Draft

Upper Snake Subbasin Summary

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Northwest Power Planning Council

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Background

The Pacific Northwest Electric Power Planning and Conservation Act (Act) of 1980 explicitly gives the Bonneville Power Administration (BPA) the authority and responsibility "to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of any hydroelectric project of the Columbia River and its tributaries in a manner consistent with…the program adopted by the Northwest Power Planning Council (Council)…and the purposes of this Act." The Act further requires BPA and the federal hydropower project operators and regulators to take the program into account to the fullest extent practicable at each relevant stage of their decision-making processes.

The Council is a planning, policy-making, and reviewing body. It develops and monitors implementation of the Columbia River Basin Fish and Wildlife Program (Program), which is implemented by BPA, the U.S. Army Corps of Engineers (USACE), the U.S. Bureau of Reclamation (BOR), and the Federal Energy Regulatory Commission (FERC) and its licensees. The Program is not intended to address all fish and wildlife problems in the Columbia Basin from all sources. Rather, the Program is meant to accommodate the needs of other programs in the basin that affect fish and wildlife, and unify and coordinate a framework for fish and wildlife mitigation and recovery activities across the basin.

Section 4(h) of the Act establishes statutory guidelines that the Council must adhere to in the development of the Program. The Council ensures that the Program complements the existing and future activities of the federal and region's state fish and wildlife managers and appropriate Indian tribes and that they remain consistent with the legal rights of appropriate Indian tribes in the region (Section 4[h][6]). The Council also ensures this consistency by giving deference to the recommendations of the basin's fish and wildlife managers in all decision-making processes and that they remain consistent with the legal rights of the appropriate Indian tribes. There are various statutory standards within the Act that the Council must adhere to, including:

- §4(h)(6)(B) The Program will "be based on, and supported by, the best available scientific knowledge";

- §4(h)(8)(a) The Program shall, "in appropriate circumstances," include enhancement measures "as means of achieving offsite protection and mitigation with respect to compensation for losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries";

- §4(h)(10)(A) Measures "to protect, mitigate and enhance fish and wildlife to the extent affected by the development and operation of the Federal Columbia River Power System (FCRPS)" will "be in addition to, and not in lieu of, other expenditures authorized or required from other entities under other agreements or provisions of law"; and

- §4(h)(7) "In the event recommendations received are inconsistent with each other, the Council, in consultation with appropriate entities, shall resolve such inconsistency in the

> Program giving due weight to the recommendations, expertise, and legal rights and responsibilities of the federal and the region's state fish and wildlife agencies and appropriate Indian tribes."

Ultimately, the Council will amend into the Program specific subbasin plans that are consistent with the basin wide goals and objectives the Program sets forth. The Council relies on subbasin summaries to provide the context for the development of subbasin plans. The subbasin assessment and planning process will complete the Program at the subbasin level and provide the implementation plans out of which fish and wildlife projects are proposed for BPA funding to implement the Program. These subbasin summaries are an interim arrangement pending development of the new Program. Subbasin summaries are a documentation of existing assessments, plans, and other information available within each subbasin and are written by subbasin teams.

Fish and wildlife managers comprise the core members of subbasin teams. Core members of the Upper Snake River subbasin team that have the legal responsibility for fish and wildlife management include the Idaho Department of Fish and Game (IDFG), the Shoshone-Bannock Tribes (SBT), and the U.S. Fish and Wildlife Service (USFWS). These entities are responsible for coordinating fish and wildlife needs and management strategies; ensuring that subbasin summaries and plans have all of the elements necessary to protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of the FCRPS; and ensuring that the summaries are ready to submit to the Council. Other key members of the subbasin teams include 1) federal, state, and tribal land managers; 2) federal, state, and tribal water quality managers; and 3) private land and water owners. Their role in the subbasin team is to provide input on the status of habitat quality, ongoing monitoring efforts, and habitat strategies; recommend habitat actions to meet habitat quality objectives; and assure consistency with other planning efforts.

Introduction

The Upper Snake River subbasin includes the Blackfoot and Portneuf River subbasins and numerous tributaries across southeastern Idaho. Streamflow in the Snake River and its major tributaries is highly regulated by dams and diversions. Irrigation projects have resulted in about 5,700 miles of canals and about 1,300 miles of drains in the subbasin. An estimated 75 percent of the economy of southern Idaho is driven by agriculture (Hazen 1997a).

Limiting factors throughout the subbasins include anthropogenic disturbances to stream habitat due to timber harvest, grazing, dam construction, irrigation diversions, and road building. Wildlife populations are limited by habitat loss, agricultural conversion and inter-species competition.

Goals and objectives focus on habitat protection, mitigation, watershed evaluation, rebuilding populations of native salmonids, and improving water quality. Fish and wildlife managers identified information gathering needs to address factors limiting fish and wildlife populations throughout the three subbasins, including minimum streamflow studies and continued genetic research to allow better evaluation of hybridization and introgression.

Subbasin Description

For purposes of this subbasin summary, the Upper Snake River subbasin is defined as the mainstem Snake River and its tributaries from Gem State Dam, near Idaho Falls, to Shoshone Falls. The Blackfoot River subbasin is consists of the Blackfoot River and its tributaries from the headwaters at Diamond and Lanes Creeks to the mouth of the Snake River. The Portneuf River subbasin is comprised of the Portneuf River and all its tributaries from the headwaters on the Fort Halls Indian Reservation to the mouth of the Snake River.

General Location

Upper Snake River Subbasin

The Upper Snake River subbasin is located in eastern Idaho and extends about 400 river miles from Idaho Falls to Shoshone Falls (Figure 1). Land surface elevation above sea level ranges from 13,770 feet in the headwaters of the Snake River to 2,500 feet at Shoshone Falls. Most streams in the subbasin originate in the foothills or montane regions (6,000 - 10,000 feet in elevation). Major tributaries include Blackfoot River, Portneuf River, Raft River, Goose Creek, and Big Cottonwood Creek.

The Raft River encompasses an area of about 1,440 square miles (m^2) with about 95 percent of this area in Idaho, the rest in Utah. The headwaters originate on the east side of the Albion Mountains east of the town of Oakley, Idaho. Perennially flowing headwater tributaries originating from the Albion Mountains near the City of Rocks National Reserve includes Almo Creek and Edwards Creek. Tributary streams originating on the west side of the Black Pine Mountains include Sixmile Creek and Eightmile Creek. Further downstream near the town of Malta, Cassia Creek enters the Raft River. The Raft River enters the Snake River at river mile 692, about 14 miles downriver of Massacre Rocks State Park.

Located to the west of the Raft River watershed, the Goose Creek watershed encompasses an estimated area of 1,160 mi^2. The headwaters of Goose Creek originate in the South Hills south of the town of Twin Falls, Idaho and flow south into Nevada, east into Utah, then north into Idaho. There are several spring-fed headwater tributaries providing significant flows in all three states before Goose Creek reaches the Oakley Reservoir impoundment, about four miles south of the town of Oakley, Idaho.

The upper Big Cottonwood Creek watershed originates from springs and seeps at 7,350 feet in elevation in the South Hills. It flows for approximately 16 miles through a rugged canyon in the northeast part of the South Hills before reaching a diversion in the foothills where essentially all of the flow is diverted for crop irrigation. Total watershed area upstream of the diversion is approximately 50 mi^2. The Big Cottonwood Wildlife Management Area (BCWMA), owned and managed by IDFG, is at the lower end of the canyon.

Blackfoot River Subbasin

The Blackfoot River subbasin encompasses about 700,000 acres and over 1,700 miles of streams in Bingham, Caribou, and Bonneville Counties (Figure 2). Diamond Creek and Lanes Creek come together to form the Blackfoot River, which winds its way west for 130 miles before reaching the Snake River west of the city of Blackfoot. Major tributaries include Wolverine, Brush, Corral, Meadow, Trail, Slug, Dry Valley, Angus, and Spring Creeks and Little Blackfoot

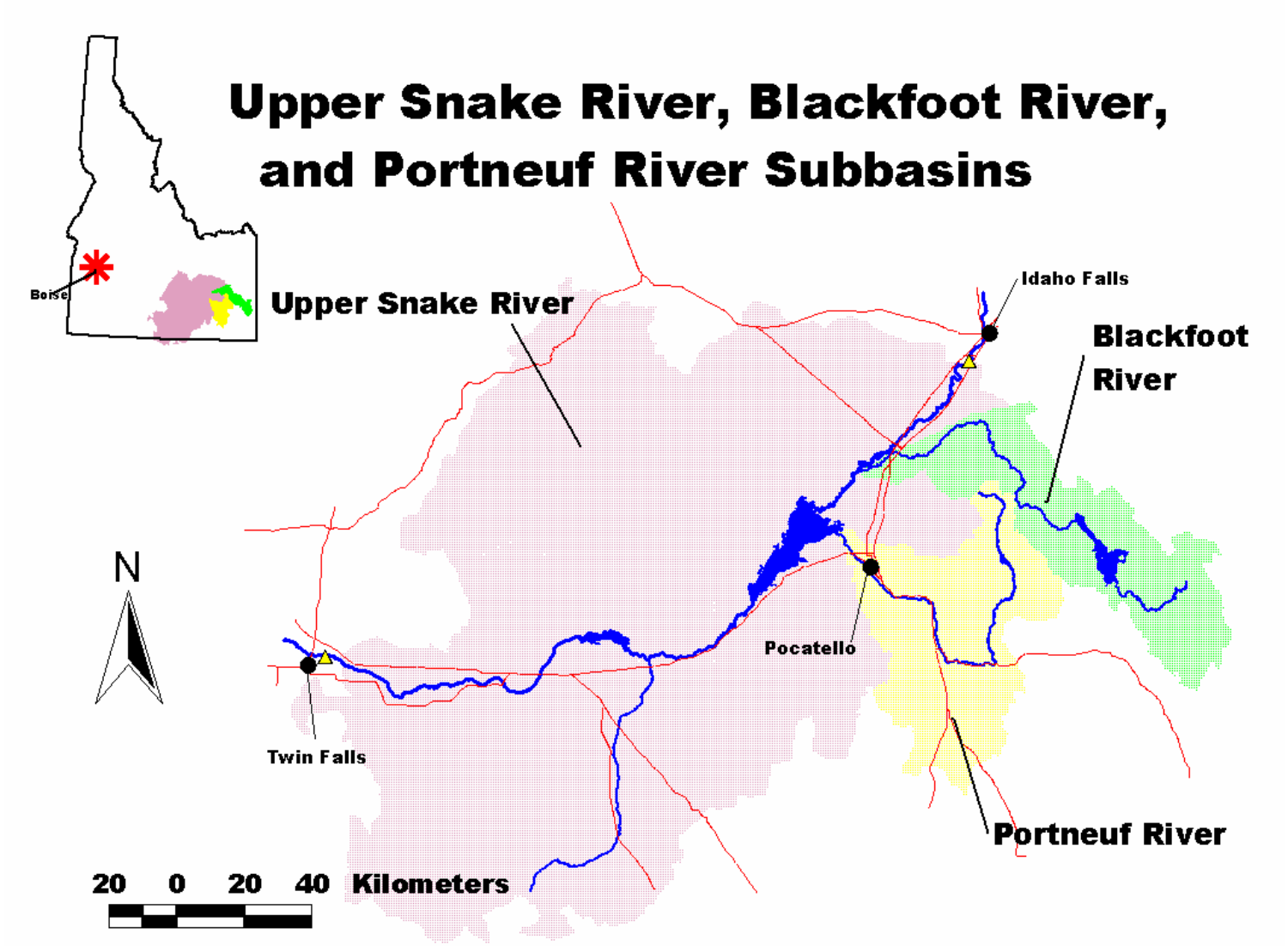


Figure 1. Upper Snake River, Blackfoot River and Portneuf River subbasins, Idaho.

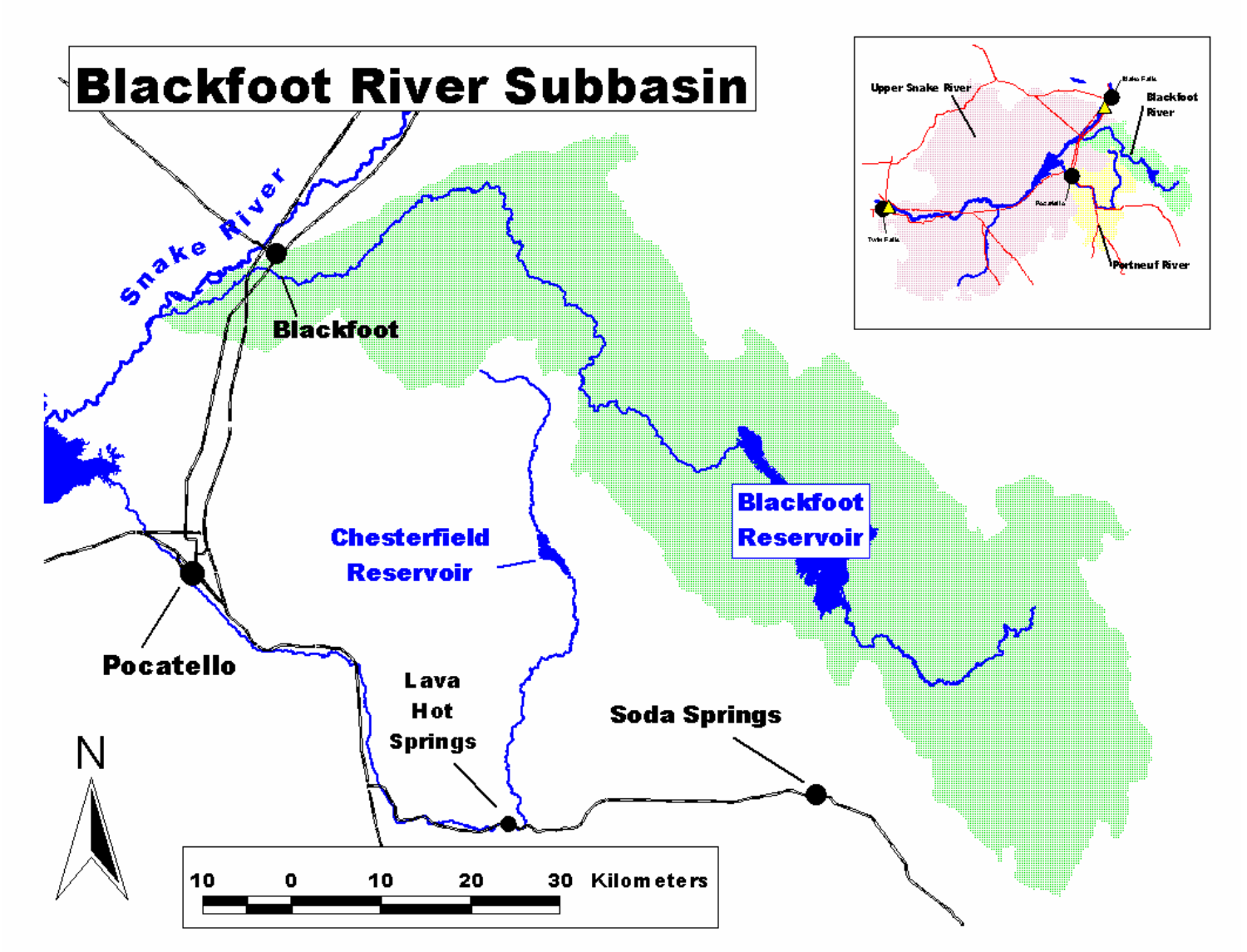


Figure 2. Blackfoot River subbasin, Idaho.

River. Blackfoot Reservoir, created in 1910, is the only major reservoir in this subbasin. The reservoir covers 17,300 surface acres and is operated by the U. S. Bureau of Indian Affairs.

Portneuf River Subbasin

The Portneuf River subbasin drains about 1,360 mi^2 in southeastern Idaho and is bounded by Malad summit to the south, the Bannock Range to the west, the Portneuf Range to the southeast, and the Chesterfield Range to the northeast (Figure 3). Marsh Creek is the only major tributary to the Portneuf River. Other creeks in this subbasin include Mink, Rapid, Garden, Hawkins, Birch, Dempsey, Pebble, Twentyfourmile, and Toponce creeks. Chesterfield Reservoir is the largest reservoir in the subbasin, and its estimated size is 1,245 acres.

Drainage Area

The Upper Snake River subbasin contains about 8,460 miles of streams (Maret 1997). Streamflow in the Snake River and its major tributaries is highly regulated by dams and diversions, primarily for agricultural use and hydroelectric power generation. Irrigation projects have resulted in about 5,700 miles of canals and about 1,300 miles of drains in the subbasin, and water transfer from one river basin to irrigate crops in another is common practice.

Total annual flows in the upper Snake River system average 4.5 MAF. At Heise, upstream from nearly all irrigation uses, the average annual flow of the Snake River is about 6,900 cubic feet per second (cfs). A significant amount of the river flow below Heise is lost to ground water and naturally recharges the Eastern Snake Plain Aquifer. Streamflows are reduced by irrigation diversions to an average flow of 3,450 cfs at Milner. A portion of the water that is diverted for agriculture percolates into the aquifer. Some of this ground water returns to the Snake River in other reaches, such as the reach from Blackfoot to American Falls.

