. For example, streamflow discharge was measured at 279 gaging stations; water-quality data were collected at 124 of those stations in 1996 (Figure 27).

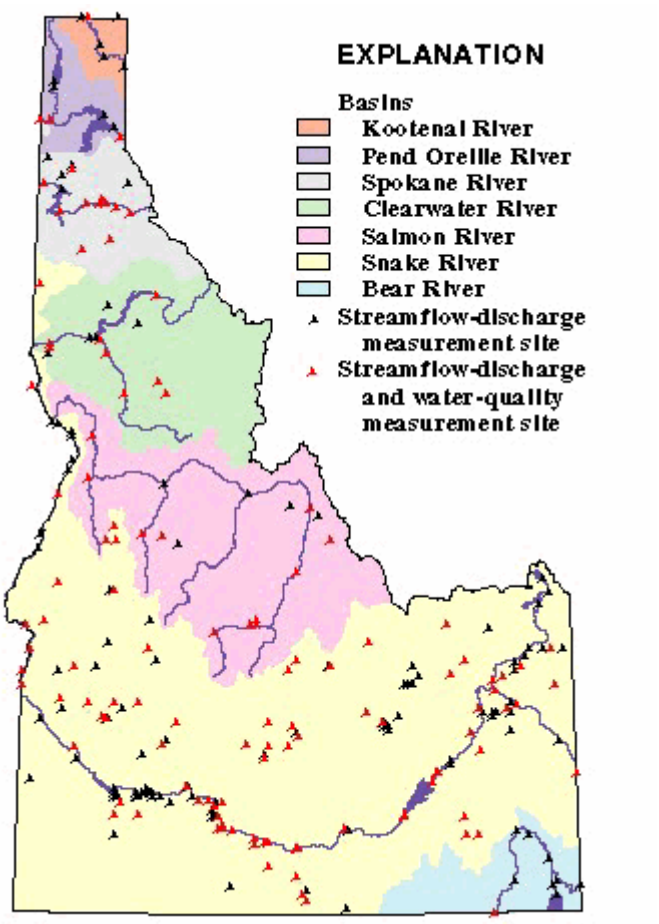

Figure 27. USGS River gages from which stream flow and water quality measurements are taken.

U.S. Department of Energy, Idaho Operations Office

DOE-ID has had an air, soils, water and foodstuffs monitoring network in place throughout the Snake River Plain since the early 1950s, specifically to monitor radiation levels. Details of this effort can be found in Saffle et al. (2000). DOE-ID also sponsors five remote-area and eight near-facility annual Breeding Bird Surveys (Belthoff et al., 1995), winter and summer big-game counts, and an annual jack-rabbit count (Luft and Warren, 2000). Moreover, DOE-ID historically supported a rigorous program of environmental and ecological research of the sagebrush-steppe ecosystem (see Appendix H).

Safari Club International

Mule Deer Recruitment in Southern Idaho -- The SE Idaho Chapter of Safari Club International partnered with the Idaho Department of Fish and Game (IDF&G) for this project. The study area is in Game Management Units 54, 55, 56, 57, 70, and 73A located in the Upper Snake subbasin, with additional studies in Game Management Unit 67 in the Upper Snake Headwaters subbasin and Game Management Units 59 and 59A in the Upper Snake Closed basin. The study period is from 1998 through 2003. The Idaho Chapter of Safari Club International, to date, has donated $10,000.00 and has supplied hundreds of man hours trapping deer for the study. $125,000.00 has been leveraged towards this study

through the U.S. Forest Service, the Bureau of Land Management, National Shooting Sports Foundation, National Fish and Wildlife Foundation and Safari Club International. This research has 2 major emphases that will identify factors that influence deer populations in Southern Idaho. The first will determine the effect of predation on mule deer population characteristics such as population growth, recruitment, and mortality. This will include an evaluation of the effectiveness of coyote control as a means to increase deer populations. The second emphasis will identify habitat factors influencing population levels of mule deer in southern Idaho. Without a thorough understanding of how deer and predator populations interact on a large scale, management of deer populations on the typical big game unit level is difficult.

Sharp-tailed Grouse Lek Inventory --This project is a partnership between the SE Idaho Chapter of Safari Club International and the Idaho Department of Fish and Game (IDF&G), and the Southeast Idaho, Jefferson County and Upper Snake River Chapters of Pheasants Forever. The study area is in portions of Bingham, Bonneville, Fremont, Jefferson, Madison and Teton counties located in the Upper Snake Headwaters subbasin and the Upper Snake Closed Basin. The study period is scheduled for March and May 2002. The Idaho Chapter of Safari Club International with matching grants and private contributions has donated $6,500.00 towards this study. An additional $6,250.00 has been pledged by the study partners. Biological aides will be hired by the IDF&G to systematically ground search suitable habitat in the identified study area. Additional survey personnel will include Idaho Chapter volunteers. Columbian sharp-tail grouse (*Tympanuchus phasianellus columnianus)* leks will be located and mapped, and the number of birds occupying will be recorded. This project will provide scientifically collected information on distribution and relative abundance of sharp-tailed grouse in a portion of eastern Idaho where only limited data currently exists. This data will be used to develop population management recommendations and prioritize habitat conservation areas.

Statement of Fish and Wildlife Needs

Multi-scale Ecological Research and Development of New analytical Tools

Fisheries/Aquatic Needs

USDI BLM (P. Koelsch, in litt.)

- The Little Lost Flood Control Project was constructed in 1985 through a Natural Resource Conservation Service (NRCS), Resource, Conservation and Development Grant to alleviate annual winter flooding and associated property damage. Fishery surveys conducted in 1999 documented the annual loss of the federally threatened bull trout during winter operation. The annual operation of the Flood Control project appears to be a significant to the recovery of the bull trout population in the Little Lost River Watershed. A feasibility study is necessary to develop an array of alternatives to reduce or eliminate the loss of bull trout. Funding avenues need to be explored to develop the feasibility study and ultimately construction of the preferred alternative.
-

USDA Forest Service (Gamett, in litt.) for the Little Lost River include:

- Assessing the temporal and spatial patterns of fluvial bull trout
- Determining the mechanisms by which brook trout replace bull trout
- Assessing the role of winter stream temperatures on bull trout spawning, incubation, and juvenile distribution
- Assessing the role of water temperature in determining salmonid species distribution
- Describing the genetic makeup, life history, and ecology of the shorthead sculpin

USDA Forest Service (Gamett in litt.) for the Big Lost River include:

- Describing the genetic makeup, life history, and ecology of the mountain whitefish
- Describing the genetic makeup, life history, and ecology of the shorthead sculpin and Paiute sculpin.

USDA FS, BLM and ID F&G by Gamett (1999) for the Little Lost River Drainage:

Habitat Management

- Improve riparian habitat and reduce sediment levels in the Wet Creek subdrainage. Reaches of emphasis are Wet Creek above Basin Creek, Coal Creek, the unnamed tributary to Wet Creek below Coal Creek, Basin Creek, and Squaw Creek. This could be accomplished through riparian pastures to better regulate grazing.
- Relocate the Mill Creek trailhead to reduce impacts to the stream associated with this development.
- Relocate the Timber Creek trail below the confluence of Slide Creek and Timber Creek. This would involve moving the trail approximately 50 to 100 m downstream of the present location. It would result in the trail crossing only Timber Creek instead of Timber Creek and Slide Creek.
- Assess potential culvert barriers in Moonshine Creek and Redrock Creek.
- If there are willing sellers, acquire land or easements on private land along perennial stream reaches to prevent housing development. Emphasis should be on Wet Creek, Big Creek, Summit Creek, Badger Creek, Squaw Creek (Wet Creek drainage), and the Little Lost River.
- Evaluate removing natural "semi-permanent" barriers that may be blocking the migration of fish into several stream reaches. These include barriers on Badger Creek 3.0 km above the Little Lost River, Bunting Creek 300 m above Badger Creek, Quigley Creek approximately 400 m above the Little Lost River, and Camp Creek immediately above Timber Creek.
- Evaluate reconnecting Williams Creek to the Little Lost River.
- Evaluate irrigation diversion barrier and connectivity between Badger Creek and the Little Lost River.
- Evaluate the potential for Horse Creek to support bull trout. If it is suitable, evaluate the possibility of reconnecting the stream to the Little Lost River.
- Relocate the Williams Creek Road (# 405) above the stream crossing approximately 1 km above the Forest boundary out of the riparian area.
- Work with cooperating landowners to improve riparian habitat on private land. Emphasis should be on the Little Lost River between Badger Creek and the private property line above Summit Creek.

- Reduce summer stream temperatures wherever possible. Emphasis should be on the Little Lost River and tributaries above Summit Creek and the Wet Creek drainage.
- Reduce sediment levels and stream temperatures in Bear Creek.
- Reduce sediment levels in Deer Creek and Redrock Creek.
- Reduce sediment levels and improve riparian conditions on Meadow Creek.