Topography/geomorphology

In general, the Upper Snake River subbasin has a land-surface form or topography that consists of tablelands with medium to high relief. Its plains have hills or low mountains. The Snake River Canyon is a steep-sided trench, cut into the relatively flat, surrounding plain. Table 1 summarizes the width of the main channel, its slope [feet (ft.)/River Mile (RM)], elevation, and elevation drop at various locations. Shoshone Falls is a 212-foot-tall natural waterfall located about 2.7 miles downstream of Twin Falls Dam. It is recognized as a natural barrier to upstream migration of native species of fish (FERC 1997a).

The elevation within the Upper Snake River subbasin also describes the varying topography of the subbasin. In the northwestern portion of the subbasin, the Clover Creek drainage begins at 6,400 feet in the Bennett Hills. In the southeastern portion of the subbasin, the Rock Creek watershed begins at 7,700 feet in the Sawtooth National Forest and drains northward to the Snake River at about 3,500 feet. Geology is characterized largely by basalt flows in the lowlands of the central and southern parts of the subbasin and by intrusive volcanic, sedimentary, and metamorphic rocks in the uplands and mountains to the north, south and east.

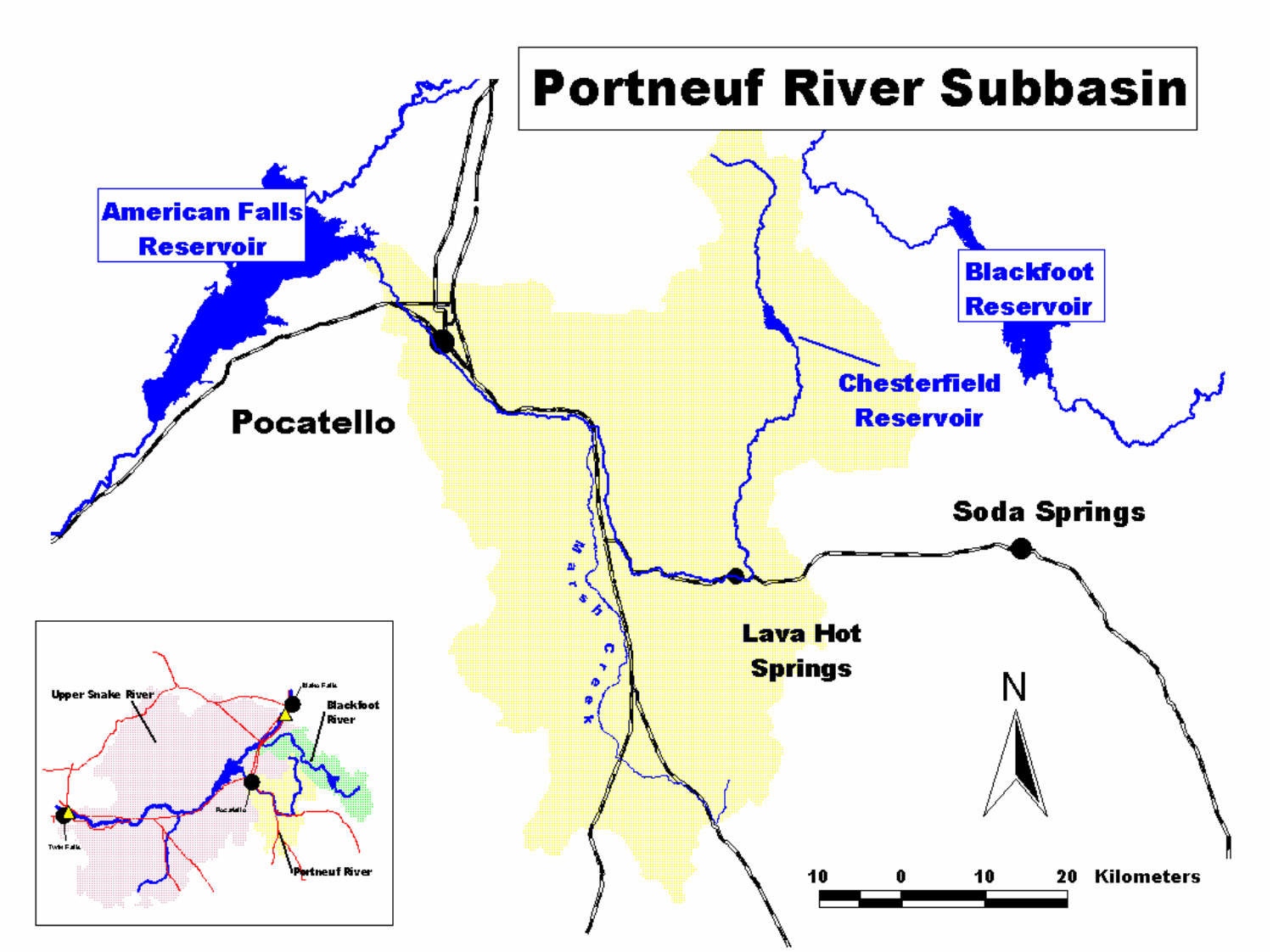


Figure 3. Portneuf River subbasin, Idaho.

Table 1. Width of the Middle Snake River channel (Buhidar 1999).

River Mile	River Width (ft.)			Reach Miles	Slope Ft./RM	Elevation (ft.)	Elevation Drop (ft.)
	Mean	Max	Min				
638-619	103	225	50	20	29.5	4,135-3,380	755
618-559	441	1500	100	60	15.2	3,380-2,580	800
558-545	254	600	150	14	7.7	2,580-2,497	83

Prepared by IDEQ-TFRO.

Soils

In the Upper Snake River subbasin, alkalization of the area lets the soil water bring salts and alkalis to the surface, then evaporats to leave a whitish crush. This alkalization and evaportationhas produced salty desert soils (or Aridisols) in many areas of subbasin. In general, the subbasin is comprised of soils that are 87 percent Aridisols and 13 percent Mollisols. Aridisols are mineral soils that have developed in dry regions, are light colored, low in organic matter, and may have accumulations of soluble salts and lime. The lower the precipitation, the more likely these accumulations are to be near the surface. Of the Aridisols and Mollisols in the subbasin, about 35 percent are loess (or buff-colored calcareous silt transported as wind deposits), while the remaining 63 percent contains residium (or residual soil that is developed from the weathering of rock directly beneath it), colluvium (loose and incoherent deposits at the foot of a slope or cliff brought there by gravity), and alluvium (deposits of silt or silty clay laid down during times of flooding).

Soil and soil productivity contribute to water quality problems in a number of ways: (1) Soil productivity is generally stable to declining due to greater intensities of vegetation management, roading, and grazing; (2) Woody material greater than 3 inches has been lost or has decreased in streams as a result of displacement and removal of soils, whole trees, and branches; (3) There is loss of soil material due to direct displacement of soils, surface and mass erosion yielding increased bare soils exposure, compaction, and concentration of water from roads; (4) Changes in the physical properties of soils have occurred in conjunction with activities that increase bulk density through compaction thus increasing surface erosion; (5) Sustainability of soil ecosystem function and process is at risk due to the redistribution of nutrients in terrestrial ecosystems due to changes in vegetation composition and pattern, removal of the larger size component of wood, and risk of uncharacteristic fire; and (6) Floodplain and riparian area soils have reduced their ability to store and regulate chemicals and water, in areas where riparian vegetation has been reduced or removed or where soil loss associated with roading in riparian areas has occurred (BLM 1997a).

Climate

The climate of Upper Snake River subbasin is semiarid with low annual rainfall, moderately hot, dry summers, moderate to cold winters, and relatively windy springs. Average annual precipitation is 10.5 inches and may vary from 50 to 150 percent of the mean. In general, precipitation is fairly consistent throughout the year, except July through September, when the total for the three months may be less than one inch. More recently, from 1991 to 1996, higher

average annual precipitation (11.20 inches) when compared to the historical normal (10.5 inches) was due to the above normal rains and snows of winter and spring (AgriMet 1994).

Average annual air temperature ranges from 40 to 51°F. January and July are typically the coldest and warmest months, with average temperatures of 29.4°F and 72.7°F, respectively. During the summer, temperatures in excess of 100°F are common. More recently, from 1991 to 1996 the higher annual air temperatures in the spring were principally due to higher than normal temperatures in 1992 and 1994 when compared to those years' mean air temperature (AgriMet 1994).

Settlement History

From pioneer times to the present, southeastern Idaho has been the site of many adventures, expeditions, and visitations. The area was originally the realm of the Shoshoni, Bannock and the Northern Paiute tribes of Native Americans. Although there was a continuous pattern of raid and rivalry between the Nez Perce and Shoshoni bands, the area was relatively peaceful. Starting in the early 1800s, explorers began encroaching from the east. John Jacob Astor's Astorians, under Wilson Price Hunt, entered what would become the Idaho territory as early as 1811, but did not reach southeast Idaho until 1813 while developing a route to the mouth of the Columbia River. They recognized the bountiful fur resources of the area and this attracted the mountain men and Indian traders.

In 1832-33, Captain Benjamin Louis Eulalie de Bonneville passed through the Bear Lake Valley on his way to the area near present-day Soda Springs. Bonneville's party included hired and free trappers and Indians. Washington Irving, in his biography of Bonneville, relates the expedition's encounters with Indian raiding parties and buffalo hunting. Bonneville also described the area around "Beer Springs" (today known as Soda Springs).

In 1834, Nathaniel J. Wyeth, a Boston trader, led an expedition of trappers into the area and established Fort Hall as a trading post. Fort Hall was the first permanent American outpost west of the Continental Divide and functioned as a center of activity and commerce. Wyeth was also the region's first chronicler of geologic features, describing "strong volcanic appearance" and "streams that occupy what appear to be cracks of an overheated surface" (Peterson 1994). Starting about 1841 and continuing to 1870, emigrants on the Oregon Trail passed through Montpelier, Georgetown Summit, and Soda Springs on their way to the Oregon Territory. This corner of Idaho was a highway for one of the greatest episodes of human migration. In 1843, John C. Fremont arrived in southeast Idaho and further solidified the route of the Oregon Trail. Fort Hall became a supply and rest point on the trail. Gold was discovered in 1861 near Pierce, in north-central Idaho. This had an immediate impact on southeast Idaho, as there was a large increase in traffic on the Oregon Trail as would-be miners traveled to the new discoveries.

Not all the people who migrated along the Oregon Trail were gold seekers; some stayed in this corner of Idaho. These settlers were primarily Mormons moving north from Utah into the fertile valleys of Bear Lake County and Old Bannock County (later divided into Bannock and Caribou Counties). Small communities, such as Franklin and Montpelier and Bennington lent a note of stability to the region. These towns turned into centers of ranching and farming.

Major Land Uses

Upper Snake River Subbasin

The Upper Snake River subbasin is comprised of 54 percent shrubland grazing land and 41 percent of agricultural land, both irrigated and dryland (ArchView 1996). These are the principle cultural land use types that affect water quality.

Land ownership in the Upper Snake River subbasin is primarily public (Figure 4). An estimated 75 percent of the economy of southern Idaho is driven by agriculture (Hazen 1997a). Current land use for Upper Snake River subbasin in comparison to adjacent watersheds is described in Table 2

Table 2. Land use estimates (Buhidar 1999)

HUC	Name	Land Use Type	Forest	Range	AG	Urban	Other	Total
17040209	Lake Walcott	%	4	54	25	1	16	100
		Sq.Miles	151	1982	919	24	593	3669
		Acres	96100	1260000	584000	15300	377000	2332400
17040210	Raft River	%	24	50	25	0	0	99
		Sq.Miles	350	741	371	7	1	1470
		Acres	225000	476000	238000	4220	470	943690
17040211	Goose Creek	%	38	44	18	0	0	100
		Sq.Miles	440	500	208	2	1	1150
		Acres	284000	323000	134000	1140	357	742497
17040212	Upper Snake Rock	%	3	54	41	1	0	99
		Sq.Miles	73	1322	1006	31	6	2438
		Acres	46300	833000	634000	19700	3880	1536880
17040213	Salmon Falls	%	8	85	6	0	0	99
		Sq.Miles	178	1808	130	1	3	2120
		Acres	115000	1170000	84000	616	1970	1371586
17040219	Malad River	%	24	63	10	1	2	100
		Sq.Miles	353	917	148	10	30	1458
		Acres	218000	567000	91600	6270	18500	901370
17040220	Camas Creek	%	6	70	25	0	0	101
		Sq.Miles	38	468	165	1	0	672
		Acres	23900	298000	105000	432	100	427432
17040221	Little Wood River	%	5	67	17	0	11	100
		Sq.Miles	56	753	189	4	118	1120
		Acres	35700	482000	121000	2390	75400	716490

Prepared by IDEQ-TFRO. HUC 17040212 is generally reported to have an area of 2440 mi^2 according to USGS.

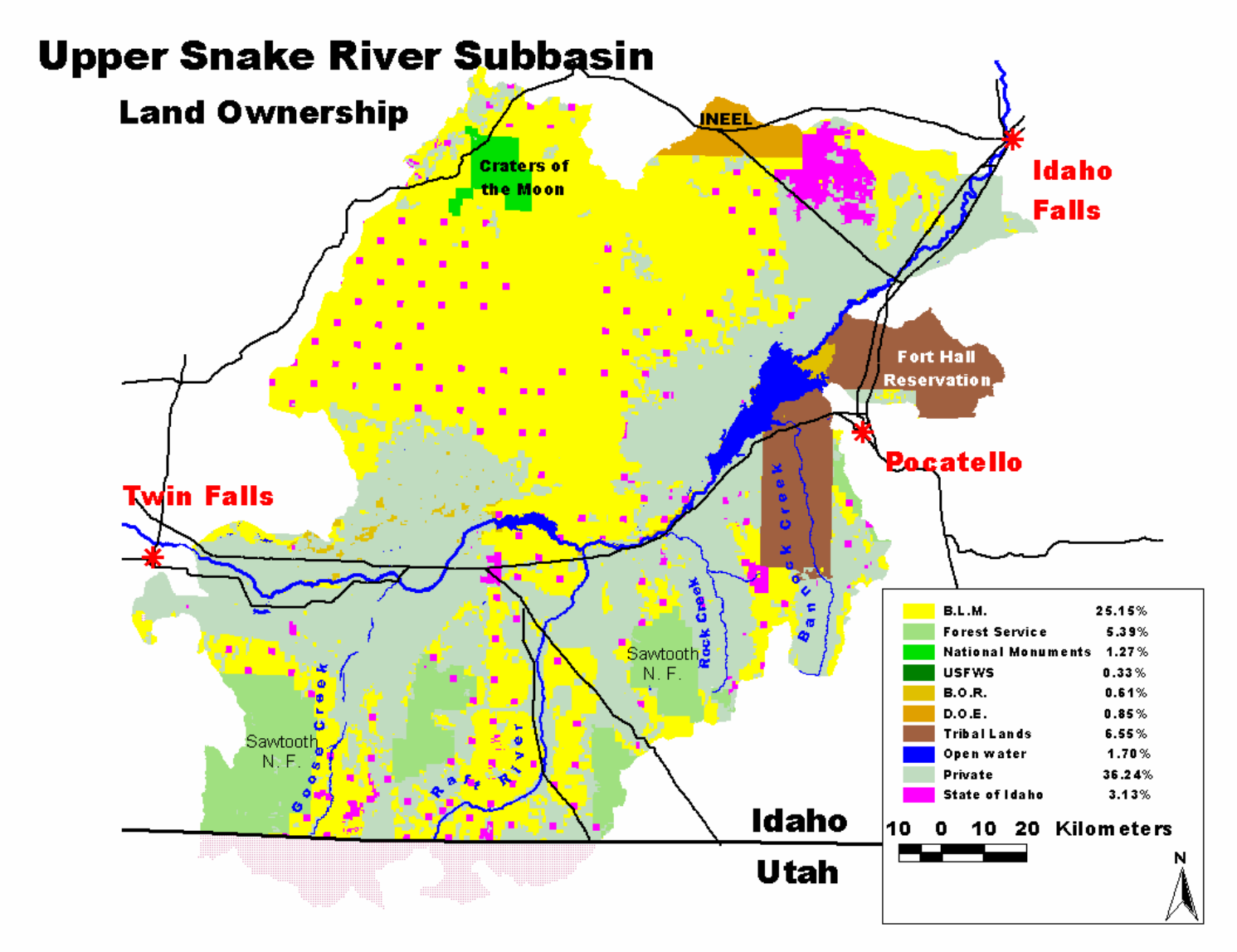


Figure 4. Land ownership in the Upper Snake River subbasin, Idaho.

Mining

Mining exploration has played an important role in Idaho's history (Figure 5). In the 1870s, Idaho entered into another phase of exploration. Disenchanted miners from the California and northern Idaho gold fields had spread out into all corners of the territory to search for the elusive Eldorado. Gold was discovered in Caribou Basin in 1870, and prospectors covered all of southeastern Idaho in their quest for the yellow metal. In the years 1871-1877, the first formal, scientific expedition visited southeastern Idaho. This was the famous Geological and Geographical Survey of the Territories, popularly called the Hayden Survey. Ferdinand Vandeveer Hayden led an assemblage of geologists, paleontologists, mineralogists, topographers, artists, and photographers in exploring, mapping, and documenting this part of the West (they also put Yellowstone on the map). One of the geologists, A. C. Peale, documented his many findings of the geology and minerals of southeast Idaho in the annual reports of the Survey to Congress (Peale 1879). The Hayden Survey established the basic geologic framework for southeastern Idaho. Formations were discovered and described, geographic characteristics were identified, and some mineral deposits were discovered.

The Gay Mine

The Simplot Fertilizer Company started exploring for phosphate on the Indian Reservation in 1945 (USFWS 1966). The exploration proved successful and in 1946, the company negotiated and obtained Tribal and allottee leases on about 7,000 acres (Carter 1978). The Simplot Fertilizer Company also obtained a Tribal business lease authorizing the company to commence phosphate extraction on February 4, 1946. The Simplot Company opened the Gay Mine that same year, and ultimately became the longest operating open pit phosphate mine in Idaho. The initial production from the Gay Mine marked the beginning of Idaho's present day phosphate mining/fertilizer industry (Carter 1978).

Mining of the phosphate ore resulted in a series of small- to medium-sized open pits. Mining depths averaged 250 feet, however, several pits exceeded 300 feet in depth. Pits were generally small, averaging 15 to 20 acres, although several reached as much as 50 acres. It is estimated that 45 pits were eventually mined.

By the early 1960s, the Gay Mine was producing over 1 million short tons of phosphate rock per year. By the mid-1970s production approached 2 million tons per year. From 1983-1985, in anticipation of peak production of about 2.2 million tons per year and development of additional leases, the stripping fleet was converted from scrapers to large (12 yards) hydraulic shovels and 85-ton trucks. This conversion produced a significant increase in mine productivity and reduction in mine operating costs.

The J. R. Simplot Company held the majority of the Tribal and allottee leases. In 1956, the FMC Corporation acquired certain leases at the Gay Mine and entered into joint ownership and operating agreements with Simplot. After 47 years of more or less continuous production, mining at the Gay Mine finally stopped for good in September 1993 and all remaining mined ore was shipped. Reclamation of the mine pits open at that time was started in October of that year.

Blackfoot River Subbasin

Several land uses have been identified as adversely affecting fish production and water quality in the Blackfoot River subbasin. Livestock grazing, irrigation withdrawal, agricultural runoff, roads, railroads, logging, recreation, and surface mining operations have been mentioned as

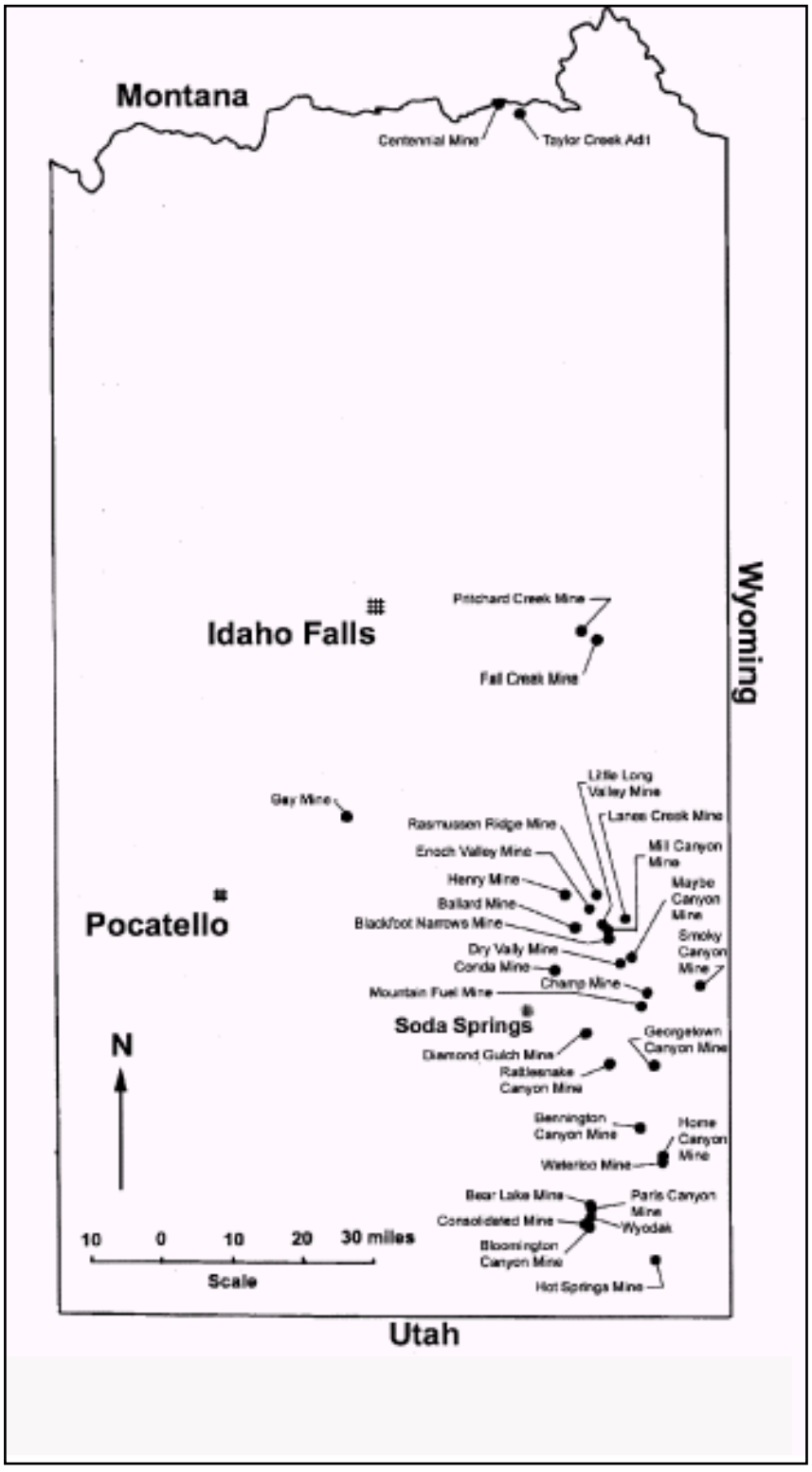


Figure 5. Locations of active and inactive mines in the Upper Snake River subbasin, Idaho.

having possible negative effects (Rich 1999; TRC Mariah Associates 1996; Caribou National Forest 1992; Mariah Associates 1982, 1990; Thurow 1981; Singh and Ralston 1979; Hancock and Bybee 1978; Platts and Martin 1978; McSorley 1977; Platts 1975; Cuplin 1961). Streams that may have been affected by cattle grazing include Trail, Slug, Lanes, Sheep, Browns Canyon, and Diamond Creeks (Thurow 1981). Platts and Martin (1978) reported altered vegetation or bank structure in Angus and Diamond Creeks due to livestock grazing. Mining activities have also increased sediment and petroleum input into Angus Creek (Platts and Rountree 1973) and sediment in Lanes Creek (Thurow 1981). Land ownership in the Blackfoot River subbasin is illustrated in Figure 6.

The Henry Mine

The Henry Mine, operated by the Monsanto Company, is located in Caribou County, southeast of the small village of Henry, Idaho. Monsanto was issued a Federal Lease on September 1, 1960. Monsanto's intent was to use the ore as replacement for the dwindling resources at their Ballard Mine (Carter 1978).

Exploration on their newly acquired Federal lease soon led the Monsanto Company to seek additional adjacent acreage. On December 10, 1962, the Bureau of Land Management (BLM) issued Monsanto a prospecting permit on April 5, 1963. Apparently, Monsanto found phosphate ore in the area of the permit because they filed an application with the BLM for a Federal Preference Right Lease on January 11, 1965. The lease, I-013814, was issued on December 1, 1965.

Mining operations were completed in mid-October, 1989, bringing to a close the active phase of the Henry Mine. Reclamation of the Henry Mine progressed throughout the active mining phase with excavated waste rock being used to backfill the pits as mining advanced. Once the mine closed in late 1989, other forms of reclamation took place such as reseeding and hydromulching of the highwalls. The BLM accepted the relinquishment of the Monsanto leases on December 7, 1993.

Portneuf River Subbasin

Land ownership in the Portneuf River subbasin includes private, federal, state, and tribal (Figure 7). Almost 60 percent of the land within the subbasin is privately owned. The largest landowners in the subbasin are the U.S. Forest Service (USFS) Caribou National Forest, the SBT, and the BLM.

Agriculture, range, forest, and urban areas are the major land uses in the subbasin. More than half of the subbasin is rangeland. Much of the forest and rangelands lie within the Caribou National Forest. Major crops grown in the Portneuf River subbasin include wheat, barley, potatoes, and hay (Ozburn and Modersitzki 1986; McNabb 1987). Beef cattle form the major livestock industry within the subbasin.

As of June 1997, there were nine facilities with National Pollution Discharge Elimination System (NPDES) permits to discharge into the Portneuf River. All the facilities are located at or downstream of Lava Hot Springs and most are located in the Pocatello area. Facilities include three wastewater treatment plants and two fish hatcheries.

There are three current or historic Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) sites within the Portneuf River subbasin (B. Roberts, IDEQ, personal communication). All three are located in or near the city of Pocatello. The Union

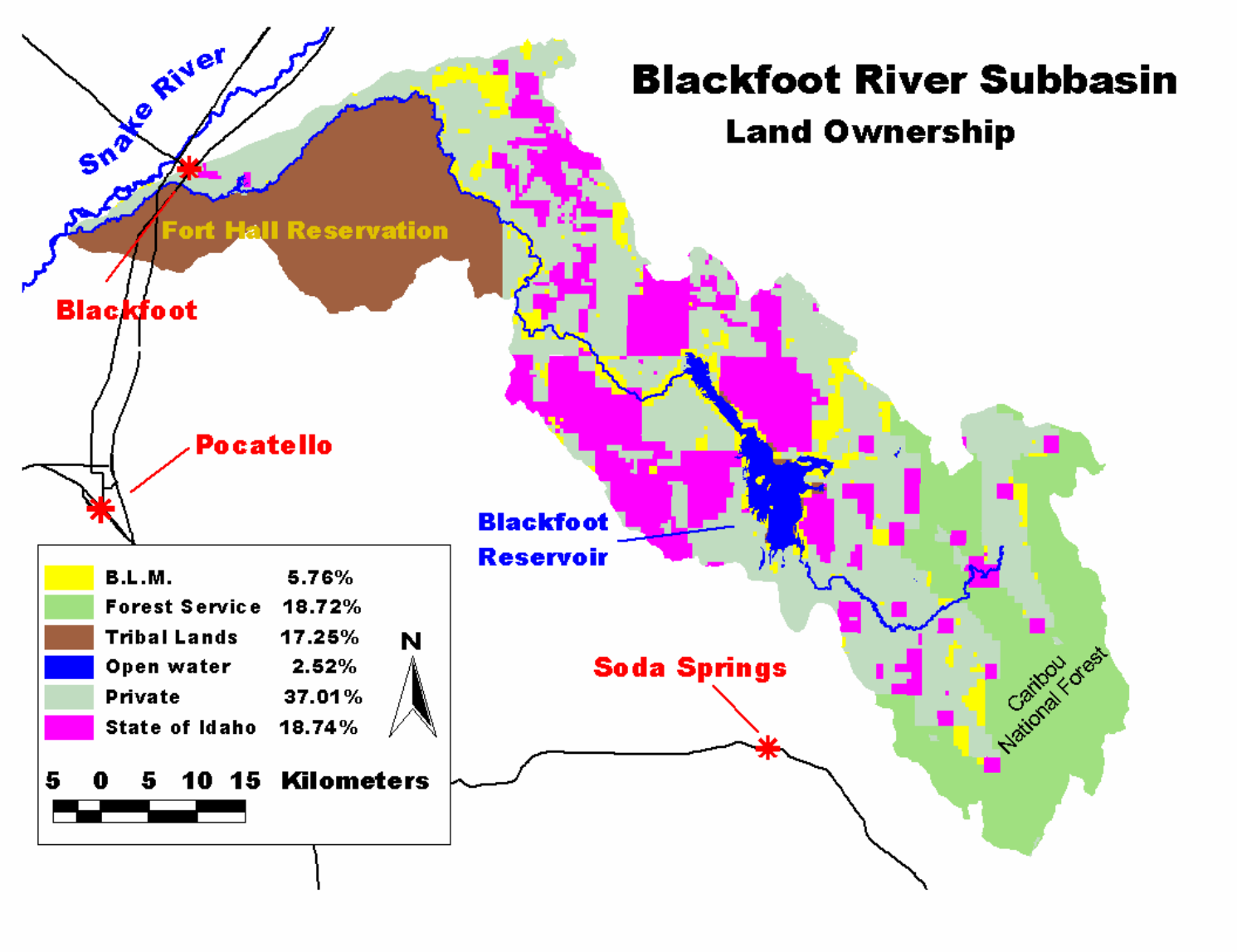


Figure 6. Land ownership in the Blackfoot River subbasin, Idaho.

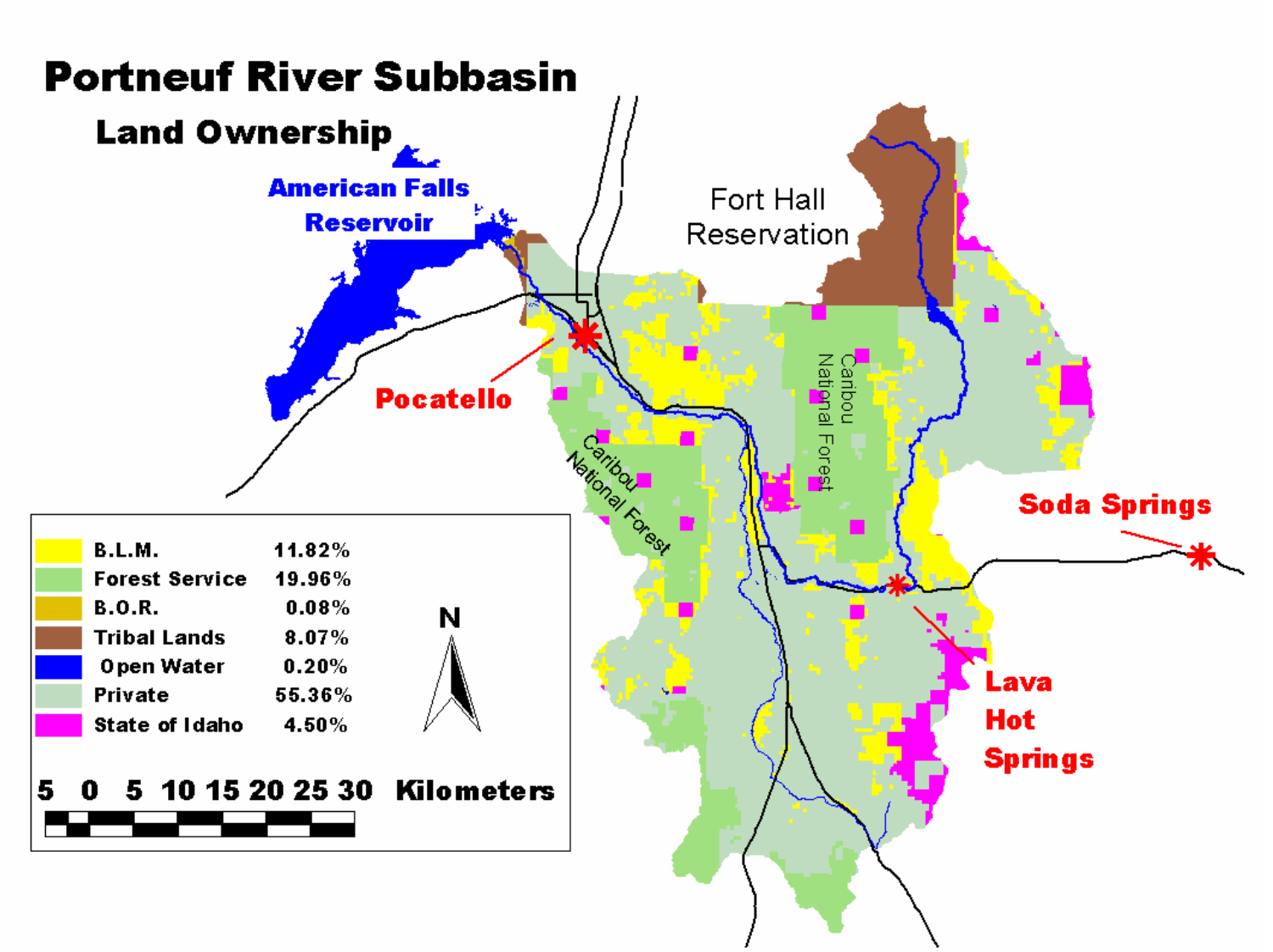


Figure 7. Land ownership in the Portneuf River subbasin, Idaho.

Pacific Railroad Sludge Pit site contained sludge contaminated by heavy metals, volatile organic compounds, and semi-volatile organic compounds. The second site, McCarty's/Pacific Hide and Fur, was contaminated by PCBs and lead. Contaminated soils at both sites have been removed. The final site, Eastern Michaud Flats, includes the FMC and Simplot phosphate ore processing facilities. The site contains numerous contaminants associated with the processing of phosphate ore including radionuclides. The Sludge Pit has been delisted and is no longer a Superfund site while the McCarty's/Pacific Hide site is in the process of being delisted (G. Brown, IDEQ, personal communication).