Fish Management

- Continue to monitor the Little Lost River at Iron Creek and Wet Creek at the Forest Boundary for brook trout expansion. These sites are above the upper limit of brook trout distribution in these 2 subdrainages and are being monitored to detect an expansion of brook trout into key bull trout streams.
- Control brook trout expansion wherever possible.
- Eradicate brook trout in Big Creek, Squaw Creek (Sawmill Canyon), Mill Creek, and the Little Lost River above Summit Creek.
- Confirm the existence of brown trout. If found, work to eradicate this species before it becomes established elsewhere in the drainage.
- Assess the loss of bull trout through irrigation diversions on Williams Creek, Wet Creek, and Sawmill Creek near Timber Creek.
- Assess the feasibility of eradicating brook trout in Meadow Creek and Dry Creek and introducing bull trout.
- Determine the degree of illegal and unintentional bull trout harvest.

Education

- Continue efforts to educate the public about the no harvest bull trout rule and identification of bull trout through annual placement of identification posters throughout the Little Lost River drainage.
- Maintain the large bull trout identification signs at the Timber Creek Campground and Sawmill Canyon at the Forest Boundary.
- Expand efforts to educate the public about the no harvest bull trout rule and identification of bull trout by placement of large bull trout identification signs at the Pass Creek/Wet Creek summit, at the Summit Creek summit, and north of Howe.
- Expand efforts to educate the public about the no harvest bull trout rule and identification of bull trout through distribution of bull trout pamphlets through Forest Service, Fish and Game, and Bureau of Land Management personnel and offices; local businesses; and tourism centers.
- Begin efforts through the news media and other means to inform the public about fish ecology, fish management, and fish management issues in the Little Lost River drainage. Emphasis should be on bull trout and bull trout recovery efforts being made by various agencies.
- Increase enforcement activities relating to the no bull trout harvest rule. Efforts should be concentrated along the Little Lost River and tributaries above Summit Creek.

The following section was developed by the members Little Lost River Interagency Technical Advisory Team for the Bull Trout (LLRITAT, 1998). These actions are recommended until a conservation plan for these watersheds can be developed.

Barriers to migration

- New culvert installations in migration routes must be designed and constructed so as not to be a migration barrier (short term). Concrete box culverts and bridges are recommended.
- Fish passage, including but not limited to bull trout, must be designed into replacement stream crossings (existing) when failures occur, design life has been exceeded or are known to be barriers. Culverts listed in the below watersheds, should be inventoried and should be planned for fish passage.
- Provide for fish passage at Moonshine Creek and Redrock Creek (short term).

Roads

- Reduce road sediment production in sub-watersheds with high substrate fine sediment characteristics (greater than 35%). Particularly the sub-watersheds that are adjunct, are priority 1 or 2, or have road density in the RHCA greater than or equal to one mile per square mile (short term).
- Reconstruct existing roads with effective cross-drain spacing and drain dip location to turn water to slope filtration, rather than to existing first order streams.

Mining

- Maintain restrictions on suction dredge mining in focal and adjunct habitats (spawning and rearing) as well as nodal habitats (mainstream migration corridors) (long term).
- Continue enforcement on current mining regulations.

Forest Practices

- Reduce the risks of stand consuming wildfires through continuation of active forest management in priority 1 and 2 sub-watersheds most at risk (short term).
- Continue enforcement on current forest practices regulations.

Threats to Lake/Reservoir Habitats

- Continue to evaluate mountain lakes to identify potential bull trout habitat, and monitor distribution of fish stocked into mountain lakes in the little Lost Key Watershed.

Fish Harvest

- Replace and increase number of fishing regulation and bull trout identification signs throughout Little Lost River key watershed where fishing access dictates (short term).
- Continue enforcement of current fishing regulations and increase patrols in identified spawning (June-August) and wintering areas (November-March) (short term).
- Improve angler ability to identify bull trout and understand reasons for protective regulations.

Agriculture/ Livestock

- Encourage improved management techniques that address cattle dispersal, timing of use, and herding.
- Evaluate livestock allotments, and if necessary, take actions that would reduce sediment production, increase streambank/channel stability, and implement management practices that contribute to riparian vegetation integrity over a wider area. Increase residual vegetation at the end of the grazing season in Upper Sawmill Canyon.
- Enforce State water laws. Don not permit new consumptive water rights.

Exotic Species

- Reduce competition with brook trout where they overlap with bull trout in priority 1 sub-watersheds through selective removal by liberalized angling and electrofishing (short term).

Additional information needs

- Continue to inventory native salmonids throughout the Closed Basin where existing information is lacking, in order to determine current status and the major factors limiting their distribution and abundance.
- Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within native Yellowstone cutthroat trout populations and to delineate genetic population structure of Yellowstone cutthroat trout throughout their historic range. This fundamental genetic information with regards to introgressive hybridization and genetic population structure is needed to identify remaining pure populations, preserve existing genetic variability, and identify population segments for the development of management plans and the designation of conservation units/management units.
- Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout. A greater understanding of the phenomenon of hybridization and introgression observed within *Oncorynchus* populations throughout the middle and upper Snake River provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of the possible future genetic risks native *Oncorynchus* populations face with regards to hybridization and introgression.
- Continue to gather and analyze genetic information on bull trout and Yellowstone cutthroat trout to determine the purity of populations and the degree of genetic variability between and among populations.
- Continue coordinated collection of water temperature data throughout the Closed Basin to determine water quality and areas of concern for native fishes.
- Identify culverts that need fish passage considerations. Those in priority 1 and 2 sub-watersheds are “short term” and the rest of the Little Lost River key watershed is “long term”.
- Identify facilities and actions needed to prevent the loss of bull trout to irrigation diversions (short term), such as diversion fish screens.
- Monitor population responses to conservation actions (long term).

- Participate in the ongoing temperature data collection effort coordinated by U.S. Environmental Protection Agency (short term).
- Continue studies looking at bull trout in Little Lost River key watershed (short term).
- Coordinate and document strategy for current and future monitoring (short term).

Recommended priorities for implementation

In the previous section a "short term" or "long term" was identified for each action and is listed in the parentheses. These priorities are based on recommendations of the Little Lost River Technical Advisory Team. Immediate actions are any of those actions with a "(short term)". Immediate actions are those actions deemed necessary to maintain groups of bull trout at risk in the Little Lost River key watershed, while the conservation plan for the entire basin is being developed.

Wildlife/Terrestrial Needs

Comprehensive Monitoring Program for Neo-tropical Migrant and Other Non-game Birds

Bird populations have long been recognized as a good indicator of environmental health. The INEEL is the only area within the Closed Basin Subbasin with a rigorous bird monitoring program. Although the best in the region, this program is wanting because it only examines bird presence and abundance, rather than the more telling metrics of productivity and survivorship. There is a scientific need to establish a comprehensive network across the subbasin of MAPS (Monitoring Avian Productivity and Survivorship; DeSante and Burton, 1997) stations to provide coordinated and uniform information on bird populations and, as an extension, an evaluation of environmental health.

Baseline Winter Surveying in the Closed Basin of the Upper Snake --The North American Moose Foundation (NAMF) and the Idaho Department of Fish and Game (IDFG) are currently planning to partner together to determine the need for surveys of moose and habitat. There have been no specific Moose surveys conducted in the Closed Basin of the Upper Snake. Accurate winter surveys, and seasonal as required, of Moose are needed to: 1) set permit levels; 2) observe the health of the herds; and 3) identify conservation areas by determining where the Moose are located. Previous survey reports were random and incidental from deer and elk surveys. Additionally, the survey process will become a resource tool to educate the public about Moose and their habitat.

Combined Aquatic & Terrestrial Needs

USDI BLM, Challis

Big Lost River Drainage

- Removal of Instream Gabions -- In the 1960s, rock and wire gabions were applied to 100-200 feet of Big Lost streambank, for purposes of bank stabilization. Since that time, erosion has circumvented these structures, leaving them mid-stream and partially unraveling. These are large structures and need to be removed to preclude further diversion of natural instream flows and bank instability.

  Affected Resources: Channel erosion around these structures and erosion of the streambanks nearby add sediment to the river system. Loss of riparian habitat affects shore birds, and added sediment may affect resident fish.

Limiting Factors: Funding is needed to remove these structures and to design and implement stream channel and bank rehabilitation.
Data Links: United States Department of the Interior Bureau of Land Management, July, 1999. Challis Resource Area Record of Decision (ROD) and Resource Management Plan, page 122.

- Thousand Springs/Chilly Slough ACEC Fencing -- Chilly Slough was fenced in the past with cattle-exclusionary fencing. These cattle exclosures are wire fence and in poor condition. The exclusion fences need to be repaired, which will offer limited returns due to the advanced deterioration of the existing fence, or replaced. Replacement of existing fence with buck and pole fencing is preferred.

  Affected Resources: Chilly Slough wetlands are habitat for numerous wetland and shore birds. Species using these areas as breeding habitats include sandhill cranes, long-billed curlews, and numerous waterfowl. Trumpeter swans have also been documented in the slough. Some populations of the slough may be unique. The spotted frog sub-population in Chilly Slough has a high probability of significant genetic difference from other populations.The wetland vegetation and water quality are affected by access by cattle.