Hydrology

The topography of southern Idaho is varied and dramatic as a result of recent volcanism and uplift of mountain ranges along normal faults (ISU Education 2001). River systems and their drainage patterns are a result of them finding routes across areas of recent volcanic activity and uplifted mountains. The Lake Bonneville Basin of western Utah, southern Idaho and eastern Nevada had major influence on today's and its fisheries resources. The Lake Bonneville floods spilled over into the Portneuf River drainage and then to the Snake River near Pocatello about 14,500 years ago. The event left its mark on the Portneuf and Upper Snake River landscape (Malde 1968).

In a few square miles of flat valley bottom near Soda Springs, Idaho, streams drain south into the Bear River and the Bonneville Basin, and north to the Blackfoot River and the Portneuf River subbasins of the Upper Snake. Basaltic flows dammed and diverted the Bear River away from the Portneuf and Snake River drainage and toward the Bonneville Basin within the last million years.

Upper Snake River Subbasin

The Snake River traverses southern Idaho from east to west along the Continental Divide in Wyoming and flowing 1,038 miles to the confluence of the Snake River with the Columbia River at Pasco, Washington. Discharge is highly variable and is managed by the BOR and Water District No. 1. The major canal companies divert water from the Snake River at Milner Dam through traditional gravity diversion systems that flow in open channels along contours (Barry 1996).

In general, streams or water bodies within the Upper Snake River subbasin may be divided into perennial and intermittant waterbodies. Each of these may be further subdivided into springs, streams, aqueducts, and lakes/reservoirs or canals (Table 3).

Table 3. Perrenial and intermittent waterbodies of the Upper Snake River subbasin (Buhidar 1999).

Waterbody	Meters	Miles	% of Total
Perennial Waterbodies			
Springs	10297.30	6.40	0.20
Streams	797277.50	495.41	15.18
Aqueducts	1226.60	0.76	0.02
Lakes and Reservoirs	143486.07	89.16	2.73
Subtotal	952287.47	591.73	18.13
Intermittant Waterbodies			
Springs	5168.34	3.21	0.10
Streams	2435981.54	1513.65	46.37
Aqueducts	1514.23	0.94	0.03
Canals	1857934.29	1154.47	35.37
Subtotal	4300598.40	2672.27	81.87
Total	5252885.87	3264.00	100.00

Prepared by IDEQ-TFRO from USGS GIS Maps via ArchView 1996. A canal is a man-made conveyance structure used to carry irrigation water from a recognized point of diversion. Natural streams, which may at times convey irrigation water, are not considered canals under the present legal definition. Aqueducts are defined as conduits or artificial channels that convey water above the surface across a river or hollow.

From this table three functional groups emerge: intermittant streams (which comprise 46.4 percent of the total stream miles), canals (which make up 35.4 percent of the total stream miles), and perennial streams (which make up 15.2 percent of the total stream miles). All streams, whether intermittant or perrenial, if they are listed as water quality limited stream segments on the 1996 303(d) list will undergo the Total Maximum Daily Load (TMDL) process as defined in the Clean Water Act and Idaho Code 39-3601.

The state's largest water district, District 1 covers the entire Upper Snake River subbasin above Milner Dam, and includes numerous streams and tributaries with thousands of individual water users (IDWR 2001). Figure 8 illustrates the locations of numerous dams on the Upper Snake River. The Water District operates reservoirs, canals, and diversion dams in three water projects as a system. The projects begin with headwater reservoirs at Jackson Lake, Grassy Lake, and Henry's Lake and end with Milner Dam and reservoir. Irrigated lands extend well downstream from Milner to the town of Bliss, about 60 miles below Milner and 35 miles below

Shoshone Falls. Three separate water projects have been developed and operated as a single system to provide the annual water operations of District 1 water users. Figure 9, Figure 10, and Figure 11 illustrate the extent of the canals and ditches used to deliver water throughout the Upper Snake River subbasin.

The policy of Water District 1 is to store water in reservoirs highest in the system and use water in the lowest reservoirs (R. Carlson, IDWR, Public Informational Workshop, Pocatello, Idaho. November 21, 2000). American Falls Reservoir is the largest and lowest reservoir in the Upper Snake River subbasin. Water discharge into the reservoir basin from springs between Blackfoot and the Fort Hall Bottoms and Snake River and Portneuf flows reliably refills the 1.67 MAF American Falls Reservoir each year.

The Minidoka Project furnishes irrigation water from five reservoirs with a combined storage capacity of more than 3 MAF. Within the Upper Snake River subbasin, project works include Minidoka Dam and Lake Walcott and American Falls Dam and Reservoir. Above the Upper Snake River subbasin the project includes Jackson Lake Dam and Lake, Island Park Dam and Reservoir, and Grassy Lake Dam and Lake. Two diversion dams, canals, laterals and drains deliver the water to about 1.1 million acres. American Falls Dam is used as a hydropower generation site by the Idaho Power Company (IPC). The Ririe Project is the smallest of the three Water District 1 water projects. Features of the project are Ririe Dam and Lake. Ririe's principle purpose is flood control. Of the total reservoir capacity (100,500 acre-feet), 80,500 acre-feet serve both flood control and irrigation, 10,000 acre-feet is dead storage, and 10,000 acre-feet are reserved for flood control.

Several hydroelectric power generation plants operate as part of the Water District 1. The Minidoka power plant (28.5 megawatts) serves the pumped irrigation requirements on and near the Minidoka Project. Power not needed for BOR project purposes is marketed in the Federal Southern Idaho Power System administered by the BPA.

The IPC operates three hydroelectric power generation plants (IPC 2001). Plants at American Falls Dam generate 92,340 kilowatts, while Milner Dam generates 59,448 kilowatts and Shoshone Falls generates 12,500 kilowatts.

The BOR actively pursues and provides water for Snake/Columbia Rivers flow augmentation for threatened and endangered salmon and steelhead. The Idaho Legislature authorized short-term rental of up to 427,000 acre-feet of water from the water bank each year. Approximately 22,000 acre-feet of BOR space and 38,000 acre-feet of water from American Falls Reservoir was provided for flow augmentation in 1999, in addition to another 148,400 acre-feet rented from Water District 1 water bank (BOR, correspondence, May 2000).

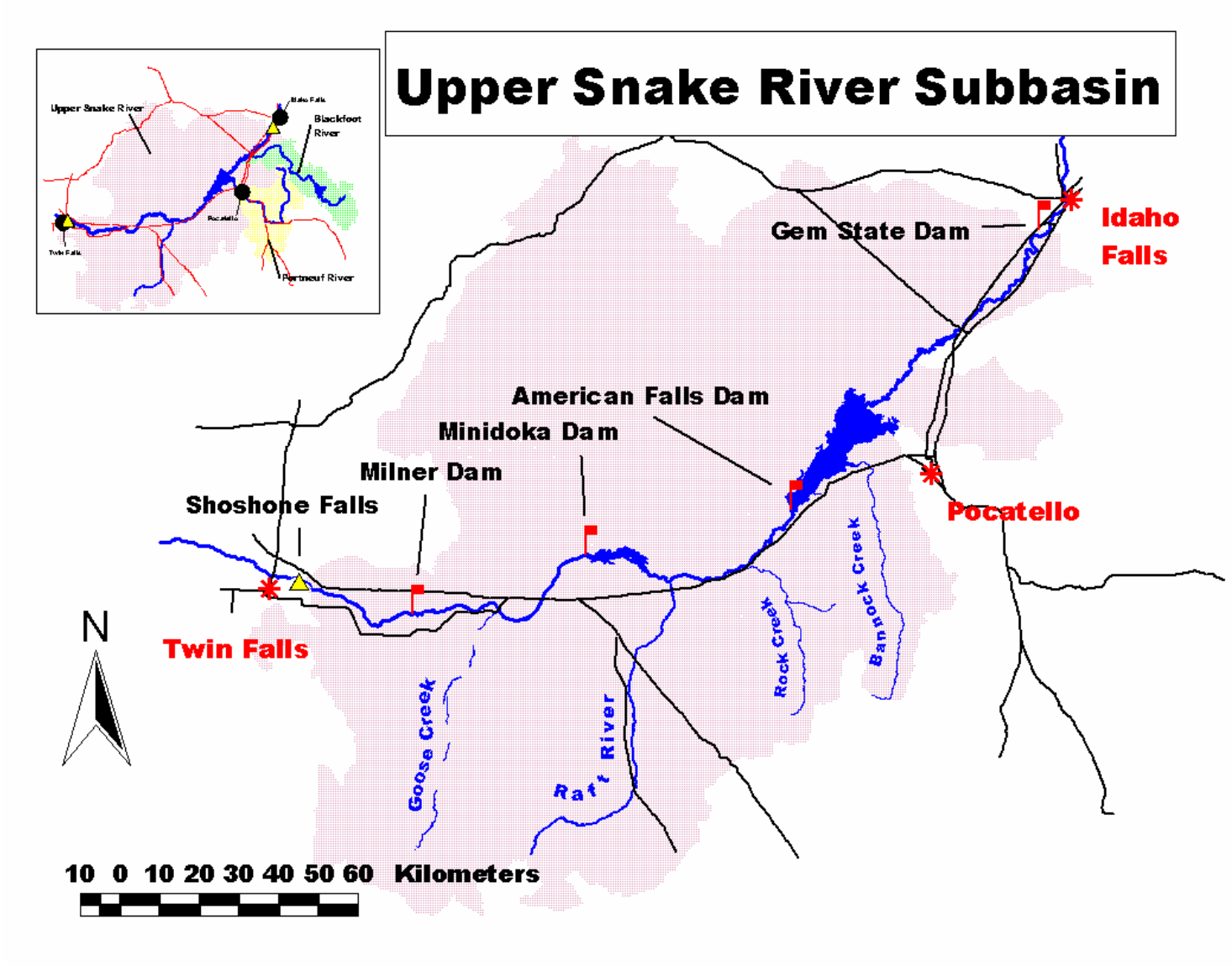


Figure 8. Upper Snake River subbasin dam locations.

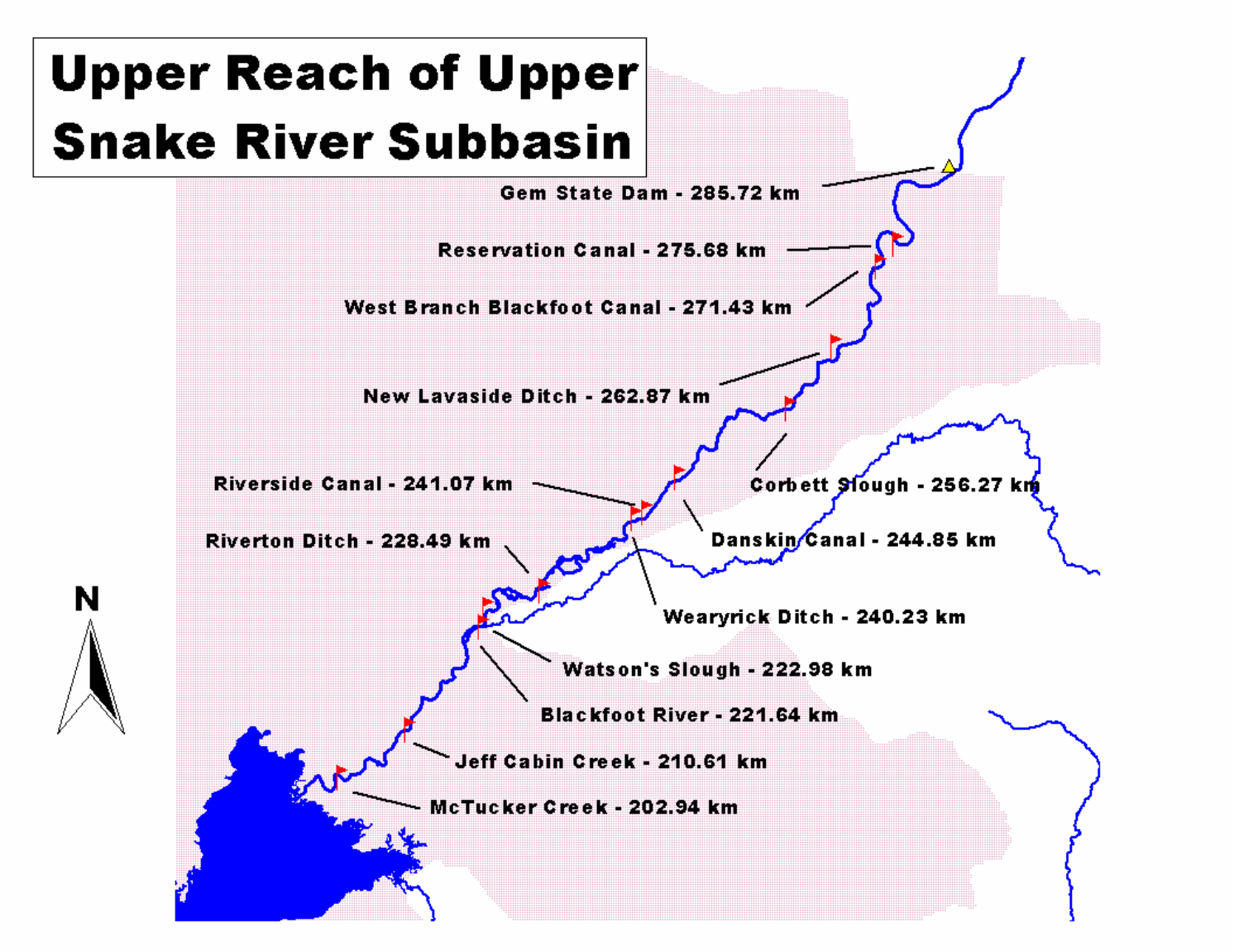


Figure 9. Water delivery and withdrawal in the upper reach of the Upper Snake River subbasin, Idaho.

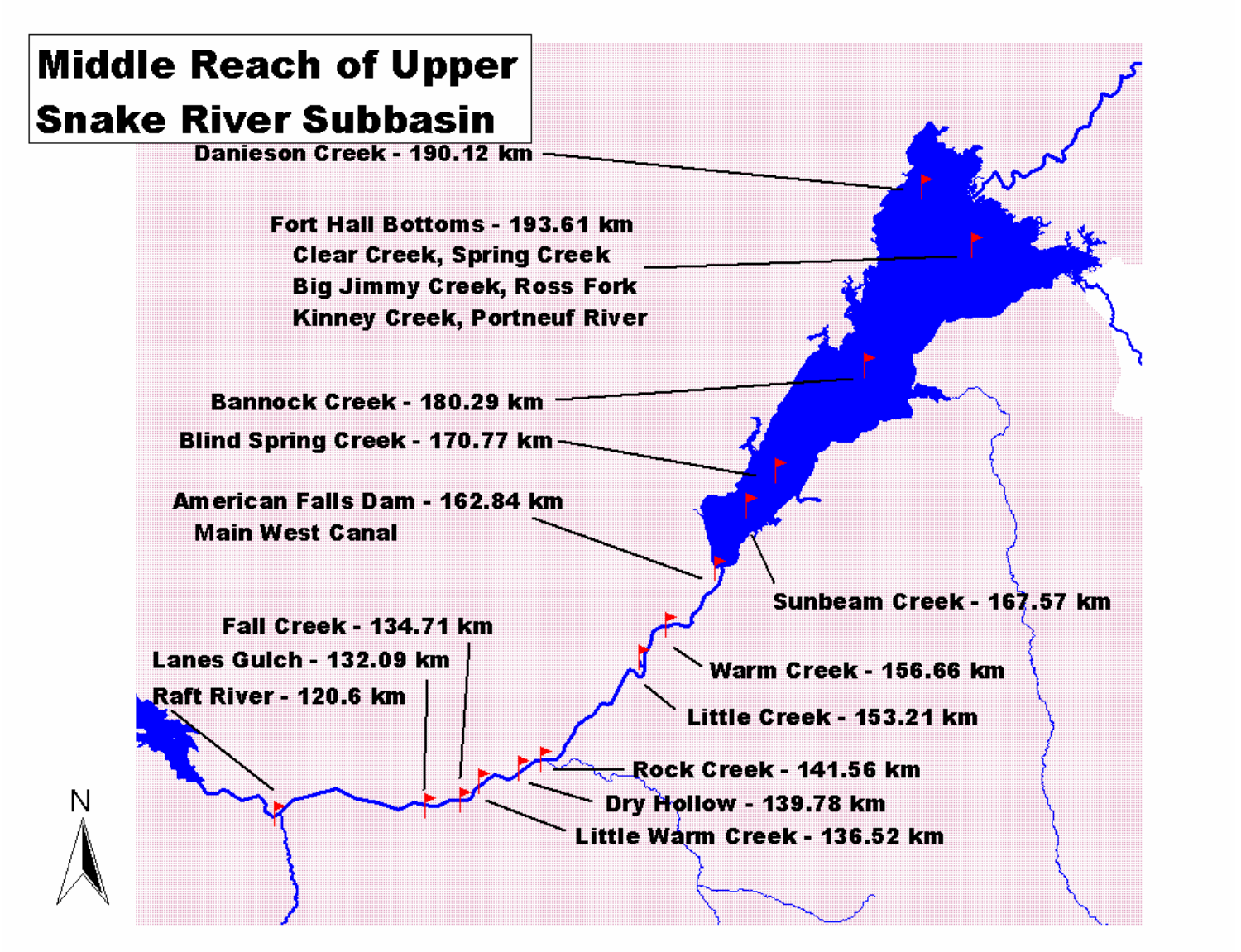


Figure 10. Water delivery and withdrawal in the middle reach of the Upper Snake River subbasin, Idaho.

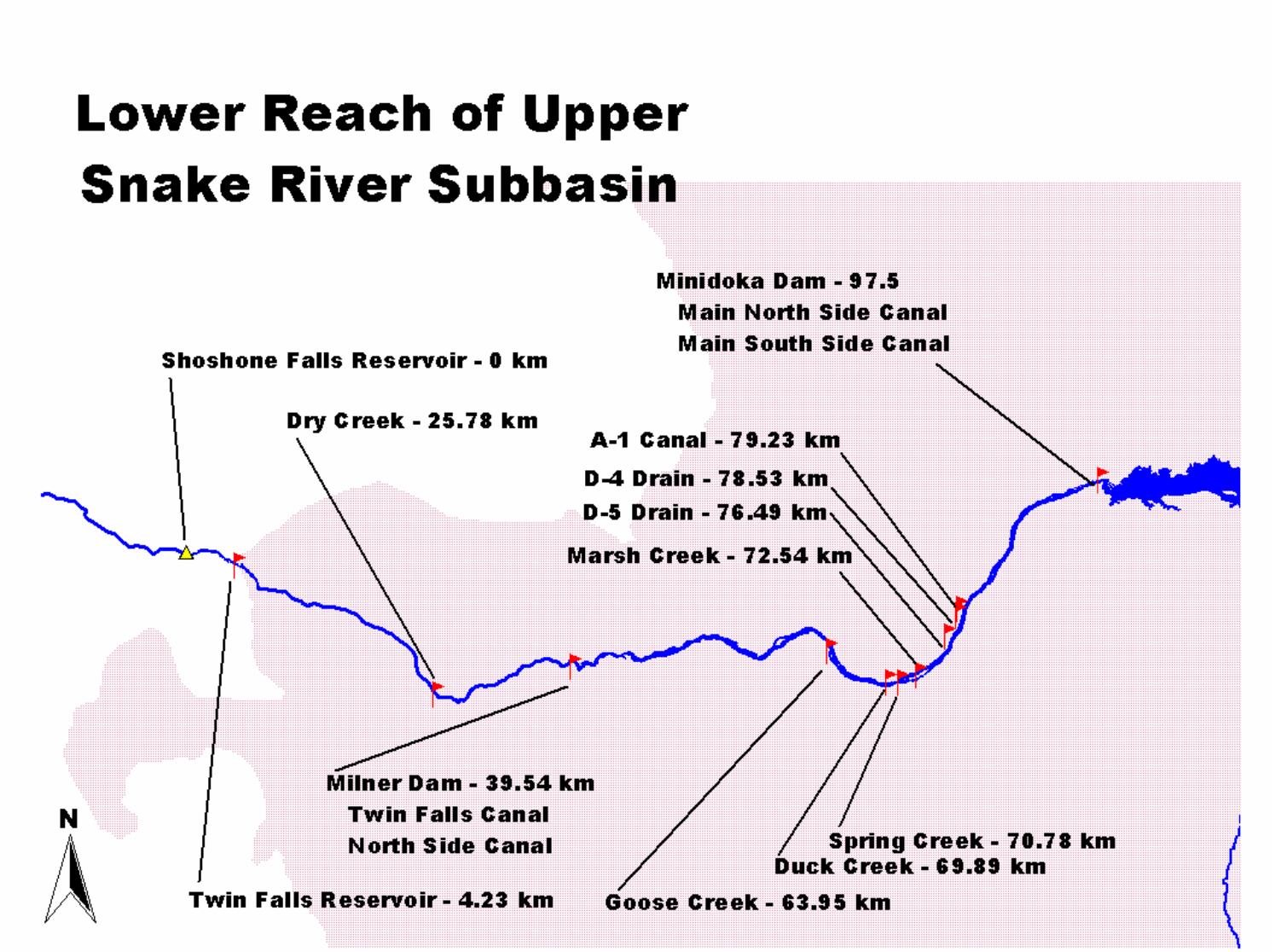


Figure 11. Water delivery and withdrawal in the lower reach of the Upper Snake River subbasin, Idaho.

Raft River

There are several perennially flowing tributaries to the Raft River originating in the Albion Mountains and Black Pine Mountain before it enters the Snake River at RM 692. Raft River rarely flows into the Snake River due to irrigation withdrawals. In fact, many of the Raft River tributaries do not reach the mainstem of the Raft River for the same reason.

The most significant perennial tributary streams in the Raft River watershed form Cassia Creek, which picks up most of its flows from Almo Creek, Stinson Creek, Clyde Creek, and Cottonwood Creek. Much of the water from these streams is diverted out of the stream channel for irrigation once it reaches lowland agricultural developments. Perennially flowing streams from the Black Pine and Sublett Mountain Ranges also rarely reach the Raft River due to irrigation withdrawals. When Raft River flows do reach the Snake River they contribute a significant amount of phosphorous, nitrogen and sediment (Miller *et al.* 1998).

Goose Creek

Goose Creek receives most of its flow from its headwaters on the south side of the mountain range south of Twin Falls known as "The South Hills." Goose Creek flows northward approximately 12 miles into Idaho before it reaches Oakley Reservoir, where nearly all of the water is withdrawn for irrigation purposes. The highly erodable soils of the Goose Creek watershed contribute significant quantities of sediment into Goose Creek and Oakley Reservoir. Since construction of the Oakley Reservoir impoundment in 1913, Goose Creek has flowed into the Snake River only once, in the very wet year of 1984. The original channel downstream of Oakley no longer exists due to farming activities and urban developments.

Big Cottonwood Creek

Most of the water in Big Cottonwood Creek originates from snowmelt runoff and spring-fed tributaries that originate in the central part of the South Hills. Big Cottonwood Creek was historically a tributary to the Snake River, but most of its water is now diverted for irrigation purposes before it reaches the Murtaugh Lake impoundment. During the normal irrigation season, most of the water is diverted out of the natural stream channel at the head of the BCWMA at the mouth of Big Cottonwood Canyon.

Impoundments

The three major impoundments in the Upper Snake River subbasin that regulate water velocities of the Middle Snake River are described in Table 4. American Falls Reservoir, Lake Walcott, Milner Lake, and other reservoirs regulate water volume and discharge.

Table 4. Description of impoundments affecting water velocities in the Middle Snake River (Buhidar 1999).

Project Name (FERC No.)	RM	Reservoir Description			Owner
		Distance (RM)	Capacity (AF)	Elevation (ft. msl)	
Shoshone Falls Dam (FERC 2778)	614.7	614.7-616.5	1500	3354.5	IPC
Twin Falls Dam (FERC 0018)	617.4	617.4-618.2	1000	3511.4	IPC
Milner Dam (FERC 2899)	639.1	639.1-674.5	26,000	4130.5	TFCC NSCC

Prepared by IDEQ-TFRO. Based on FERC 1997a, and the individual FERC or NPDES license applications. IPC = Idaho Power Company; TFCC = Twin Falls Canal Company; NSCC = North Side Canal Company. Msl = mean sea level. Twin Falls Dam, Shoshone Falls Dam, and Upper Salmon Falls Dam do not store water nor load follow, meaning they have no effect on discharge in the Middle Snake River on either a diel or seasonal basis. Lower Salmon Falls Dam and Bliss Dam load follow but do not alter their flows outside of a diel timeframe.

Water Rights, Management, and Storage

The State of Idaho has statutory authority to administer water rights within its boundaries. Under the Prior Appropriation Doctrine, natural flow rights in Idaho are satisfied in order of priority based on date (first in time is first in right). When the water supply is limited, a water right holder with an earlier natural flow right (a senior water right) may receive a full supply, whereas a water right holder with a later or more recent date (a junior water right) may not. Diversion rights for irrigation are appurtenant to the land, whereas diversion rights for other purposes such as power, municipal, and industrial water supply are not.

Storage reservoirs such as American Falls, Jackson Lake, and Palisades are operated for irrigation purposes (BOR 1997). Table 5 describes the spaceholder contracts (through November 1995) in the American Falls, Jackson Lake, and Palisades storage facilities for specific canal companies in the Upper Snake River subbasin. The two primary canal companies in the subbasin have their water rights based primarily on natural flow with supplemental storage rights (Robison 1998).

Table 5. Spaceholder contracts in the Upper Snake River subbasin as of November 1995 (AF) (Buhidar 1999).

Spaceholder	American Falls	Jackson Lake	Palisades	Total
American Falls Reservoir District	274,338 (NSCC) 148,747 (TFCC)	0 0	0 0	423,085
MID	44,951	0	44,500	89,451
NSCC	116,471	312,007	116,600	545,078
TFCC	0	97,183	0	97,183
TOTAL (%)	584,507 (50.6%)	409,190 (35.4%)	161,100 (14.0%)	1,154,797

NSCC = North Side Canal Company; TFCC = Twin Falls Canal Company. MID = Milner Irrigation District. A spaceholder contract is defined as a type of repayment contract in which storage space is purchased in contrast to purchasing a specific amount of water. The amount of water that accumulates in that storage space belongs to the purchaser. Storage season is normally defined as beginning October 1 and extending to the date that no more water is available for storage. The irrigation season is defined in spaceholder contracts as April 1 to October 31, although the actual water may not be used till April 15 to October 15. A water year (or WY) begins on October 1 and extends to September 30 the following year (BOR 1996-1997).

Springs, Seeps, and Groundwater

In addition to tributary streams, springs and seeps provide a significant contribution of flow to the Snake River. The greatest number of springs is located in the Thousand Springs area of the Hagerman Valley, downstream of Shoshone Falls. Because spring water comprises such a large amount of the total streamflow in the Middle Snake River, it has an obvious beneficial effect on water quality. Additionally, the decline in average spring flows since the 1950s is credited to increased groundwater pumping, change from furrow to sprinkler irrigation, changes in water management, and traditional drought conditions. Average discharge at Thousand Springs was around 4,000 cfs in the early 1900s and increased to almost 7,000 cfs in the 1950s. It has since decreased to about 5,000 cfs (BOR 1997).

Canal Systems

The Twin Falls Canal Company (TFCC) and North Side Canal Company (NSCC) irrigate tracts on the south and north sides of the Snake River (Figure 11). The Twin Falls area is predominantly irrigated by the TFCC, the largest irrigation company in the state of Idaho. The TFCC diverts an average of 1.1 MAF per year from the Snake River. The irrigation water is delivered to the area by gravity feed via the High Line and Low Line canals. Approximately 202,000 acres are serviced by the TFCC. An estimated 85 to 90 percent of irrigation in the Twin

Falls area is surface irrigated with sprinkler irrigation making up the balance (Cosgrove *et al.* 1997; Haye 1998; Barry 1996).

The Hazelton-Jerome-Wendell-Gooding area, or Northside Tract is predominantly irrigated by the NSCC. The NSCC diverts an average of 1.2 MAF per year from the Snake River. The irrigation water is delivered to the area by gravity feed via the Main Canal. Approximately 160,000 acres are serviced by the NSCC. An estimated 80 percent of irrigation is primarily sprinkler irrigation (Heaps 1998; Barry 1996).

Approximately 6,000 farms within the Twin Falls and Northside Tracts discharge into one or more points in a return flow channel. The largest withdrawals within this reach of the river are at Minidoka Dam and Milner Dam. During low water years, essentially all of the flows from the Snake River are diverted out of the river channel at Milner Dam leaving the Snake River completely dry until it picks up spring flows several miles downstream.

Blackfoot River Subbasin

As with most dammed rivers, the natural hydrograph in the Blackfoot River subbasin has been altered by the construction of Blackfoot Reservoir. Flow information from the U.S. Geological Survey (USGS) surface water station on the Blackfoot River above the reservoir near Henry indicates that flows increase substantially in April, peak in May at over 600 cfs, remain high in June, and then gradually decline. Below the dam at the Shelley gage site, discharge begins increasing in April, peaks around 750 cfs in June and July, and remains relatively high in August and September before gradually declining through January. Flows at the Blackfoot gage site are lower than what is measured at the Shelley site. Through the irrigation season, this difference is understandable as water is diverted into several irrigation canals (e.g., Little Indian Ditch, Just Canal, Hanson Ditch, Taylor Ditch, Fort Hall Main Canal, North Canal). The equalizing dam, near the City of Blackfoot, was built to help regulate water from Blackfoot Reservoir into the Fort Hall Irrigation Canal.

Portneuf River Subbasin

Flows in the Portneuf River subbasin vary according to location but follow the general pattern of high spring flows and low flows in late summer-early fall. The hydrograph is highest from March through June, coinciding with snowmelt at higher elevations. Low flows occur from July to October. The diversion of water for irrigation affects flows throughout the irrigation season (mid-April to mid-September). Monthly mean flows for the Portneuf River at Pocatello range from 522 cfs in April to 95 cfs in August. An apparent loss of streamflow (about 87 cfs), probably to groundwater, from the Portneuf River and Marsh Creek occurs somewhere between the gaging stations at Topaz and McCammon and the gaging station at Pocatello (Norvitch and Larson 1970).

Water Quality

Upper Snake River Subbasin

Non-point source pollution and water diversions are the predominant influences on surface water quality in the Upper Snake River subbasin. Pollutants of greatest concern that have been associated with stream habitat degradation include nutrients, sediment, bacteria, organic waste and elevated water temperature. Irrigation drainage, aquaculture effluent, municipal effluent,

hydrologic modification, and dams affect water quality in the middle reach of the Snake River. Segments of this river were listed as water quality limited in 1990 because nuisance weed growth had exceeded water quality criteria and standards established for protection of coldwater biota and salmonid spawning.

Above American Falls Reservoir

The Snake River from the Bonneville County line to Ferry Butte is listed on the 1998 Federal Clean Water Act Section 303(d) list. This river reach is scheduled for TMDL development in 2003. Listed pollutants of concern for this stretch of river include nutrients, sediment, dissolved oxygen and flow alteration. Aside from numerous irrigation withdrawals and returns, the only major tributary is the Blackfoot River, the confluence of which is located just upstream from Ferry Butte.

Extensive data gaps exist regarding characterization of nutrient, sediment and dissolved oxygen loading in this reach of river. Also, very little is known as to the impairment of beneficial uses from these pollutants in this river reach.

American Falls Reservoir

American Falls Reservoir is listed on the 1998 303(d) list. This reservoir is scheduled for TMDL development in 2003. Listed pollutants of concern are nutrients, sediment, and dissolved oxygen. Current knowledge regarding characterization of basic limnological dynamics in American Falls Reservoir is sparse. Work is currently proceeding on characterizing the majority of the nutrient and sediment loads from tributary waters into the reservoir, including the mainstem Snake River, Blackfoot River, Portneuf River, tributaries that enter the reservoir located on the Fort Hall Indian Reservation, and numerous irrigation returns on the north and west side of the reservoir.

Also, little is known as to the impairment of beneficial uses from pollutant loading into the reservoir. The objective of the Water Quality Monitoring Work Plan (IDEQ 2001) is to collect baseline limnological data, including temperature/dissolved oxygen/conductivity/pH profiles, as well as characterize nutrient concentrations, primary productivity (chlorophyll a) and phyto- and zooplankton communities. The Idaho Department of Environmental Quality (IDEQ) proposes biweekly sampling from May through October 2001 at sites along three transects. This information will be used to begin development of TMDLs for nutrients, sediment and dissolved oxygen in American Falls Reservoir.

Middle Snake River

Water quality data for this reach are based on a comprehensive multi-agency/multi-organization collection of water quality information from 1990 through 1998.

Total Suspended Solids

Total Suspended Solids (TSS) concentrations are greatest in the spring and summer than in the fall and winter (Table 6). Overall, the TSS decreases from Milner Dam to Shoshone Falls due to the reservoir nature of some of this portion of the Snake River. However, by the time it gets to King Hill, the TSS has increased by 1.7 times in concentration. A similar condition occurs in the spring and summer, except that the TSS has increased by 1.6 times in concentration by the time it gets to King Hill. The fall and winter season indicates a slight increase (1.02) from Milner

Dam to Shoshone Falls, but the TSS increases by 1.9 times in concentration by the time it gets to King Hill.

Table 6. Total suspended solids, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	Shoshone Falls	King Hill
Mean TSS (mg/L)	15.8	15.0	25.9
Spring and Summer (mg/L)	19.0	17.1	27.7
Fall and Winter (mg/L)	12.6	12.9	24.2

Total Phosphorus

Total phosphorus (TP) is summarized in Table 7. In general, the TP concentration is greatest in the fall and winter than in the spring and summer. The TP increases from Milner Dam to Shoshone Falls by 1.1 times, but decreases by 0.6 times by the time it reaches King Hill. A similar occurs in the spring and summer except that the TP increases by 1.2 times to Shoshone Falls, but decreases 0.7 times by the time it reaches King Hill. The fall and winter season is similar except that it increases by 1.1 times to Shoshone Falls, but decreases by 0.6 times by the time it reaches King Hill. There appears to be a fall/winter TP component at Milner Dam (Milner Pool or Milner Lake) that causes a substantial increase than what is seen in the summer by 1.3 times.