  Limiting Factors: Funds are needed to renovate or replace fencing.
  Data Links: United States Department of the Interior source Area Record of Decision (ROD) and Resource.Management Plan, page 122. United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, pages 39, 97, 144, 195, 201, 324, 341, 669, 670

- Sage Creek Watershed -- Investigation and Remediation of Causes of Scouring Debris Flow. A scouring debris flow that moved down Bradshaw Creek (Sage Creek drainage) is suspected to have initiated because of impacts from timber harvest activities on public forest lands above. Research into the physical conditions that initiated the debris flow, and rehabilitation of human-caused conditions may be able to preclude other similarly-caused erosional and depositional sequences.

  Affected Resources: Bradshaw Creek basin hillslopes and stream channel, as well as Sage Creek below, were affected by this catastrophic sediment movement. Resident trout may have experienced disturbance due to this large sediment pulse.
  Limiting Factors: Funds are needed to investigate the hillslope, hydrologic, geologic, climatic, vegetative, and management dynamics involved in this occurrence. Funds are also needed to complete rehabilitation of the sites of flow initiation and the eroded areas within the stream channel below.
  Data Links: United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volumes 1 and 2, page 657.

- Wildhorse Fence -- Streams of a grazing allotment in the Big Lost, on both Bureau of Land Management and U. S. Forest Service lands, have experienced impacts from cattle drifting down from higher elevations later in the grazing season. The long boundary between BLM and USFS managed lands needs to be fenced to preclude unwanted movement of cattle down tributaries and onto the banks of the Big Lost. Cattle exclosure fencing is needed for Twin Bridges Creek.

  Affected Resources: Streambanks of Burnt Creek, Garden Creek, and Twin Bridges Creek, as well as the Big Lost River, receive out-of-season impacts from the cattle. Riparian vegetation, and potentially, resident trout may be impacted by the extended season of use. Human recreation in the area, picnicking, dispersed camping, hunting, and hiking, are also affected by the cattle impacts.
  Limiting Factors: Funds are needed to construct over six miles of wire fence along the Forest Service/Bureau of Land Management boundary and as an exclosure along Twin Bridges Creek.
  Data Links: United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, page 624-626, 657.

Little Lost River Drainage

- Summit Creek Fencing -- Summit Creek ACEC/RNA was fenced with cattle-exclusionary fencing in the 1970's. These cattle exclosures are wire fence and in poor condition. The exclusion fences need to be repaired, which will offer limited returns due to the advanced deterioration of the existing fence, or replaced. Replacement of existing fence with buck and pole fencing is preferred, to protect resource values: wetland, recreation, and safe elk movement.
  Affected Resources: Although the Little Lost has no surface connection to the Snake River, it has resident populations of cutthroat and brook trout. Habitat of these fish, as well as recreation values, will be protected by well-maintained exclusionary fencing.
  Recreationists and elk will experience safer passage through and over buck and pole fencing.
  Limiting Factors: Funds are needed to renovate or replace fencing. Funds are needed to inventory sage grouse habitat.
  Data Links: United States Department of the Interior Bureau of Land Management, July, 1999. Challis Resource Area Record of Decision (ROD) and Resource Management Plan, pages 16, 17. United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, pages 195, 321, 632, 656, 658.

- Study/Redirect Summit Creek Agricultural Water back to the Pahsimeroi Drainage -- Portions of flows from Big Gulch in the Pahsimeroi drainage, north of Summit Creek in the upper Little Lost, after use as agricultural water, are diverted into Summit Creek drainage in the Little Lost. The Pahsimeroi is occupied by bull trout, and experiences extreme low flows. Currently, agricultural water is diverted

from Big Gulch in the upper Pahsimeroi subbasin, north of the divide, and returned to Summit Creek in the Little Lost subbasin, on the south side of the divide.
Affected Resources: Low flows are suspected to negatively affect the anadromous fish of the Pahsimeroi subbasin. Returning the diverted flows to the Pahsimeroi, along with other measures planned for that subbasin, will help ensure adequate instream flows for Pahsimeroi fish runs.
Limiting Factors: The water user involved may wish to continue to return water to Summit Creek rather than return it to the Pahsimeroi subbasin. Adequate funding is needed to make returning water to the Pahsimeroi advantageous for the water user. Water right holder concurrence is not assured for this project.
Data Links: United States Department of the Interior Bureau of Land Management / United States Department of Agriculture Forest Service, May 2001(draft). Pahsimeroi River Subbasin Review, page 120.

- Donkey Hills and Summit Creek Basin Vegetative Inventories -- Within the Donkey Hills ACEC, surveys are needed to determine the health and extent of vegetative ecosystems in the area, including a survey of the relative health of the forest vegetation in the area. The Summit Creek basin provides a sage grouse stronghold; important due to the loss of Snake River sage grouse habitat due to wildfire. Sage grouse habitat here needs inventory.

  Affected Resources: Donkey Hills is an upland divide between the Little Lost and Pahsimeroi drainages. Critical elk wintering habitat and elk calving areas are within the ACEC borders. This area and the Summit Creek basin are quite removed from most human impacts and thus have unique value for wildlife, as well as offering intact uplands which promote hydrologic stability within the Little Lost system. The Summit Creek habitat is a stronghold for sage grouse, a potential candidate species under the Endangered Species Act.
  Limiting Factors: Funds are needed to complete the vegetative ecosystem and forest health surveys in Donkey Hills, and the sage grouse habitat study in Summit creek basin.
  Data Links : United States Department of the Interior Bureau of Land Management / United States Department of Agriculture Forest Service, May 2001(draft). Pahsimeroi River Subbasin Review, page 120.
  United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, page 316.

Needs Identified by The Nature Conservancy for the Closed Basin drainages of the Big Lost River, Little Lost River, and Birch Creek.

- Subbasin-wide assessment of highest quality sage steppe habitat on public and private lands and development of conservation plans for protecting these areas.
- Development and implementation of a federally-funded conservation easement acquisition program for the preservation of working agricultural lands with significant wildlife habitat.

- Secure appropriations to fund rangeland conservation practices and compensate permittees for targeted federal grazing allotment buy-outs and/or reductions.
- Development and implementation of landowner incentive and stewardship programs for the protection, enhancement and restoration of key habitat areas.
- Development and implementation of "grass banks" for the enhancement and restoration of public lands grazing allotments and associated wildlife habitat.
- Secure special designations for ecologically significant public lands (i.e., ACEC, RNA).
- Restoration and enhancement of sage steppe and riparian habitats through plantings, fencing projects, seeding, weed control, and reintroduction of ecologically desirable fire regimes.
- Restoration and maintenance of desired flow regimes in targeted waterways. Secure increased technical and financial support for efforts to preserve bull trout habitat through tributary reconnections, diversion enhancements, irrigation improvements and other projects.

Upper Snake Closed Basin Subbasin Recommendations

Projects and Budgets

Continuation of Ongoing Projects

Project: 33007 – Implement Best Management Practices to improve riparian habitat and upland conditions in the Medicine Lodge watershed.

Sponsor: Clark Soil Conservation District

Short Description:

Enhance riparian habitat and reduce non-point source pollution within the Medicine Lodge watershed through the development and implementation of conservation plans on private lands, coordinated with local, state, and federal land managers .

Abbreviated Abstract

The Medicine Lodge Creek watershed is located in southeastern Idaho in Clark and Jefferson Counties of Idaho, within the Columbia Basin's Closed Basin Subbasin, Upper Snake Province. Numerous agencies and interests have identified this watershed as a priority for maintaining and improving the existing natural resources, including Yellowstone Cutthroat Trout and Sage Grouse.

Current hydrologic conditions differ from historic conditions. Many of the tributary streams to Medicine Lodge Creek long ago had extensive beaver dam complexes and ponds that provided abundant fishing opportunities. Today the hydrologic regime is altered with these streams experiencing downcutting and gullying, with a lower water table stressing and reducing remnant riparian-wetland vegetation. Beaver removal, dredging and draining of wetlands, irrigation withdrawals, improper grazing and natural, high flow events have all contributed to the present condition. This present condition of the stream channel compared to the earlier prevalence of beaver-dominated systems, is still affecting the hydrologic regime and sediment delivery.

Multiple agencies and interests are dedicating resources to eradicate noxious weeds, such as leafy spurge and knapweed, and improving riparian and upland habitat for multiple resource objectives. Yellowstone cutthroat trout habitat, sage grouse habitat, and other resource habitats specific to the watershed, are to be addressed through a holistic, ecologically based project. The Clark Soil Conservation District (Clark SCD) has recently requested funding through the Environmental Protection Agency's (EPA) Non-point Source 319 Program to address these resource concerns on the private lands within the watershed. Private landowners are proactive and are choosing to install and apply Best Management Practices (BMPs) to meet resource objectives and the upcoming Total Maximum Daily Load (TMDL) for Medicine Lodge Creek as required by the Clean water Act, to be developed by the Idaho Department of Environmental Quality (IDEQ).

Through cooperation of multiple agencies and interests, such as the Bureau of Land Management (BLM), US Forest Service (USFS), Natural Resources Conservation Service (NRCS), Idaho Association of Conservation Districts (IASCD), Idaho Soil Conservation Commission (ISCC), Idaho Department of Lands (IDL), IDEQ, Clark, Clark County Weed Control Department, Shoshone-Bannock Tribes, Trout Unlimited, and other interests, this watershed project will successfully implement BMPs on upland and riparian areas to meet multiple resource objectives, primarily the TMDL requirements and other objectives, such as those outlined in the Northwest Power Planning Council's (NWPPC) 2000 Fish and Wildlife Program (FWP).

The west fork of Irving Creek, a tributary of Medicine Lodge is an important reach for consideration. An evaluation of a 1.7 mile portion of the stream will be conducted to characterize channel morphology, biological characteristics and feasibility of various restoration activities to improve the streams riparian functioning condition, channel and bank stability, floodplain development and biologic features to support the Yellowstone Cutthroat trout.

Research, Monitoring and Evaluation Activities:

Non BPA funded

USDS Forest Service

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Little Lost River basin:

- A study assessing the relationship between summer stream temperature and bull trout distribution and abundance.
- A study assessing the relationship between groundwater temperature and juvenile bull trout distribution in small stream basins.
- A study assessing the feasibility of electrofishing to remove exotic brook trout from small streams.
- A study assessing the relationship between water temperature and brook trout
- distribution to determine the influence of water temperature on brook trout
- invading bull trout streams.
- A study to identify which species of fish were native to the Sinks Drainages and the manner in which they were established.
- A study to determine the temporal nature of bull trout spawning.
- An assessment of fish entrainment through water diversions.
- An assessment of fish passage barriers (culverts and bridges) associated with roads and trails.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Little Lost River: Closed Basin Subbasin Summary 151 Draft October 26, 2001

- Fish populations
- Fish habitat
- Riparian vegetation
- Depth fines
- Stream temperatures

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Big Lost River basin:

- A study assessing the relationship between water temperature and brook trout
- distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish was native to the Sinks Drainages and the manner in which they were established.
- An assessment of fish entrainment through water diversions.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the
- Big Lost River
- Riparian vegetation
- Depth fines
- Stream temperatures

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data.

Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment, Closed Basin Subbasin Summary 152 Draft October 26, 2001 the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of

the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards.

USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists, and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

The USGS has monitored hydrologic conditions in the Snake River Plain aquifer at the INEEL since the early 1950's. A multiphase project began in 1987 to characterize the fate and transport of radioactive and chemical constituents in the aquifer. In the first phase of this project, stratigraphic, geochemical, and hydraulic studies are being incorporated to Closed Basin Subbasin Summary 153 Draft October 26, 2001 define the ground-water flow system at the INEEL. Complementary studies include the use of environmental tracers to provide information about the rate of ground-water flow and geochemical-reaction experiments to evaluate the chemical processes that affect the transport of waste constituents in the subsurface. In the second phase, numerical flow models are developed to simulate the occurrence and movement of water in the aquifer system. These models integrate data obtained from the first-phase studies and are used to evaluate the conceptual model of the flow system. In the third phase, a solute-transport model is developed to test hypotheses about the movement of radiochemical constituents in the aquifer. In addition to the large-scale characterization study, the USGS began a flood-plain study in 1994 to delineate the possible extent, volume, and velocity of floods in relation to INEEL processing and storage facilities. Other USGS activities at the INEEL include regional and local surface geologic mapping and subsurface stratigraphic, isotopic, and paleomagnetic studies to help develop hazard assessments for potential threats from earthquakes and volcanic eruptions for the INEEL and for specific reactor and radioactive-waste storage facilities.

Hydrologic and Water-Quality Data --Idaho has seven major river basins--the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of water resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water-quality data at numerous sites throughout the State.

For example, streamflow discharge was measured at 279 gaging stations; water-quality data were collected at 124 of those stations in 1996.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
98002	Snake River Native Salmonid Assessment	Data share & coordination of monitoring activities

Relationship to Existing Goals, Objectives and Strategies

This proposed project complements the ongoing soil and water conservation activities of the local Clark SCD and NRCS. Through their programs, all natural resource problems are addressed, where feasible to the cooperating landowner, through technically sound environmental planning. NRCS planning policy requires that conservationists meet NEPA requirements and other local, state, and federal requirements and laws.

The Idaho Sage Grouse Task Force developed the Idaho Sage Grouse Management Plan. The task force was comprised of representatives from natural resource agencies and agricultural, sportsman, and conservation organizations. The Plan is designed as a framework for local working groups (LWGs) to develop site-specific programs to improve local sage grouse populations. This plan is expected to be in place until population goals are met in all Management Areas. It will be reviewed by the Statewide Sage Grouse Task Force at least annually and updated and revised as new information becomes available. A local working group is developing a plan that covers portions of the Medicine Lodge watershed.

The Environmental Quality Incentives Program (EQIP) project in Medicine Lodge is located at Small, ID and is designed to be an educational project to display different techniques available and encourage other landowners to consider implementing BMPs. This site in particular was chosen due to its visibility because it is on the main Medicine Lodge road. The site implemented various techniques such as rock barb, brush boxes, riprap, and decreasing livestock access to a water gap.

The Teton Regional Land Trust Inc. (TRTL) has worked with private landowners in the Medicine Lodge Watershed to put 2,617 acres of private land into a conservation easement. This land encompasses different areas throughout the drainage, and legally limits the amount of development that can take ever take place on the land.

There are currently 5 landowners in the Medicine Lodge Watershed who have applied for Continuous Conservation Reserve Program (C-CRP). The project would include installing approximately 485 acres of riparian forest buffer with livestock exclusions. Additional applications for C-CRP are expected.

The Snake River Native Salmonid Assessment project (98002) goals are analogous to some of those mentioned above, as well as others, namely to promote the long-term viability of native resident salmonids. IDFG activities under this assessment project will correspond to those in the Medicine Lodge project. Data collection will be coordinated with the native salmonid assessment project, primarily through the Idaho Falls IDFG field office. Information and data generated within the project will be made available to the native salmonid assessment.

Review Comments

Although the proposal calls for instream work (e.g., rock weirs, in stream barbs, etc.), CBFWA questions whether passive restoration techniques have been considered. CBFWA found that local fish and wildlife managers view the proposed work as a good idea but question the priority of the project. The proposed work would implement BMPs, which should already be in place in the subbasin. In addition, CBFWAF identified a lack of coordination with the Tribes.

Budget

FY2003	FY2004	FY2005
$98,902 Category: Recommended Action Comments:	$116,402 Category: Recommended Action	$116,402 Category: Recommended Action

Research, Monitoring and Evaluation Activities

BPA-funded

Idaho Department of Fish and Game

The Snake River Native Salmonid Assessment (Project No. 980002) is an ongoing IDFG research project initiated in August 1998 to: 1) assess the current status of native salmonids in the middle and upper Snake River provinces in Idaho, 2) identify factors limiting populations of native salmonids, and 3) develop and implement recovery strategies and plans. The inventorying phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the middle and upper Snake River provinces, and concurrent habitat measurements are being used to preliminarily examine factors that influence this presence/absence and abundance. Genetic samples are also being collected to assess the purity of populations and the degree of genetic variability among and within populations of native salmonids. Based on these findings, major limiting factors will be investigated during the second phase of the project. In the third phase, recovery strategies for individual or groups of subbasins will be developed to address the factors most important in limiting the patterns of distribution and abundance of native salmonids.

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

native salmonids where the long-term persistence of native salmonids is being threatened by the presence of exotic species.

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

Non BPA funded

USDS Forest Service

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Little Lost River basin:

- A study assessing the relationship between summer stream temperature and bull trout distribution and abundance.
- A study assessing the relationship between groundwater temperature and juvenile bull trout distribution in small stream basins.
- A study assessing the feasibility of electrofishing to remove exotic brook trout from small streams.
- A study assessing the relationship between water temperature and brook trout distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish were native to the Sinks Drainages and the manner in which they were established.
- A study to determine the temporal nature of bull trout spawning.
- An assessment of fish entrainment through water diversions.
- An assessment of fish passage barriers (culverts and bridges) associated with roads and trails.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Little Lost River:

- Fish populations
- Fish habitat
- Riparian vegetation
- Depth fines
- Stream temperatures

The Challis Ranger District of the USDA Forest Service is conducting or participating in the following research/assessment activities in the Big Lost River basin:

- A study assessing the relationship between water temperature and brook trout distribution to determine the influence of water temperature on brook trout invading bull trout streams.
- A study to identify which species of fish was native to the Sinks Drainages and the manner in which they were established.
- An assessment of fish entrainment through water diversions.
- A study to determine sculpin species occurrence and distribution.

The Forest Service monitors the following fish and fish habitat parameters in the Big Lost River:

- Riparian vegetation
- Depth fines
- Stream temperatures

Idaho Department of Environmental Quality

The Idaho Department of Environmental Quality is engaged in ongoing research to obtain the most recent and site specific scientific knowledge available for the purposes of refining water quality criteria. Monitoring activities in Idaho have focused on beneficial uses and ambient water quality trends. Data from DEQ's monitoring are used to document the existence of uses, the degree of use support, and reference conditions. This monitoring is made up of primarily the collection of biological and physical data. The ambient trend monitoring network is designed to document water quality trends at the river basin and watershed scales through the collection of mainly water column constituent data. Biological parameters are being added to this network as well. Fifty-six monitoring stations are currently sampled on a rotating basis to provide data for water quality trend assessment. DEQ also monitors chemical, physical and biological components of the aquatic environment through the Beneficial Use Reconnaissance Project. DEQ continues to refine the water body assessment guidance for evaluating BURP data. The primary assessments are designed to determine the support status of the two main aquatic life beneficial uses, Cold Water Biota and Salmonid Spawning.