Table 7. Total phosphorus, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	Shoshone Falls	King Hill
Mean TP (mg/L)	0.121	0.136	0.086
Spring and Summer (mg/L)	0.107	0.126	0.089
Fall and Winter (mg/L)	0.135	0.146	0.083

Nitrite plus Nitrate

Nitrite plus Nitrate (NOX) concentrations are illustrated in Table 8. In general the NOX concentration is greatest in the fall and winter than in the spring and summer. Overall, the NOX increases by 3 times to Shoshone Falls and then essentially stabilizes at this level through King Hill, although there are increases and decreases along the way. The spring and summer increases by 4.3 times to Shoshone Falls and then appears to stabilize at this level through King Hill, although there are increases and decreases along the way. The fall and winter increases by 2.4 times to Shoshone Falls and then also stabilizes at this level through King Hill, although there are increases and decreases along the way.

Table 8. Total nitrite plus nitrate, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	Shoshone Falls	King Hill
Mean NOX (mg/L)	0.415	1.232	1.278
Spring and Summer (mg/L)	0.261	1.118	1.190
Fall and Winter (mg/L)	0.569	1.346	1.367

Total Ammonia

Total ammonia (NH_3) concentration is greatest in the fall and winter than in the spring and summer (Table 9). Overall, the NH_3 increases by 6.9 times to Shoshone Falls and then decreases 0.2 times through King Hill (to 1.4 times that coming in from Milner Dam). The spring and summer concentration increases 6.1 times to Shoshone Falls and then decreases 0.3 times through King Hill (to 1.6 times that coming in from Milner Dam). The fall and winter concentration increases 7.6 times to Shoshone Falls and then decreases 0.2 times through King Hill (to 1.3 that coming in from Milner Dam).

Table 9. Total ammonia, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	**Shoshone Falls**	**King Hill**
Mean NH_3 (mg/L)	0.029	0.199	0.041
Spring and Summer (mg/L)	0.028	0.171	0.044
Fall and Winter (mg/L)	0.030	0.227	0.039

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN) is illustrated in Table 10. In general the TKN concentration is greatest in the Spring/Summer than in the Fall/Winter. Overall, the TKN decreases 0.6 times to Shoshone Falls and then increases 1.2 times through King Hill (but 0.8 times that coming in from Milner Dam). The Spring/Summer decreases 0.7 times to Shoshone Falls and then increases 1.1 times through King Hill (but 0.8 times that coming in from Milner Dam). The Fall/Winter decreases 0.6 times to Shoshone Falls and then increases 1.3 times through King Hill (but 0.8 times that coming in from Milner Dam).

Table 10. Total Kjeldahl Nitrogen, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	**Shoshone Falls**	**King Hill**
Mean TKN (mg/L)	0.42	0.27	0.33
Spring and Summer (mg/L)	0.45	0.30	0.34
Fall and Winter (mg/L)	0.39	0.24	0.32

Total Nitrogent to Total Phosphorus

The ratios determined by Total Nitrogen to Total Phosphorus (TN:TP) are used to define the limiting nutrient nature of a waterbody to potentially have nuisance algal growth. Ratios > 16 are considered to be phosphorus limiting. Ratios less than 10 are considered to be nitrogen limiting. Total nitrogen is defined as the sum of TKN and NOX. Table 11 summarizes these ratios in the Milner Dam to Shoshone Falls reach.

Table 11. Total Nitrogen to Total Phosphorus ratios, Milner Dam to Shoshone Falls (Bihudar 2001).

	Milner Dam	Shoshone Falls	King Hill
Mean TKN (mg/L)	0.42	0.27	0.33
Mean NOX (mg/L)	0.415	1.232	1.278
Mean TN (mg/L)	0.835	1.502	1.608
Mean TP (mg/L)	0.121	0.136	0.086
TN:TP	7	11	19

The limiting ratio at Milner Dam is nitrogen limiting. At Shoshone Falls the ratio has increased but not sufficiently to say if it is nitrogen or phosphorus limiting. It is assumed that it could be either. By the time water arrives at King Hill the ratio indicates the water is phosphorus limiting.

Flow Conditions

Flow has a tremendous affect on water quality. In the Middle Snake River, it has been determined that high flows cause an increase in TSS but a decrease in TP. High flow conditions were compared against the 1984 hydrologic year. Low flow conditions were compared against the 1992 hydrologic year. Mean or average conditions were compared against the 1983-1998 hydrologic years. Flows are illustrated in Table 12.

Table 12. Flow conditions in the Snake River from Milner Dam to King Hill (Bihudar 2001).

	Milner Dam	Shoshone Falls	King Hill
High Flow (cfs)	9,432	10,644	18,069
Mean Flow (cfs)	3,860	4,737	11,398
Low Flow (cfs)	366	1,146	7,384

The increase in flow between Milner Dam and Shoshone Falls does not change drastically because the amount of return flows from springs and canalways is much in this stretch of the Snake River. However, by the time the water reaches King Hill substantially inflows from various canal, springs, and seeps enhances the volume of water in the river (Table 13).

Table 13. Increase in Snake River flow (Bihudar 2001).

Variance	Shoshone Falls	King Hill	Increase
High Flow (cfs)	1,212	7,425	6.1 x
Mean Flow (cfs)	877	6,661	7.6 x
Low Flow (cfs)	780	6,238	8.0 x
Range (cfs)	432	1,187	2.7 x

State Water Qualilty Standards

The river segment from Milner Dam to Pillar Falls appears to be meeting its narrative standard for sediment although it is listed for sediments in the 1996 303(d) list (Bihudar 2001).

Monitoring data confirms that from 1990 to 1998, of 455 samples taken (247 for Milner Dam and 208 for Pillar Falls) only two samples were greater than the 52 milligrams per liter (mg/L) TSS instream target: 63 mg/L on June 26, 1997 and 77 mg/L on March 25, 1997. These levels were found during high flow years in two separate months. Thus, there is a 1.9 percent chance (2 months in 108 months) that such an event will occur, indicating that even under high flow conditions the water quality entering this segment is well below the instream target for meeting beneficial uses for salmonid spawning and cold water biota. Total Suspended Solids values greater than 25 mg/L but less than 52 mg/L were accounted for in 16.2 percent of 469 samples taken in the same time period. Thus, 83.8 percent of 469 samples were less than 25 mg/L TSS. Because of this higher water quality for sediment, this segment is considered background for the entire Middle Snake River and is protected under the antidegradation policy at current existing conditions.

Current existing conditions are defined in the Upper Snake River TMDL and include (1) Point and nonpoint source inputs need to reduce to levels less than 52 mg/L TSS before discharging into this segment of the Middle Snake River; (2) Instream TSS concentrations less than 25 mg/L are to be maintained in the Milner Dam to Pillar Falls stretch during all months of the year, except that values greater than or equal to 25 mg/L TSS but less than 52 mg/L TSS shall have an occurrence rate of no more than 52 percent during March, April, and May; no more than 33 percent during June, July, and August; and, no more than 15 percent during September, October, and November. These occurrence rates are based on the historical conditions (n=455 samples) from 1990 through 1998 for the total of all samples in any water year. Total Suspended Solids values greater than 52 mg/L do not imply that degradation by TSS may occur up to 52 mg/L. Rather, TSS values should be less than 25 mg/L except during those seasonal quarters where allowance is made (based on historical TSS conditions) to not exceed 52 mg/L under any and all conditions that may affect water quality.

Blackfoot River Subbasin

Above Blackfoot Reservoir

McSorley (1977) monitored water quality in the upper Blackfoot River subbasin from just below the dam to the confluence of Lanes and Diamond creeks including one site on Diamond Creek. He concluded that overall the water quality in the area was excellent. He measured levels of phosphorus sufficient to support summer algal blooms in Blackfoot Reservoir. Singh and Ralston (1979) also concluded water quality of streams in the upper Blackfoot River was very good.

Several areas have been identified as having water quality problems. Platts and Primbs (1975) in their work on upper Angus Creek found, among other things, high temperatures, high amounts of suspended sediment, and high concentration of nutrients (i.e., phosphates, nitrates, nitrites). In the late 1970s, based on macroinvertebrate sampling, Platts and Andrews (1980) declared that the upper Blackfoot River and its tributaries (Mill, Angus, Diamond, and Kendall creeks) more closely resemble unpolluted streams of southeastern Idaho than polluted streams. Only Diamond Creek and lower Angus Creek had macroinvertebrate communities indicative of some stress. Reaches of Bacon Creek include high percentages of fines in the substrate and degraded channel characteristics such as lack of riparian vegetation, channel braiding, and downcutting (IDFG, personal communication).

Recent sampling in the upper Blackfoot River subbasin has been associated with phosphate mining. Mariah Associates (1990) concluded that Dry Valley Creek and adjacent Blackfoot

River showed signs of environmental disturbance. Sediment levels were high and macroinvertebrate densities were low. Rich (1999) mentioned low stream flows, high water temperatures, and lack of spawning and rearing habitat in upper Dry Valley Creek as the main reasons behind lack of trout in the upper reaches. Mariah Associates (1991a) in their study of Spring and Mill creeks reported good water quality but poor benthic invertebrate populations in Spring Creek associated with significant amounts of fine material in the substrate. They attributed the input of fine material to below normal precipitation (which can result in lower spring flows responsible for moving fine sediment) and streamflow and cattle grazing resulting in stream bank erosion and subsequent streambed sedimentation.

Mariah in 1993 monitored two intermittent streams, NDR and Goodheart, concluding that water quality in NDR Creek was similar to that in Spring and Mill creeks while water quality in Goodheart showed effects of mining in the drainage (Mariah Associates 1993a). In their 1992a report, they noted good water quality in Angus, Rasmussen, No Name, and Sheep creeks. Turbidity measurements collected by Mariah Associates (1992a) from 1990 to 1992 in Angus and Sheep creeks were well within limits for trout. Only upper Angus Creek at a site located just downstream of a previously mined area showed degraded water quality.

The Caribou National Forest has monitored several streams in the upper Blackfoot River subbasin, which cross the forest. From a fish habitat perspective, the streams were generally in good overall condition. Presence of macroinvertebrate species tolerant to sediment and organic enrichment were noted in most streams. Only Lanes and Browns Canyon creeks exhibited a good population of clean water species. Ratings of aquatic habitat resulted in most streams falling into either the very high or high category.

Representatives from the Idaho Chapter of the American Fisheries Society looked at physical characteristics on State lands on three streams in the upper Blackfoot River subbasin in 1994 (Scully *et al.* 1998) and 1995 (IDFG, unpublished data). The Blackfoot River section (just upstream of Angus Creek) had only 51 percent of its streambanks considered stable. A high percentage of fine sediment on the streambed surface, low number of riffles, and actively eroding streambanks were also noted in this reach. In the Diamond Creek section of state land (just upstream of Kendall Creek) fine sediment represented 34 percent of stream substrate and bank stability was 70 percent. This section of the stream had been influenced by human activity (channel straightening, livestock grazing) and displayed few undercut banks, shallow pool depth, and lack of cover. In Lanes Creek (state section that includes Corrailsen Creek), the percentage of surface fines was 33 percent and bank stability averaged 70 percent.

Sampling by USGS indicates some organochlorine compound contamination in fish in the upper Blackfoot River near Henry. Although levels were not substantial enough for discussion in the narrative of the report, Maret and Ott (1997) did detect DDT breakdown products (p,p=-DDD and p,p=-DDE), dieldrin, and total DDT in carp.

Blackfoot Reservoir

Blackfoot Reservoir is located about in the middle of the subbasin and is an influence on lower Blackfoot River water quality. The reservoir can be classified as eutrophic based on clarity (Perry 1977) and water quality (Thurow 1981). Chlorophyll a and nutrient levels indicate the reservoir is also highly productive (USACE 1974; Thurow 1981). Thurow found nitrogen to be the limiting factor in algal growth. Maximum temperature in the reservoir observed by Thurow in the reservoir in 1980 was 24°C.

Scully *et al.* (1993) reported that water quality in Blackfoot Reservoir in summer of 1991 was poor for trout with surface temperatures generally too high and bottom dissolved oxygen concentrations too low to provide "usable" trout habitat. Mid-day sampling on 20, 21 August showed mean dissolved oxygen concentrations ranging from 5.0 to 6.4 mg/l at the surface and 3.2 to 4.7 mg/l near the bottom. Temperatures ranged from 21.1°C (70°F) to 23.8°C (75°F) at the water surface and 18.5°C (65°F) to 19.9°C (68°F) at the bottom. Scully *et al*. also noted a heavy plankton bloom of Aphanizomenon, a blue-green algae, in the upper reservoir area.

Below Blackfoot Reservoir

Water quality problems exist in the lower Blackfoot River subbasin. The Bingham County Local Working Group (1997) recognized water quality as the highest priority for the conservation action plan for Bingham County. In addition to problems on streams recognized on the 303(d) list, the group also suggested problems may exist on Jones, Cedar, Lincoln, and Garden creeks. Possible causes of high turbidity observed by Balmer and Noble (1979) in Cold, Garden, Wood, and Deadman creeks were overgrazing, beaver activity, or geologic condition. A small landslide was noted as a contributor of turbidity into Garden Creek.

Crist and Holden (1986) monitored water quality at five stations from the mouth of the Blackfoot River to the Trail Creek Bridge. They found generally good water quality in the upper section with increases in nutrient and turbidity levels observed at downstream sites leading to a degradation of water quality. Agricultural activities, primarily irrigation and subsequent return flows into the Blackfoot River, and City of Blackfoot municipal activities (e.g., storm water) were attributed as the main cause of this downstream deterioration in water quality. Lower temperatures, turbidity, and sediment loads at upper sites resulted in higher support of salmoides.

Drewes (1987) monitored several streams near lower Trail Creek and Reid Valley for suspended sediment, bacteria, nitrogen, and phosphorus from November 1986 to July 1987. He noted three areas of mass wasting - Blackfoot River between the USGS gage site near Shelley and Reid Bridge, Jones Creek, Cedar Creek - contributing to the sediment load in the Blackfoot River. Drewes quantified sediment input from mass wasting on Blackfoot River only at 6.17 tons. Contact recreation standards for fecal coliform were exceeded in Jones, Cedar, and Miner creeks. Total inorganic nitrogen (nitrate, nitrite, ammonia) exceeded 0.3 mg/l in all streams (Blackfoot River, Wolverine Creek, Jones Creek, and Cedar Creek) except Miner Creek. Exceedances were more prevalent at the lower rather than upper sites. All streams exceeded a concentration of 0.1 mg/l of total phosphorus during Drewes' study.

Royer and Minshall (1998) found high levels of surface fine sediment in the Blackfoot River below the dam. Mean substratum embeddedness averaged 71 percent at a mainstem Blackfoot River site, just above Morgan Bridge, in October 1996.

Information on fecal coliform numbers in lower Blackfoot River subbasin appears to be limited. The Southeastern District Health Department (personal communication) sampled water behind the equalizing dam in June and July of 1992. Fecal coliform values were less than 1 colony/100 ml of water on both dates. Fecal streptococcus numbered 17 colonies and 1 colony/100 ml, respectively.

Proper Functioning Condition evaluation by BLM and the Idaho Soil Conservation Commission (ISCC) indicate nonfunctioning, in terms of managing energy of flowing water, stream segments throughout the Blackfoot River subbasin. In addition to the mainstem Blackfoot River, stream reaches, which were not properly functioning were found in Wolverine, Jones, Rawlins, Horse, Deadman, Grave, Dry Valley, Lanes, Corrailsen, and Diamond creeks. Not

coincidently, nonfunctioning stream reaches also tended to have a greater percentage of unstable streambanks than properly functioning reaches.

Analysis of diatom (algae) communities indicate that biological condition of the Blackfoot River deteriorates in a downstream direction. Two sites were sampled in 1997 (near Grave Creek campground and Slug Creek) and one in 1998 (just downstream of Reservation Canal). The campground and Slug Creek sites scored 22 and 28, respectively, in the River Diatom Index (RDI; Fore 2000). An RDI of 28 is well within the fair biological condition category while 22 is on the cusp of fair and poor. The lower site had an RDI rating of 16, well within the poor category of biological condition.

Portneuf River Subbasin

The Environmental Protection Agency (EPA) rates the Portneuf River subbasin at 5 on a scale of 1 to 6 with a score of 6 indicating subbasins with the most serious water quality problems (EPA, internet communication). The most serious problems are attainment of beneficial uses, wetland loss, agricultural runoff, and population change.

Problems in the Portneuf River have been recognized for several years. Ozburn and Modersitzki (1986) wrote that uses of the Portneuf River for recreation, drinking water supply, agricultural water supply, and a healthy fishery are impaired by sediment, nitrogen, turbidity, phosphate, and bacteria inputs into the stream.

The effect of diminished water quality is often first realized within the local fish population. For example, cutthroat and rainbow trout are considered highly intolerant to water quality degradation, whereas common carp (*Cyprinus carpio*) have a high tolerance of degraded water quality (Chandler *et al.* 1993). Evermann (1896, cited in Mohr 1968) reported that in Mink Creek "we found the cutthroat trout to be quite abundant." At least by the mid-1960s cutthroat trout were "not very abundant in the Portneuf River" according to Mohr (1968) in his investigation of the fishes of the Portneuf River and tributaries.