United States Geological Survey

Interior Columbia Basin Ecosystem --The USGS provides earth science information to the U.S. Forest Service (USFS) and the Bureau of Land Management (BLM) project staff, which is completing a scientific assessment of all land in a seven-State region of the Columbia River Basin east of the Cascade Mountains. Goals of the scientific assessment are to understand the development and current state of land, water, plants, animals, and society within the basin and to model future conditions that could result from different management alternatives and disturbances. In coordination with the scientific assessment, the USFS and BLM staff also is developing regional management strategies for Federal lands in the Basin. Goals of the management strategies are to maintain and improve ecological integrity by promoting the natural processes that operate in healthy aquatic, terrestrial, and landscape ecosystems and to provide sustainable flows of resources from Federal lands. Mineral-resource potential of the Interior Columbia Basin is a partial indicator of the potential for economic development, land use, and environmental hazards. USGS scientists have provided detailed digital geologic, hydrologic, and mineral-resource information to USFS and BLM staff biologists, botanists, forest ecologists, sociologists,

and economists; participated in systems modeling; provided data to be used by the agencies in the development of management alternatives; and contributed to several reports.

Idaho National Engineering and Environmental Laboratory -- The Idaho National Engineering and Environmental Laboratory (INEEL) which is operated by the U.S. Department of Energy, is located on the eastern Snake River Plain in southeastern Idaho.

The USGS has monitored hydrologic conditions in the Snake River Plain aquifer at the INEEL since the early 1950's. A multiphase project began in 1987 to characterize the fate and transport of radioactive and chemical constituents in the aquifer. In the first phase of this project, stratigraphic, geochemical, and hydraulic studies are being incorporated to define the ground-water flow system at the INEEL. Complementary studies include the use of environmental tracers to provide information about the rate of ground-water flow and geochemical-reaction experiments to evaluate the chemical processes that affect the transport of waste constituents in the subsurface. In the second phase, numerical flow models are developed to simulate the occurrence and movement of water in the aquifer system. These models integrate data obtained from the first-phase studies and are used to evaluate the conceptual model of the flow system. In the third phase, a solute-transport model is developed to test hypotheses about the movement of radiochemical constituents in the aquifer. In addition to the large-scale characterization study, the USGS began a flood-plain study in 1994 to delineate the possible extent, volume, and velocity of floods in relation to INEEL processing and storage facilities. Other USGS activities at the INEEL include regional and local surface geologic mapping and subsurface stratigraphic, isotopic, and paleomagnetic studies to help develop hazard assessments for potential threats from earthquakes and volcanic eruptions for the INEEL and for specific reactor and radioactive-waste storage facilities. An extensive bibliography of USGS publications and reports relative to the INEEL is in Appendix F.

Hydrologic and Water-Quality Data --Idaho has seven major river basins--the Kootenai, the Pend Oreille, the Spokane, the Clearwater, the Salmon, the Snake, and the Bear. Rivers in these basins supply surface water for agriculture, industry, hydroelectric-power generation, recreation, fish and wildlife habitat, and other uses within Idaho and in adjacent States. Aquifers supply ground water for these same uses in many parts of the State. Water from geothermal aquifers also is used for space heating. Hydrologic and water-quality data are critical for the day-to-day administration and management of water resources; for determining the extent and severity of droughts; for characterizing and predicting conditions during floods; and for monitoring the effects of people's activities on streamflow, ground-water supply, and water quality. The data also are essential to plan development activities and to carry out interpretive studies that provide information for making decisions about water issues that affect millions of people.

The USGS, in cooperation with the Idaho Department of Water Resources, the Bureau of Reclamation, and more than 20 other local, State, and Federal agencies, collects surface- and ground-water and water-quality data at numerous sites throughout the State. For example, streamflow discharge was measured at 279 gaging stations; water-quality data were collected at 124 of those stations in 1996.

U.S. Department of Energy, Idaho Operations Office

DOE-ID has had an air, soils, water and foodstuffs monitoring network in place throughout the Snake River Plain since the early 1950s, specifically to monitor radiation levels. Details of this effort can be found in Saffle et al. (2000). DOE-ID also sponsors five remote-area and eight near-facility annual Breeding Bird Surveys (Belthoff et al., 1995), winter and summer big-game counts, and an annual jack-rabbit count (Luft and Warren, 2000). Moreover, DOE-ID historically supported a rigorous program of environmental and ecological research of the sagebrush-steppe ecosystem.

Safari Club International

Mule Deer Recruitment in Southern Idaho -- The SE Idaho Chapter of Safari Club International partnered with the Idaho Department of Fish and Game (IDF&G) for this project. The study area is in Game Management Units 54, 55, 56, 57, 70, and 73A located in the Upper Snake subbasin, with additional studies in Game Management Unit 67 in the Upper Snake Headwaters subbasin and Game Management Units 59 and 59A in the Upper Snake Closed basin. The study period is from 1998 through 2003. The Idaho Chapter of Safari Club International, to date, has donated $10,000.00 and has supplied hundreds of man hours trapping deer for the study. $125,000.00 has been leveraged towards this study through the U.S. Forest Service, the Bureau of Land Management, National Shooting Sports Foundation, National Fish and Wildlife Foundation and Safari Club International. This research has 2 major emphases that will identify factors that influence deer populations in Southern Idaho. The first will determine the effect of predation on mule deer population characteristics such as population growth, recruitment, and mortality. This will include an evaluation of the effectiveness of coyote control as a means to increase deer populations. The second emphasis will identify habitat factors influencing population levels of mule deer in southern Idaho. Without a thorough understanding of how deer and predator populations interact on a large scale, management of deer populations on the typical big game unit level is difficult.

Sharp-tailed Grouse Lek Inventory --This project is a partnership between the SE Idaho Chapter of Safari Club International and the Idaho Department of Fish and Game (IDF&G), and the Southeast Idaho, Jefferson County and Upper Snake River Chapters of Pheasants Forever. The study area is in portions of Bingham, Bonneville, Fremont, Jefferson, Madison and Teton counties located in the Upper Snake Headwaters subbasin and the Upper Snake Closed Basin. The study period is scheduled for March and May 2002. The Idaho Chapter of Safari Club International with matching grants and private contributions has donated $6,500.00 towards this study. An additional $6,250.00 has been pledged by the study partners. Biological aides will be hired by the IDF&G to systematically ground search suitable habitat in the identified study area. Additional survey personnel will include Idaho Chapter volunteers. Columbian sharp-tail grouse (*Tympanuchus phasianellus columnianus)* leks will be located and mapped, and the number of birds occupying will be recorded. This project will provide scientifically collected information on distribution and relative abundance of sharp-tailed grouse in a portion of eastern Idaho where only limited data currently exists. This data will be used to develop population management recommendations and prioritize habitat conservation areas.

Needed Future Actions

Multi-scale Ecological Research and Development of New analytical Tools

Fisheries/Aquatic Needs

USDI BLM (P. Koelsch, in litt.)

- The Little Lost Flood Control Project was constructed in 1985 through a Natural Resource Conservation Service (NRCS), Resource, Conservation and Development Grant to alleviate annual winter flooding and associated property damage. Fishery surveys conducted in 1999 documented the annual loss of the federally threatened bull trout during winter operation. The annual operation of the Flood Control project appears to be a significant to the recovery of the bull trout population in the Little Lost River Watershed. A feasibility study is necessary to develop an array of alternatives to reduce or eliminate the loss of bull trout. Funding avenues need to be explored to develop the feasibility study and ultimately construction of the preferred alternative.

USDA Forest Service (Gamett, in litt.) for the Little Lost River include:

- Assessing the temporal and spatial patterns of fluvial bull trout
- Determining the mechanisms by which brook trout replace bull trout
- Assessing the role of winter stream temperatures on bull trout spawning, incubation, and juvenile distribution
- Assessing the role of water temperature in determining salmonid species distribution
- Describing the genetic makeup, life history, and ecology of the shorthead sculpin

USDA Forest Service (Gamett in litt.) for the Big Lost River include:

- Describing the genetic makeup, life history, and ecology of the mountain whitefish
- Describing the genetic makeup, life history, and ecology of the shorthead sculpin and Paiute sculpin.

USDA FS, BLM and ID F&G by Gamett (1999) for the Little Lost River Drainage:
Habitat Management

- Improve riparian habitat and reduce sediment levels in the Wet Creek subdrainage. Reaches of emphasis are Wet Creek above Basin Creek, Coal Creek, the unnamed tributary to Wet Creek below Coal Creek, Basin Creek, and Squaw Creek. This could be accomplished through riparian pastures to better regulate grazing.
- Relocate the Mill Creek trailhead to reduce impacts to the stream associated with this development.
- Relocate the Timber Creek trail below the confluence of Slide Creek and Timber Creek. This would involve moving the trail approximately 50 to 100 m downstream of the present location. It would result in the trail crossing only Timber Creek instead of Timber Creek and Slide Creek.
- Assess potential culvert barriers in Moonshine Creek and Redrock Creek.