In 1991, IDFG revisited a site in the upper Portneuf River, which had been electrofished annually from 1979 to 1987 (Scully *et al.* 1993). The densities in 1991 of both wild cutthroat and rainbow trout were less than 0.1 fish/100 m^2, a substantial decrease from previous high densities of over 1.5 wild rainbow trout and 0.5 wild cutthroat trout per 100 m^2 collected from 1984 to 1986. The decline was attributed to a decrease in spawning success and overall survival associated with severe sedimentation and very low flow.

The IDFG also electrofished 2 miles of Marsh Creek through the Arimo Ranch area. Seventy-three percent of the fish shocked were suckers (letter from Richard Scully, IDFG, to Janet Waters, Portneuf Soil and Water Conservation District, 5 June 1998). Only 13 (3 percent) of the 478 fish captured were trout or whitefish.

An increase in the abundance of carp is indicative of a decrease in water quality. Mohr (1968) found no carp present in his investigation of nine sites on the mainstem Portneuf River. Thirty years later, carp were abundant enough that Maret (1997) reported that the high incidence of carp in a coldwater stream like the Portneuf River to be a strong indication of habitat degradation. Degradation in the Portneuf River includes habitat changes caused by sediment (Portneuf Soil and Water Conservation District 1996).

Water quality degradation can also be seen in macroinvertebrate communities. Sampling of macroinvertebrates by Minshall and Andrews (1973) throughout the Portneuf River and by Ecology Consultants (1977) in the lower Portneuf River indicated that the fauna has been greatly influenced by irrigation activities, runoff from agricultural lands, increased sediment and

turbidity, and stream alteration. A comparison of invertebrate drift in 1979 and 1988 at two sites in the upper Portneuf River showed an overall substantial decline in both numbers of individuals and taxa (Mende 1989). Ecology Consultants (1977) also sampled periphyton in 1977 and found primarily pollutant tolerant algae inhabiting the lower Portneuf River.

Vegetation

Four ecoregions comprise more than 99 percent of the land area in the Upper Snake River subbasin: Snake River Basin/High Desert (50 percent); Middle Rockies (23 percent); Northern Basin and Range (18 percent); and Northern Rockies (9 percent). Current vegetation types are illustrated in Figure 12.

There are two types of natural vegetation in Upper Snake River subbasin: sagebrush-grass vegetation that predominates the entire subbasin and riparian vegetation in the tributaries and Snake River Canyon. The advent of irrigation canals changed some of the sagebrush-grass vegetation to agricultural crops and pastureland, and in some locations has provided a means by which some riparian and grassland plants have established due to incidental leakage.

The Upper Snake River subbasin sagebrush steppe is comprised of sagebrush/wheatgrass and salt bush/greasewood communities. An estimated 54 percent of the subbasin is rangeland. The Snake River Plain occupies approximately 22,500 mi^2. Big sagebrush (*Artemisia tridentata*) and bluebunch wheatgrass (*Agropyron spicatum*) are the dominant shrub and grass species in the subbasin. Most of the sagebrush is found at elevations from 2,000 to 7,000 feet. Where sagebrush dominates below 7,000 feet, annual precipitation characteristically varies between 8 and 20 inches (Wright 1979; Cronquist 1972; West 1983). Currently, large tracts of native rangelands have been converted to non-native crested wheatgrass monocultures in response to fire restoration by the BLM and private landowners. Sagebrush directly influences the soil microclimate by accumulating litter (litter, moss lichen) to a much greater depth when compared to adjacent grass or sparse vegetation; by insulating its plant canopy and affecting the amount of radiant energy that reaches the surface of the soil or understory vegetation; and by having a significant effect on the soil-water potential due both to the shading effects of the canopy and insulating effects of the litter (Wight *et al.* 1991).

Since forested cover types comprise less than 5 percent of the Upper Snake River subbasin, riparian areas and wetlands become critical plant communities because of their vegetative diversity and value to wildlife. These communities vary from emergent herbaceous wetlands, associated with springs and seeps, to forest-scrub areas, containing small trees and understories of shrubs (FERC 1997a). In river and tributary canyons, little vegetation occurs on the basalt cliffs and talus slopes because of the steep walls and the lack of soil and organic material, which limits the establishment of vegetation (Smithman 1983; Brinson *et al.* 1981). Agricultural land use, commercial land development, and more diversified year-round recreational use have drastically changed many riparian buffer zones in the subbasin over the last twenty years by drawing the population closer to the edges of streams and tributaries. Because of this, sediment trapping has been minimized, nutrient retention and removal through filtering has been minimized, wildlife habitat in areas with woody vegetation has been reduced (FERC 1990). With regard to the irrigation canal system, some irrigation return flows have increased the riparian area and vegetation by providing a water source via a sediment delta (Robison 1998).

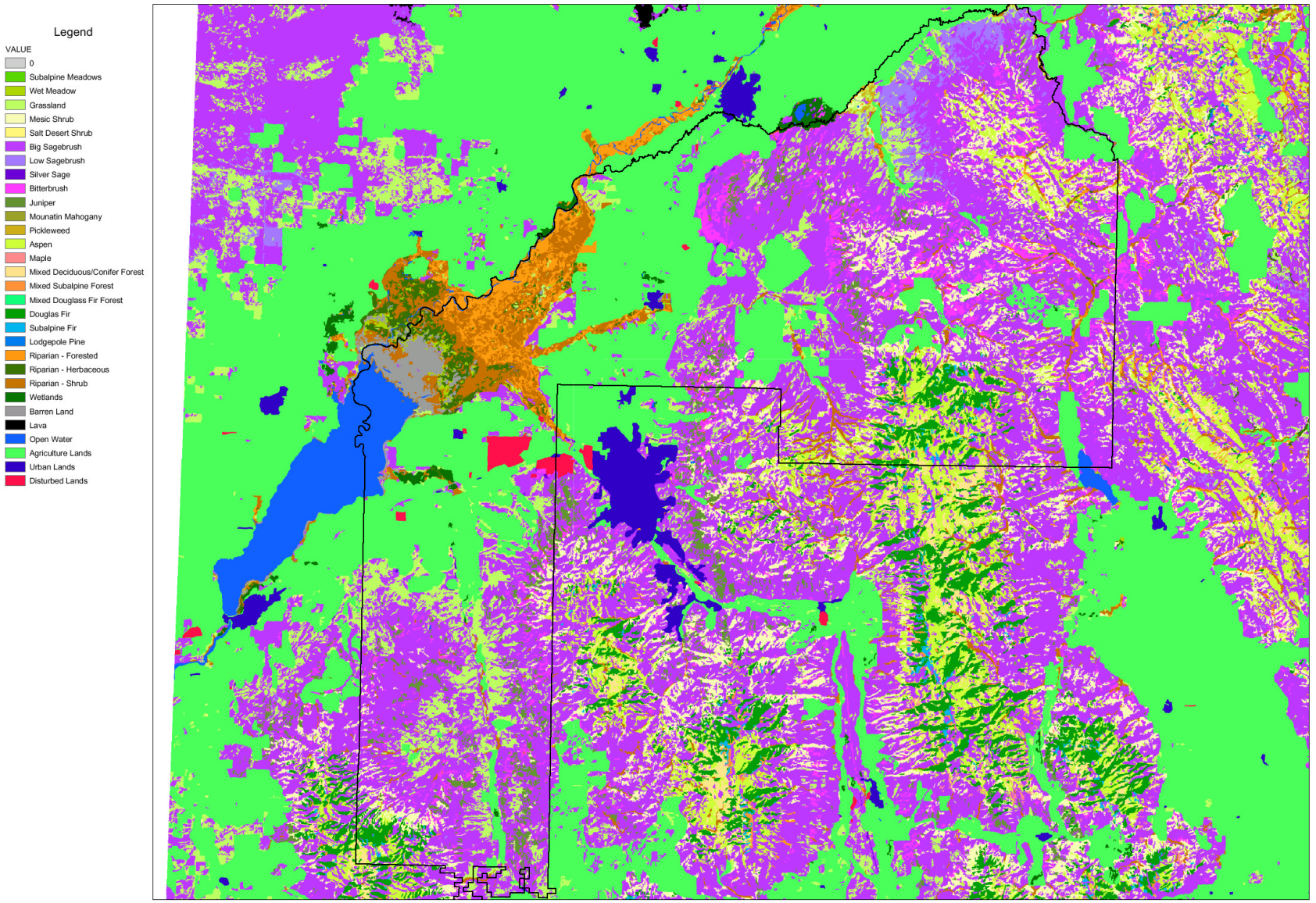


Figure 12. Current vegetation types in the Upper Snake River subbasin, Idaho.

Fish and Wildlife Resources

Fish and Wildlife Status

Fisheries

A variety of native and introduced fishes are found in the Upper Snake River subbasin (Table 14). Only two are native game fish: mountain whitefish and Yellowstone cutthroat trout. All the 14 introduced fish species can be considered game or food fish.

Table 14. Native and introduced fish species in the Upper Snake River subbasin, Idaho.

Common Name	Scientific Name
Native Fish Species	
Mountain whitefish	*Prosopium williamsoni*
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*
Utah chub	*Gila atraria*
Leatherside chub	*Gila copei*
Longnose dace	*Rhinichthys cataractae*
Speckled dace	*Rhinichthys osculus*
Redside shiner	*Richardsonius balteatus*
Utah sucker	*Catostomus ardens*
Bluehead sucker	*Catostomus discobolus*
Mountain sucker	*Catostomus platyrhynchus*
Mottled sculpin	*Cottus bairdi*
Paiute Sculpin	*Cottus beldingi*
Introduced Fish Species	
White sturgeon	*Acipenser transmontanus*
Kokanee salmon	*Oncorhynchus nerka*
Rainbow trout	*Oncorhynchus gairdneri*
Brown trout	*Salmo trutta*
Brook trout	*Salvelinus fontinalis*
Lake trout	*Salvelinus namaycush*
Common carp	*Cyprinus carpio*
Brown bullhead	*Ictalurus nebulosus*
Channel catfish	*Ictalurus punctatus*
Bluegill	*Lepomus macrochirus*
Smallmouth bass	*Micropterus dolomieui*
Largemouth bass	*Micropterous salmoides*
Black crappie	*Pomoxis nigromaculatus*
Yellow perch	*Perca flavescens*

Yellowstone Cutthroat Trout

The native distribution of Yellowstone cutthroat trout in Idaho during the last 8,000-10,000 years includes the Snake River subbasin upstream from Shoshone Falls, and a now extinct population from Waha Lake (Behnke 1992). Although anecdotal information exists for some streams in this area, historical native distribution of Yellowstone cutthroat trout is largely assumed (Behnke 1992). Little quantitative historical information is available documenting number or density of Yellowstone cutthroat trout prior to European white man.

To facilitate summary of available information and to provide geographic focus for conservation efforts, the Yellowstone cutthroat trout range in Idaho was subdivided into 13 Geographic Management Units (GMU) (Lentsch *et al.* 1997) (Figure 13). The GMU boundaries were selected based on historic distribution, present population status, and documented or suspected movement patterns. The Shoshone-Bannock Indian Reservation (SBIR) represents one of the 13 GMUs, however an IDFG analysis excluded all streams and Yellowstone cutthroat trout populations within the boundaries of the SBIR.

The IDFG identified stream segments within the native distribution of Yellowstone cutthroat trout that currently support the subspecies. Color-coding indicated that Yellowstone cutthroat trout were present based on electrofishing surveys regarding Yellowstone cutthroat trout presence. No information was requested from managers regarding the purity or strength of populations for this assessment. The IDFG reported 209 streams or stream segments representing 1,629 miles currently support Yellowstone cutthroat trout. Four to 33 different streams, and 25 to 245 miles of stream, were reported to contain Yellowstone cutthroat trout in each GMU.
The distribution and abundance of Yellowstone cutthroat trout have declined in the Snake River Plain of Idaho through habitat degradation, genetic introgression, and exploitation (Thurow *et al.* 1988; May 1996). Habitat degradation has included negative impacts from grazing (riparian loss, siltation, and widening and deepening of stream channels) and habitat fragmentation from impoundments and diversions. Many remaining populations exist as localized remnants of original sub-populations with little or no connectivity (May 1996). Genetic introgression with non-native cutthroat and other trout is one of the greatest threats to remaining pure populations of Yellowstone cutthroat trout. The impacts of genetic introgression with non-native rainbow trout have yet to be fully investigated and caution should be applied before developing conclusions relative to overall Yellowstone cutthroat trout status. With the exception of populations in Montana, most populations have not received sufficient testing for a definitive assessment of genetic status (May 1996). In addition to hybridization, competition with non-native invaders has had deleterious affects on Yellowstone cutthroat trout populations. Griffith (1988) reported that cutthroat trout are less likely to coexist with brook trout than with other nonnative salmonids even in undisturbed habitats, and Yellowstone cutthroat trout have been extirpated from most areas in Yellowstone National Park where brook trout have been introduced. Exploitation from angling in areas of unrestricted take has been supported by evidence of the susceptibility of cutthroat trout to overfishing. Gresswell (1995) stated that Yellowstone cutthroat trout are extremely vulnerable to angling, and angler harvest has contributed to substantial declines in population abundance throughout the historical range of the

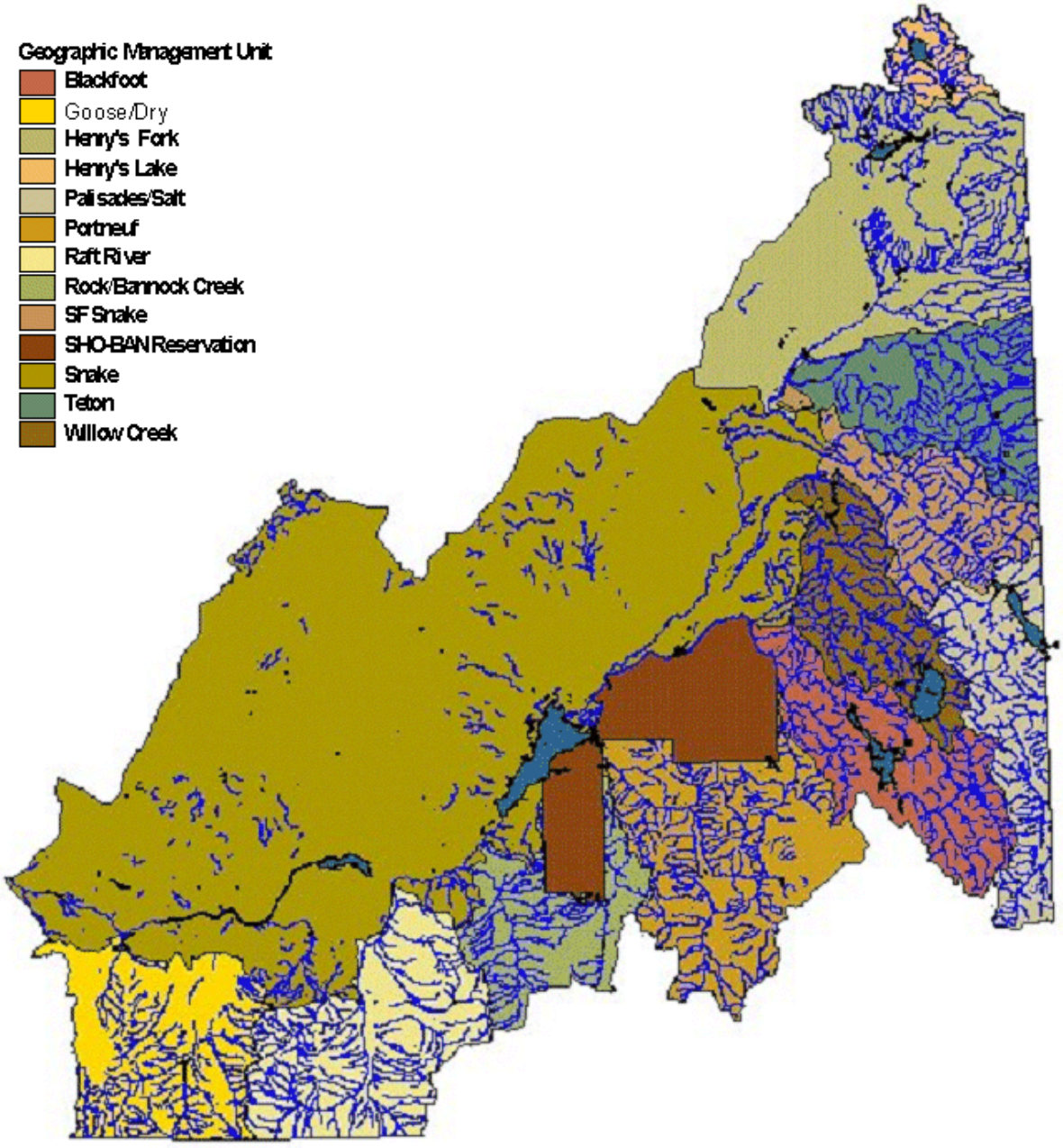


Figure 13. Yellowstone cutthroat trout historical range (1:100,000 scale) within 13 Geographic Management Units.

subspecies (Gresswell 1995). It is clear that many threats to Yellowstone cutthroat trout are difficult to control without strict enforcement and massive changes in land/water usage, and management policies. Pure populations of Yellowstone cutthroat trout have been extirpated from most of their historical habitat. Varley and Gresswell (1988) stated that only about 10 percent of the estimated original stream range of about 15,000 miles remains inhabited by Yellowstone cutthroat trout. The Fort Hall Indian Reservation is located within the historic range of Yellowstone cutthroat trout and suffers the same threats to Yellowstone cutthroat trout populations, specifically, competition with non-natives, hybridization, overfishing, and habitat degradation.