- If there are willing sellers, acquire land or easements on private land along perennial stream reaches to prevent housing development. Emphasis should be on Wet Creek, Big Creek, Summit Creek, Badger Creek, Squaw Creek (Wet Creek drainage), and the Little Lost River.
- Evaluate removing natural "semi-permanent" barriers that may be blocking the migration of fish into several stream reaches. These include barriers on Badger Creek 3.0 km above the Little Lost River, Bunting Creek 300 m above Badger Creek, Quigley Creek approximately 400 m above the Little Lost River, and Camp Creek immediately above Timber Creek.
- Evaluate reconnecting Williams Creek to the Little Lost River.
- Evaluate irrigation diversion barrier and connectivity between Badger Creek and the Little Lost River.
- Evaluate the potential for Horse Creek to support bull trout. If it is suitable, evaluate the possibility of reconnecting the stream to the Little Lost River.
- Relocate the Williams Creek Road (# 405) above the stream crossing approximately 1 km above the Forest boundary out of the riparian area.
- Work with cooperating landowners to improve riparian habitat on private land. Emphasis should be on the Little Lost River between Badger Creek and the private property line above Summit Creek.
- Reduce summer stream temperatures wherever possible. Emphasis should be on the Little Lost River and tributaries above Summit Creek and the Wet Creek drainage.
- Reduce sediment levels and stream temperatures in Bear Creek.
- Reduce sediment levels in Deer Creek and Redrock Creek.
- Reduce sediment levels and improve riparian conditions on Meadow Creek.

Fish Management

- Continue to monitor the Little Lost River at Iron Creek and Wet Creek at the Forest Boundary for brook trout expansion. These sites are above the upper limit of brook trout distribution in these 2 subdrainages and are being monitored to detect an expansion of brook trout into key bull trout streams.
- Control brook trout expansion wherever possible.
- Eradicate brook trout in Big Creek, Squaw Creek (Sawmill Canyon), Mill Creek, and the Little Lost River above Summit Creek.
- Confirm the existence of brown trout. If found, work to eradicate this species before it becomes established elsewhere in the drainage.
- Assess the loss of bull trout through irrigation diversions on Williams Creek, Wet Creek, and Sawmill Creek near Timber Creek.
- Assess the feasibility of eradicating brook trout in Meadow Creek and Dry Creek and introducing bull trout.
- Determine the degree of illegal and unintentional bull trout harvest.

Education

- Continue efforts to educate the public about the no harvest bull trout rule and identification of bull trout through annual placement of identification posters throughout the Little Lost River drainage.
- Maintain the large bull trout identification signs at the Timber Creek Campground and Sawmill Canyon at the Forest Boundary.
- Expand efforts to educate the public about the no harvest bull trout rule and identification of bull trout by placement of large bull trout identification signs at the Pass Creek/Wet Creek summit, at the Summit Creek summit, and north of Howe.
- Expand efforts to educate the public about the no harvest bull trout rule and identification of bull trout through distribution of bull trout pamphlets through Forest Service, Fish and Game, and Bureau of Land Management personnel and offices; local businesses; and tourism centers.
- Begin efforts through the news media and other means to inform the public about fish ecology, fish management, and fish management issues in the Little Lost River drainage. Emphasis should be on bull trout and bull trout recovery efforts being made by various agencies.
- Increase enforcement activities relating to the no bull trout harvest rule. Efforts should be concentrated along the Little Lost River and tributaries above Summit Creek.

The following section was developed by the members Little Lost River Interagency Technical Advisory Team for the Bull Trout (LLRITAT, 1998). These actions are recommended until a conservation plan for these watersheds can be developed.

Barriers to migration

- New culvert installations in migration routes must be designed and constructed so as not to be a migration barrier (short term). Concrete box culverts and bridges are recommended.
- Fish passage, including but not limited to bull trout, must be designed into replacement stream crossings (existing) when failures occur, design life has been exceeded or are known to be barriers. Culverts listed in the below watersheds, should be inventoried and should be planned for fish passage.
- Provide for fish passage at Moonshine Creek and Redrock Creek (short term).

Roads

- Reduce road sediment production in sub-watersheds with high substrate fine sediment characteristics (greater than 35%). Particularly the sub-watersheds that are adjunct, are priority 1 or 2, or have road density in the RHCA greater than or equal to one mile per square mile (short term).
- Reconstruct existing roads with effective cross-drain spacing and drain dip location to turn water to slope filtration, rather than to existing first order streams.

Mining

- Maintain restrictions on suction dredge mining in focal and adjunct habitats (spawning and rearing) as well as nodal habitats (mainstream migration corridors) (long term).
- Continue enforcement on current mining regulations.

Forest Practices

- Reduce the risks of stand consuming wildfires through continuation of active forest management in priority 1 and 2 sub-watersheds most at risk (short term).
- Continue enforcement on current forest practices regulations.

Threats to Lake/Reservoir Habitats

- Continue to evaluate mountain lakes to identify potential bull trout habitat, and monitor distribution of fish stocked into mountain lakes in the little Lost Key Watershed.

Fish Harvest

- Replace and increase number of fishing regulation and bull trout identification signs throughout Little Lost River key watershed where fishing access dictates (short term).
- Continue enforcement of current fishing regulations and increase patrols in identified spawning (June-August) and wintering areas (November-March) (short term).
- Improve angler ability to identify bull trout and understand reasons for protective regulations.

Agriculture/ Livestock

- Encourage improved management techniques that address cattle dispersal, timing of use, and herding.
- Evaluate livestock allotments, and if necessary, take actions that would reduce sediment production, increase streambank/channel stability, and implement management practices that contribute to riparian vegetation integrity over a wider area. Increase residual vegetation at the end of the grazing season in Upper Sawmill Canyon.
- Enforce State water laws. Don not permit new consumptive water rights.

Exotic Species

- Reduce competition with brook trout where they overlap with bull trout in priority 1 sub-watersheds through selective removal by liberalized angling and electrofishing (short term).

Additional information needs

- Continue to inventory native salmonids throughout the Closed Basin where existing information is lacking, in order to determine current status and the major factors limiting their distribution and abundance.
- Use genetic markers to detect and quantify levels of hatchery produced *O. mykiss* introgression within native Yellowstone cutthroat trout populations and to delineate genetic population structure of Yellowstone cutthroat trout throughout their historic range. This fundamental genetic information with regards to introgressive hybridization and genetic population structure is needed to identify remaining pure populations, preserve existing genetic variability, and identify population segments

for the development of management plans and the designation of conservation units/management units.

- Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout. A greater understanding of the phenomenon of hybridization and introgression observed within *Oncorynchus* populations throughout the middle and upper Snake River provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of the possible future genetic risks native *Oncorynchus* populations face with regards to hybridization and introgression.
- Continue to gather and analyze genetic information on bull trout and Yellowstone cutthroat trout to determine the purity of populations and the degree of genetic variability between and among populations.
- Continue coordinated collection of water temperature data throughout the Closed Basin to determine water quality and areas of concern for native fishes.
- Identify culverts that need fish passage considerations. Those in priority 1 and 2 sub-watersheds are "short term" and the rest of the Little Lost River key watershed is "long term".
- Identify facilities and actions needed to prevent the loss of bull trout to irrigation diversions (short term), such as diversion fish screens.
- Monitor population responses to conservation actions (long term).
- Participate in the ongoing temperature data collection effort coordinated by U.S. Environmental Protection Agency (short term).
- Continue studies looking at bull trout in Little Lost River key watershed (short term).
- Coordinate and document strategy for current and future monitoring (short term).

Recommended priorities for implementation

In the previous section a "short term" or "long term" was identified for each action and is listed in the parentheses. These priorities are based on recommendations of the Little Lost River Technical Advisory Team. Immediate actions are any of those actions with a "(short term)". Immediate actions are those actions deemed necessary to maintain groups of bull trout at risk in the Little Lost River key watershed, while the conservation plan for the entire basin is being developed.

Wildlife/Terrestrial Needs

Comprehensive Monitoring Program for Neo-tropical Migrant and Other Non-game Birds

Bird populations have long been recognized as a good indicator of environmental health. The INEEL is the only area within the Closed Basin Subbasin with a rigorous bird monitoring program. Although the best in the region, this program is wanting because it only examines bird presence and abundance, rather than the more telling metrics of productivity and survivorship. There is a scientific need to establish a comprehensive network across the subbasin of MAPS (Monitoring Avian Productivity and Survivorship; DeSante and Burton, 1997) stations to provide coordinated and uniform information on bird populations and, as an extension, an evaluation of environmental health.

Baseline Winter Surveying in the Closed Basin of the Upper Snake --The North American Moose Foundation (NAMF) and the Idaho Department of Fish and Game (IDFG) are currently planning to partner together to determine the need for surveys of moose and habitat. There have been no specific Moose surveys conducted in the Closed Basin of the Upper Snake. Accurate winter surveys, and seasonal as required, of Moose are needed to: 1) set permit levels; 2) observe the health of the herds; and 3) identify conservation areas by determining where the Moose are located. Previous survey reports were random and incidental from deer and elk surveys. Additionally, the survey process will become a resource tool to educate the public about Moose and their habitat.

Combined Aquatic & Terrestrial Needs

USDI BLM, Challis

Big Lost River Drainage

- Removal of Instream Gabions -- In the 1960s, rock and wire gabions were applied to 100-200 feet of Big Lost streambank, for purposes of bank stabilization. Since that time, erosion has circumvented these structures, leaving them mid-stream and partially unraveling. These are large structures and need to be removed to preclude further diversion of natural instream flows and bank instability.

  Affected Resources: Channel erosion around these structures and erosion of the streambanks nearby add sediment to the river system. Loss of riparian habitat affects shore birds, and added sediment may affect resident fish.
  Limiting Factors: Funding is needed to remove these structures and to design and implement stream channel and bank rehabilitation.
  Data Links: United States Department of the Interior Bureau of Land Management, July, 1999. Challis Resource Area Record of Decision (ROD) and Resource Management Plan, page 122.

- Thousand Springs/Chilly Slough ACEC Fencing -- Chilly Slough was fenced in the past with cattle-exclusionary fencing. These cattle exclosures are wire fence and in poor condition. The exclusion fences need to be repaired, which will offer limited returns due to the advanced deterioration of the existing fence, or replaced. Replacement of existing fence with buck and pole fencing is preferred.

  Affected Resources: Chilly Slough wetlands are habitat for numerous wetland and shore birds. Species using these areas as breeding habitats include sandhill cranes, long-billed curlews, and numerous waterfowl. Trumpeter swans have also been documented in the slough. Some populations of the slough may be unique. The spotted frog sub-population in Chilly Slough has a high probability of significant genetic difference from other populations.The wetland vegetation and water quality are affected by access by cattle.
  Limiting Factors: Funds are needed to renovate or replace fencing.
  Data Links: United States Department of the Interior source Area Record of Decision (ROD) and Resource.Management Plan, page 122. United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental

Impact Statement (FEIS). Volume 2, pages 39, 97, 144, 195, 201, 324, 341, 669, 670

- Sage Creek Watershed -- Investigation and Remediation of Causes of Scouring Debris Flow. A scouring debris flow that moved down Bradshaw Creek (Sage Creek drainage) is suspected to have initiated because of impacts from timber harvest activities on public forest lands above. Research into the physical conditions that initiated the debris flow, and rehabilitation of human-caused conditions may be able to preclude other similarly-caused erosional and depositional sequences.

  Affected Resources: Bradshaw Creek basin hillslopes and stream channel, as well as Sage Creek below, were affected by this catastrophic sediment movement. Resident trout may have experienced disturbance due to this large sediment pulse.
  Limiting Factors: Funds are needed to investigate the hillslope, hydrologic, geologic, climatic, vegetative, and management dynamics involved in this occurrence. Funds are also needed to complete rehabilitation of the sites of flow initiation and the eroded areas within the stream channel below.
  Data Links: United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volumes 1 and 2, page 657.

- Wildhorse Fence -- Streams of a grazing allotment in the Big Lost, on both Bureau of Land Management and U. S. Forest Service lands, have experienced impacts from cattle drifting down from higher elevations later in the grazing season. The long boundary between BLM and USFS managed lands needs to be fenced to preclude unwanted movement of cattle down tributaries and onto the banks of the Big Lost. Cattle exclosure fencing is needed for Twin Bridges Creek.

  Affected Resources: Streambanks of Burnt Creek, Garden Creek, and Twin Bridges Creek, as well as the Big Lost River, receive out-of-season impacts from the cattle. Riparian vegetation, and potentially, resident trout may be impacted by the extended season of use. Human recreation in the area, picnicking, dispersed camping, hunting, and hiking, are also affected by the cattle impacts.
  Limiting Factors: Funds are needed to construct over six miles of wire fence along the Forest Service/Bureau of Land Management boundary and as an exclosure along Twin Bridges Creek.
  Data Links: United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, page 624-626, 657.

Little Lost River Drainage

- Summit Creek Fencing -- Summit Creek ACEC/RNA was fenced with cattle-exclusionary fencing in the 1970's. These cattle exclosures are wire fence and in poor condition. The exclusion fences need to be repaired, which will offer limited returns due to the advanced deterioration of the existing fence, or replaced.

Replacement of existing fence with buck and pole fencing is preferred, to protect resource values: wetland, recreation, and safe elk movement.

Affected Resources: Although the Little Lost has no surface connection to the Snake River, it has resident populations of cutthroat and brook trout. Habitat of these fish, as well as recreation values, will be protected by well-maintained exclusionary fencing.
Recreationists and elk will experience safer passage through and over buck and pole fencing.
Limiting Factors: Funds are needed to renovate or replace fencing. Funds are needed to inventory sage grouse habitat.
Data Links: United States Department of the Interior Bureau of Land Management, July, 1999. Challis Resource Area Record of Decision (ROD) and Resource Management Plan, pages 16, 17. United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, pages 195, 321, 632, 656, 658.

- Study/Redirect Summit Creek Agricultural Water back to the Pahsimeroi Drainage -- Portions of flows from Big Gulch in the Pahsimeroi drainage, north of Summit Creek in the upper Little Lost, after use as agricultural water, are diverted into Summit Creek drainage in the Little Lost. The Pahsimeroi is occupied by bull trout, and experiences extreme low flows. Currently, agricultural water is diverted from Big Gulch in the upper Pahsimeroi subbasin, north of the divide, and returned to Summit Creek in the Little Lost subbasin, on the south side of the divide.

  Affected Resources: Low flows are suspected to negatively affect the anadromous fish of the Pahsimeroi subbasin. Returning the diverted flows to the Pahsimeroi, along with other measures planned for that subbasin, will help ensure adequate instream flows for Pahsimeroi fish runs.
  Limiting Factors: The water user involved may wish to continue to return water to Summit Creek rather than return it to the Pahsimeroi subbasin. Adequate funding is needed to make returning water to the Pahsimeroi advantageous for the water user. Water right holder concurrence is not assured for this project.
  Data Links: United States Department of the Interior Bureau of Land Management / United States Department of Agriculture Forest Service, May 2001(draft). Pahsimeroi River Subbasin Review, page 120.

- Donkey Hills and Summit Creek Basin Vegetative Inventories -- Within the Donkey Hills ACEC, surveys are needed to determine the health and extent of vegetative ecosystems in the area, including a survey of the relative health of the forest vegetation in the area. The Summit Creek basin provides a sage grouse stronghold; important due to the loss of Snake River sage grouse habitat due to wildfire. Sage grouse habitat here needs inventory.

Affected Resources: Donkey Hills is an upland divide between the Little Lost and Pahsimeroi drainages. Critical elk wintering habitat and elk calving areas are within the ACEC borders. This area and the Summit Creek basin are quite removed from most human impacts and thus have unique value for wildlife, as well as offering intact uplands which promote hydrologic stability within the Little Lost system. The Summit Creek habitat is a stronghold for sage grouse, a potential candidate species under the Endangered Species Act.

Limiting Factors: Funds are needed to complete the vegetative ecosystem and forest health surveys in Donkey Hills, and the sage grouse habitat study in Summit creek basin.

Data Links : United States Department of the Interior Bureau of Land Management / United States Department of Agriculture Forest Service, May 2001(draft). Pahsimeroi River Subbasin Review, page 120.

United States Department of the Interior Bureau of Land Management, October, 1998. Challis Resource Area Proposed Resource Management Plan and Final Environmental Impact Statement (FEIS). Volume 2, page 316.

Needs Identified by The Nature Conservancy for the Closed Basin drainages of the Big Lost River, Little Lost River, and Birch Creek.

- Subbasin-wide assessment of highest quality sage steppe habitat on public and private lands and development of conservation plans for protecting these areas.
- Development and implementation of a federally-funded conservation easement acquisition program for the preservation of working agricultural lands with significant wildlife habitat.
- Secure appropriations to fund rangeland conservation practices and compensate permittees for targeted federal grazing allotment buy-outs and/or reductions.
- Development and implementation of landowner incentive and stewardship programs for the protection, enhancement and restoration of key habitat areas.
- Development and implementation of "grass banks" for the enhancement and restoration of public lands grazing allotments and associated wildlife habitat.
- Secure special designations for ecologically significant public lands (i.e., ACEC, RNA).
- Restoration and enhancement of sage steppe and riparian habitats through plantings, fencing projects, seeding, weed control, and reintroduction of ecologically desirable fire regimes.
- Restoration and maintenance of desired flow regimes in targeted waterways. Secure increased technical and financial support for efforts to preserve bull trout habitat through tributary reconnections, diversion enhancements, irrigation improvements and other projects.

Actions by Others

Non-BPA Funded

Conservation Easements

Protected areas include lands which, due to legal status or formalized conservation arrangements, are secure from degradation, uncontrolled development, and other threats. Areas in the Closed Basin are protected by agency designations (e.g. Reserves, Wildlife Management Areas, etc.) addressed above under Major Land Uses – Protected Areas, and private actions, mostly through the conservation efforts of non-profit organizations such as the Teton Regional Land Trust and The Nature Conservancy.

Teton Regional Land Trust

The Teton Regional Land Trust (TRLT) works with large properties to protect priority fish and wildlife habitats. Stream corridors in the Beaver/Camas Creek, Medicine Lodge Creek and Birch Creek drainages are of premium fish and wildlife value owing to the relatively arid nature of the landscape. The large, undeveloped shrub steppe and forested habitat support high numbers of elk, deer, antelope, and moose. Sage grouse and sharp-tailed grouse are species of special concern within the area. Very significant populations of these species area found in the area. Many other wildlife species are also found here, including some species one might not suspect, such as rare bats that roost in isolated sink holes and caves.

To date TRLT has protected nearly 3,400 acres in this area. We will continue to focus on these large landscapes as strongholds for fish and wildlife, and as important migration corridors. It is vital to protect these large open areas from development or habitat altering land uses. The best of these lands should be conserved through conservation easements and fee acquisition to insure that they continue to function as habitat.

The Nature Conservancy

The Nature Conservancy (TNC) has actively conserved lands in the Closed Basin for a decade, to preserve unique wildlife, plant, aquatic and open space values.

- Birch Creek Valley

  Between the Beaverhead and Lemhi Mountains, over 50 pristine springs merge to form a fen wetland at the Birch Creek Preserve. In cooperation with the Bureau of Land Management (BLM), the Conservancy has protected 1,160 acres of this rare high desert spring ecosystem. The globally rare alkali primrose, marsh felwort and Kelsey's phlox, along with several endemic mollusks can be found here. Birch Creek's clear waters also support wild rainbow trout and sculpin populations. In 1995, TNC purchased 1160 acres located within the Birch Creek fen north of Lone Pine. TNC transferred 1080 acres of the property to BLM through a series of land exchanges and retained ownership of 80 acres. In 2000, TNC purchased 315 acres contiguous to our existing 80-acre ownership along with an adjacent BLM and USFS grazing permit and state lease (approximately 15k acres). TNC and BLM manage these lands for their unique wildlife, plant, aquatic, open space and recreational values. The alkali primrose (*Primula alcalina*) along with five other rare plants are found in the wetland. Endemic

snails such as the Birch Creek springsnail and the rustic pondsnail also live in the alkaline wetland. The rare and endemic species found at this site define the Birch Creek fen as a B1 site: "critically imperiled because of extreme rarity or because some biological factor makes species especially vulnerable to extinction." A principal goal underlying these acquisitions is to preserve, enhance and restore the unique alkali wetlands and associated endemic plants and plant communities, including the globally rare alkali primrose. TNC's intent is to retain control of the federal grazing permits and state lease for the purpose of enhancing natural values on these public lands as well as leveraging additional conservation by working with other grazing permittees in the valley through some form of rest/rotation or "grass banking" scheme.

- Little Lost River Valley

Summit Creek, an isolated headwater tributary of the Little Lost River between the Lemhi mountains and the Lost River Range. Unusual hydrological features at Summit Creek have created conditions for unique plants, such as the rare marsh felwort and alkali primrose. In addition, the stream provides habitat for a genetically isolated population of bull trout. In 1997, The Nature Conservancy (TNC) purchased 625 acres on Summit Creek, which joins Sawmill Creek to form the Little Lost River. TNC manages the property for its unique wildlife, plant, aquatic and open space values. The property also provides habitat for alkali primrose and federally listed bull trout. TNC is using the property as a platform to develop additional conservation opportunities in the valley. They are currently working with a contiguous landowner and the agricultural extension agents from Custer and Butte Counties to develop and implement a rest/rotation grazing system utilizing the property. Upper Summit Creek is classified as a B1 site.

- Big Lost Valley

Located within a wild mountain valley on the western slope of the Lost River Range, Chilly Slough habitat to more than 130 bird species can be found here, half of them shorebirds and waterfowl, including Sandhill Cranes and trumpeter swans. The area also provides habitat for the rare rush aster, swamp willow-wort and marsh felwort. Since 1991, TNC has assisted in protecting over 1300 acres of private lands through direct purchase within the 5000-acre Chilly Slough/Thousand Springs wetland complex. These lands were eventually transferred to BLM or Idaho Fish and Game. TNC's efforts have been part of a larger partnership involving the US Fish and Wildlife Service (through the North American Wetlands Conservation Act), BLM, ID Fish and Game, Ducks Unlimited, and the Rocky Mt. Elk Foundation. TNC does not own property in the valley currently, but is using its past work at Chilly Slough as a platform to pursue conservation easement acquisitions on private lands along the main stem of the Big Lost River. Over 130 species of birds, Chilly Slough has a B2 biodiversity ranking ("Imperiled because of rarity or because other factors demonstrably make species very vulnerable to extinction").

- Medicine Lodge

The Nature Conservancy recently (Summer, 2001) conserved a shrub-steppe unit in the Crooked Creek Drainage of the Medicine Lodge Watershed. This parcel includes 2,640 acres fee with 35,000 acres of allotments.

Intermountain West Joint Venture

The Intermountain West Joint Venture (IWJV) is a public/private partnership, under the leadership of Ducks Unlimited, organized to build a cooperative management framework and to extend that framework to implementing on-the-ground wetland conservation projects that protect, enhance, and restore wetland and associated upland habitats (Southeast Idaho Wetland Focus Area Working Group, 2001). The IWJV is a far-reaching, collaborative effort and all stakeholders in wetland issues are encouraged to join in this conservation effort. Established in 1994, the IWJV involves portions of the eleven western states, including Idaho, and responsible for organizing wetland conservation efforts at the regional and local levels.

Table 45. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	**33007**
Provincial Team Funding Recommendation	**Recomm. Action**
1. Secure increased technical and financial support to restore and maintain desired flow regimes in targeted waterways to preserve bull trout habitat through tributary reconnections, diversion enhancements, irrigation improvements and other projects.	
2. Restore and enhance sage steppe and riparian habitats through plantings, fencing projects, seeding, weed control, and reintroduction of ecologically desirable fire regimes.	+
3. Develop and implement landowner incentive and stewardship programs for the protection, enhancement and restoration of key habitat areas.	+
4. Secure special designations for ecologically significant public lands (i.e., ACEC, RNA).	
5. Development and implement "grass banks" for the enhancement and restoration of public lands grazing allotments and associated wildlife habitat.	
6. Subbasin-wide assessment of highest quality sage steppe habitat on public and private lands and development of conservation plans for protecting these areas.	
7. Develop and implement a federally-funded conservation easement acquisition program for the preservation of working agricultural lands with significant wildlife habitat.	
8. Secure appropriations to fund rangeland conservation practices and compensate permittees for targeted federal grazing allotment buy-outs and/or reductions.	
9. Assess the temporal and spatial patterns of fluvial bull trout populations.	
10. Determine the mechanisms by which brook trout replace bull trout.	
11. Assess the role of winter stream temperatures on bull trout spawning,	

Project Proposal ID	33007
incubation, and juvenile distribution.	
12. Assess the role of water temperature in determining salmonid species distribution.	
13. Describe the genetic makeup, life history, and ecology of the shorthead sculpin, Paiute sculpin, and mountain whitefish.	
14. Improve riparian habitat and reduce sediment levels throughout the subbasin.	+
15. Relocate trailheads, trails, other recreational developments and roads to reduce impacts to streams in targeted watersheds.	
16. Reconstruct or relocate existing roads with effective cross-drain spacing and drain dip location to turn water to slope filtration, rather than to existing first order streams.	
17. Assess potential culvert barriers to fish migration throughout the subbasin.	+
18. Evaluate reconnecting tributaries to improve fish habitat.	+
19. Evaluate irrigation diversion barriers to fish migration throughout the subbasin.	+
20. Reduce summer stream temperatures wherever necessary.	+
21. Reduce sediment levels and stream temperatures in targeted drainages throughout the subbasin.	+
22. Control brook trout expansion into bull trout habitat wherever possible and eradicate brook trout in targeted drainages.	
23. Determine the degree of illegal and unintentional bull trout harvest.	
24. Reduce the risks of stand consuming wildfires through active forest management in priority sub-watersheds.	
25. Encourage best management practices and techniques that address cattle dispersal, timing of use, and herding.	+
26. Conduct a comprehensive monitoring program for neo-tropical migrant and other non-game birds.	
27. Assess need for surveys of moose and habitat.	
28. Replace existing non-functional Thousand Springs/Chilly Slough ACEC wire fence with buck and pole fencing.	
29. Investigate causes of Sage Creek watershed scouring debris flow.	
30. Replace existing non-functional Summit Creek ACEC/RNA wire fence with buck and pole fencing to protect wetland, wildlife and recreation resource values.	
31. Conduct vegetative inventories within the Donkey Hills ACEC to determine the health and extent of vegetative ecosystems in the area.	

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

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