The species most sought after by anglers in the upper Snake River system is the Yellowstone cutthroat trout. Habitat alterations and introduced exotic fish species have greatly decreased the abundance and distribution of this species. Because of these problems, the IDFG lists the Yellowstone cutthroat trout as a species of special concern. In recent years the IDFG has reduced the creel limit for Yellowstone cutthroat trout, has stopped stocking brook and brown trout that are considered to be both competitors with and predators on Yellowstone cutthroat trout, and has sterilized hatchery rainbow trout to prevent hybridization with Yellowstone cutthroat trout. In a few streams, there has been reduction or elimination of livestock grazing in riparian areas as measures to improve habitat and water quality. There has been very little change in irrigation and hydropower operations to help Yellowstone cutthroat trout. Quoting from the IDFG's 2001-2006 Fisheries Management Plan (page 45), "Within Idaho, high quality habitat (for Yellowstone cutthroat trout) is restricted to the Snake River drainage upstream from American Falls Reservoir. Habitat is most affected by water withdrawals. Where possible, the IDFG will recover populations by species management working in cooperation with irrigation canal companies and the BOR to screen diversions and develop more benign management practices for water storage and irrigation."

Leatherside Chub

A native non-game species, the leatherside chub, is also listed by IDFG as a species of special concern. This species has a limited distribution in the upper Snake River subbasin and may have never been abundant. Populations of leatherside chub occur in the Goose Creek and Raft River drainages, near the lower end of the upper Snake River subbasin. Recently, in 2000, Caribou National Forest biologists found leatherside chub in the upper Blackfoot River tributary of Angus Creek.

Above American Falls Reservoir

This river reach runs through a cottonwood riparian forest interspersed with cropland and pasture that were created by removal of the native cottonwood forest community. The communities of Shelly, Firth, and Blackfoot border the river.

The only large tributary in this reach is the Blackfoot River. Most of the potential flow from this tributary is stored in Blackfoot Reservoir. Below the mouth of the Blackfoot River there are several short, spring-fed streams that may be spawning streams. Most of these streams enter the Snake River from the southeast side and are within the Fort Hall Indian Reservation. Upstream from Blackfoot River there are no significant spawning streams.

Lukens (1988) conducted creel and electrofishing surveys in the Snake River between Shelley and American Falls Reservoir in 1986 and 1987. He concluded that the trout fishery was recruitment limited and recommended fingerling stocking to increase the catch rate. Catch rate in

1987 was less than 0.2 trout/hour. In 1991, IDFG began supplementing the river population with approximately 250,000 rainbow and 25,000 brown trout fingerlings annually.

Fort Hall Indian Reservation

Salmonid densities in Spring Creek, Jimmy Drinks Creek, and other Bottoms and montane areas on the Fort Hall Indian Reservation are similar to disturbed and undisturbed streams in other areas of the intermountain region and the Rocky Mountains (Platts and McHenry 1988). Non-native fishes were stocked on the Fort Hall Indian Reservation until 1994 when the permit fishing programs goals shifted to natural production and catch and release angling for trophy trout. Past non-native hatchery outplantings included rainbow trout, brown trout, and brook trout. Figure 14 the shows total number of rainbow trout and brown trout stocked on the Fort Hall Bottoms between 1974 and 1994.

In addition to non-native species (rainbow trout, brown trout, and brook trout), finespot cutthroat trout, a subspecies phenotypically different from Yellowstone cutthroat trout, have been stocked in the Fort Hall Bottoms and at some upland sites periodically over the past 25 years. Finespot cutthroat trout, a native fish to the Snake River, may have historically inhabited both the Fort Hall Bottoms and mountain streams on the Fort Hall Indian Reservation. Data on upland stocking and for years prior to 1974 have been difficult to find, but most streams in mountainous areas of the Fort Hall Indian Reservation have been stocked either illegally or by Tribal personnel. The majority of upland streams contain a mix of rainbow trout, cutthroat trout, and hybrids.

Currently, Spring Creek and other Fort Hall Bottoms streams that connect to American Falls Reservoir contain rainbow trout, Yellowstone cutthroat trout, brown trout, rainbow trout-Yellowstone cutthroat trout hybrids, yellow perch, Utah suckers, mountain whitefish, mottled sculpin, Paiute sculpin, and common carp. Upland streams, including the Blackfoot River and Portneuf River on the Fort Hall Indian Reservation, contain rainbow trout, Yellowston cutthroat trout, brook trout, mottled sculpin, redside shiner, speckled dace, longnose dace, mountain sucker, and Utah chub.

In 1999, a genetic inventory of suspected populations of rainbow trout and Yellowstone cutthroat trout was initiated Reservation wide. The SBT contracted with The University of Montana Wild Trout and Salmon Genetics Laboratory to identify Yellowstone cutthroat trout and rainbow trout. The technique used to determine genetic purity was paired interspersed nuclear DNA element PCR (PINE). PINE analysis uses segments of non-coding DNA (introns) found within genes. The sequence of DNA introns is not constrained by selection and accumulates mutations at a higher rate than surrounding exons (coding DNA). The rate of change observed in most introns is of appropriate magnitude to be different between species but uniform within a species. Individual loci were scored facilitating the identification of F1 hybrids, backcrosses and hybrids beyond F1's (P. Spruell, personal communication, 1999).

Tribal fisheries collected non-lethal tissue samples from twelve streams during summer/fall of 1999. Fish were collected using a Coffelt® backpack electrofisher. Tissue samples were collected from rainbow trout, cutthroat trout, and hybrids regardless of apparent genetic purity.

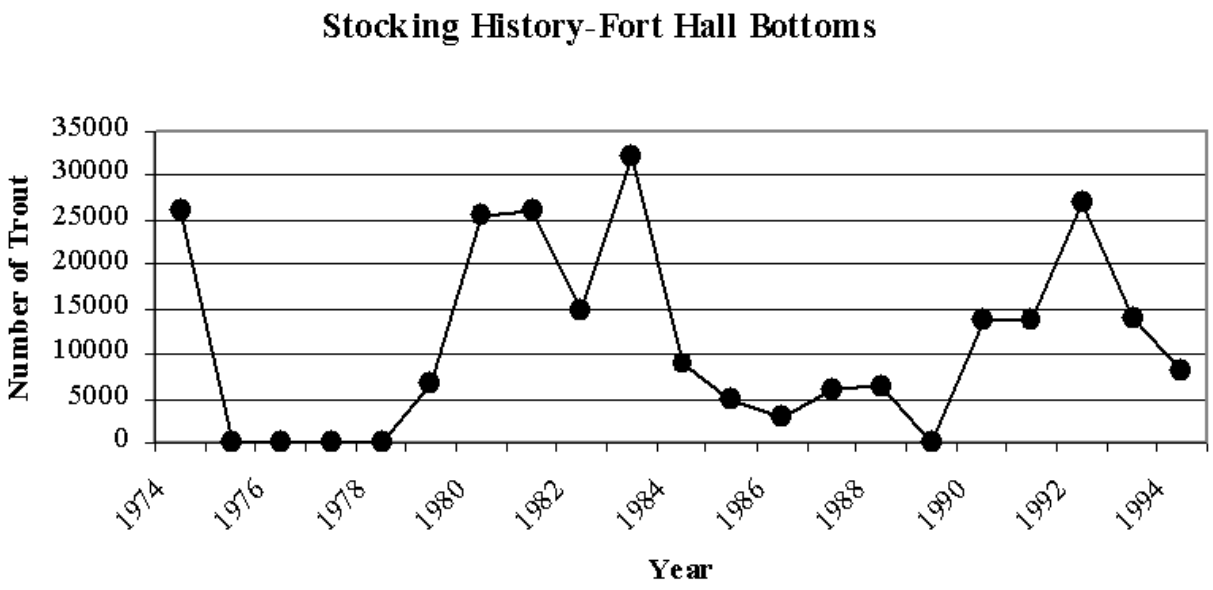


Figure 14. Stocking history of the Fort Hall Bottoms, 1974 - 1994. Figure does not include limited stocking of finespot cutthroat trout.

Twenty-five non-lethal fin clips were collected from individual fish, placed in 95 percent ethanol, labeled, and shipped to the University of Montana for laboratory analysis. Samples were collected as high in drainages as salmonids could be found. Thirteen streams were found to contain salmonids. Table 15 shows dates of collection, location, sample size, water temperature, and elevation.

Table 15. Fisheries genetic inventory sampling summary, Fort Hall Indian Reservation, August - September 1999.

Stream	% Hybrid	Species	Sample Size	Temp. (°C)	Date	Elev. (ft)
30-Day	NA	BRK	0	10	8/24/99	7400
Birch	Not Complete	HYB	9	9	9/27/99	5200
Cold Creek	NA	NO FISH	0	12	9/22/99	5390
Garden Creek	NA	NO FISH	0	11	9/22/99	4800
Lower Moonshine	NA	SUC, DAC, RSS	0	22	8/18/99	4800
Lower/Mid Jeff Cabin	NA	SUC, DAC, RSS	0	17	8/19/99	5660
Portneuf/Chesterfield	NA	RBT, SUC, DAC	0	20	8/19/99	5400
Squaw Creek	NA	NO FISH	0	>20	8/18/99	5076
Upper Portneuf	NA	DAC	0	>16	8/16/99	5685
Wood Creek	NA	NO FISH	0	16	8/10/99	5600
Mill	0.0	CUT	25	8.5	8/9/99	7300
Ross Fork	0.0	CUT	25	10	8/11/99	5700

Stream	% Hybrid	Species	Sample Size	Temp. (°C)	Date	Elev. (ft)
WF Bannock	12.0	HYB	25	12	8/17/99	5100
South Fork Ross	25.0	HYB, BRK, SUC	25	10	9/21/99	5500
Moonshine	28.6	HYB	25	14	9/1/99	4700
Little Toponce	37.5	HYB	25	13	8/16/99	6800
Big Jimmy	50.0	HYB, SUC	25	19	8/26/99	4300
Midnight	50.0	HYB	25	16	8/4/99	5000
Spring	55.0	HYB, SUC, RBT	25	16	8/3/99	4380
North Toponce	73.3	HYB	25	8	8/12/99	7700
Rattlesnake	95.5	HYB, SUC	25	19	8/18/99	4300
Clear	100.0	HYB	25	12	8/31/99	4300

The length of stream sampled varied from a minimum of three pool/riffle sequences to the entire length of the stream. Ross Fork was longitudinally re-sampled in 2000 to determine extent of pure Yellowstone cutthroat trout. Data for Birch Creek and the 2000 Ross Fork sample are currently being analyzed by the University of Montana. Presence and absence were determined using genetic inventory data and data from past fish surveys (Taki and Arthaud 1993; Arthaud and Taki 1994; Arthaud *et al.* 1995, Arthaud *et al.* 1996; Moser and Colter 1997, Moser 1998; Moser 1999). Two sites showed no evidence of genetic introgression, Mill Creek and Ross Fork Creek (Figure 15). Mill Creek was sampled approximately one mile from its origin. Past electrofishing surveys approximately one mile downstream of the Mill Creek sampling site yielded rainbow trout, brook trout, cutthroat trout, and hybrids. Presence of pure Yellowstone cutthroat trout may indicate some environmental barrier to non-natives or a physical barrier to fish movement downstream of the sampling site, or a combination of both. Fish densities at the Mill Creek site were very low compared to other sites based on a catch per unit effort of 37 fish per hour.

The presence of pure native Yellowstone cutthroat trout in Ross Fork was surprising because of two factors; the Ross Fork site is highly accessible to humans and is certain to have been stocked in the past by the Tribes or privately. Second, the site is accessible to colonization from downstream sources. The apparent purity of the population is most likely due to some suite of habitat characteristics (i.e. water temperature, gradient, etc.) amenable to survival and reproduction of native Yellowstone cutthroat trout.

American Falls Reservoir

American Falls Reservoir is the largest reservoir in the state with over 48,000 surface acres. It is second largest in the state by volume at nearly 1.7 MAF. The American Falls Reservoir fishery is managed for hatchery stocked rainbow trout. In 2000, IDFG conducted a creel survey on American Falls Reservoir from March to November. Anglers fished 125,436 hours, caught 21,085 fish and had an average catch rate of 0.17 fish/h. Anglers caught 13,869 rainbow trout, 5,936 smallmouth bass, 462 brown trout, 690 cutthroat trout, 72 rainbow x cutthroat hybrids, and 57 kokanee.

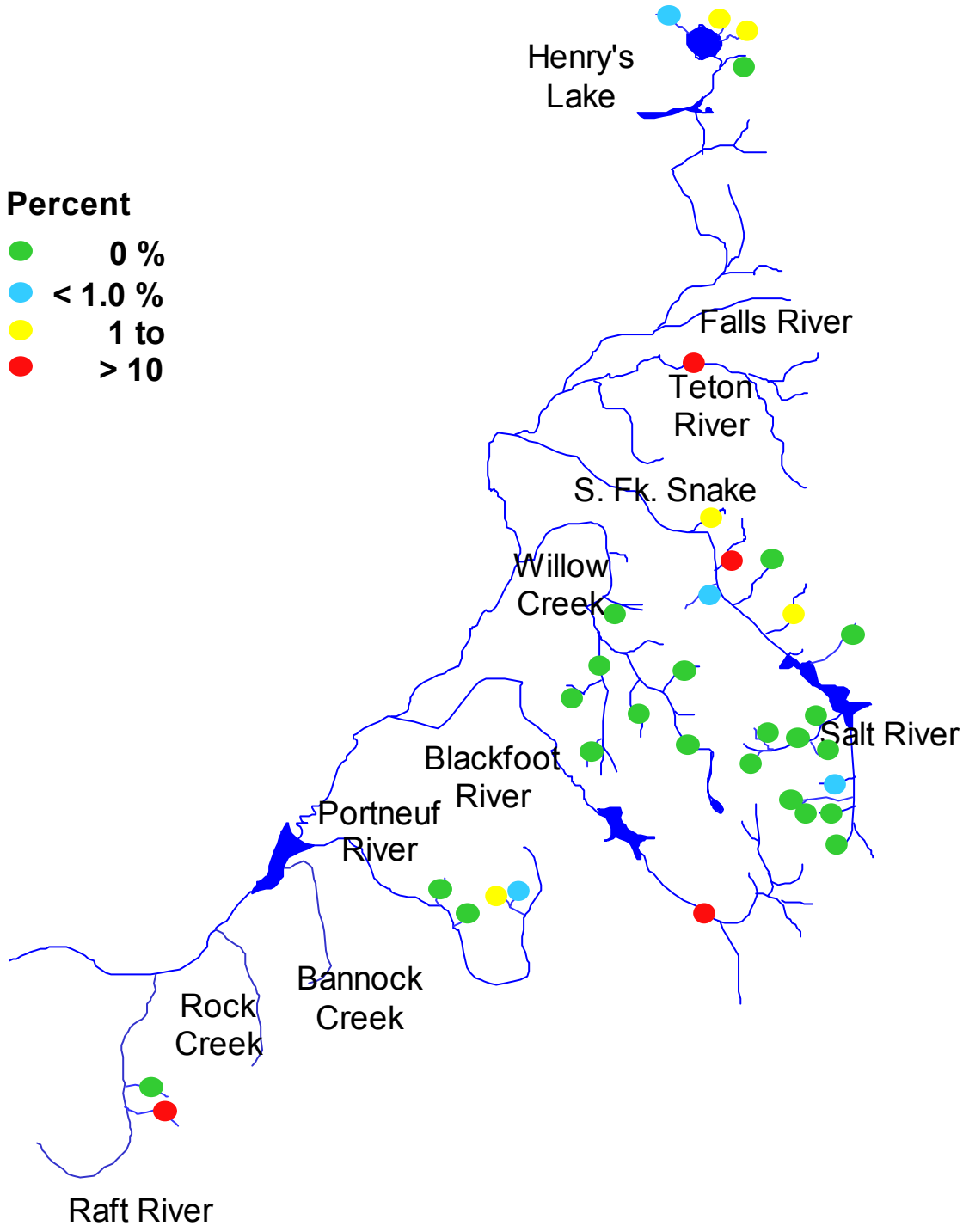


Figure 15. Rainbow trout introgression in 35 Idaho Yellowstone cutthroat trout streams based on 1998–99 genetics sampling.

There is natural reproduction of salmonids in the spring-fed creeks on the Fort Hall Reservation as well as in a few other streams tributary to the Snake River and American Falls Reservoir. However, this production appears to be inadequate to seed American Falls Reservoir. Most of the reservoir catch appears to have come from stocked trout. Trout grow rapidly in American Falls Reservoir growing from near 9 inches when stocked in spring to near 13 to 15 inches by the end of the growing season. At the end of two growing seasons, rainbow trout are between 17 and 19 inches. Rainbow trout commonly grow to 21 inches in American Falls Reservoir with rare individuals exceeding 23 inches.

Below American Falls Reservoir

The Snake River from American Falls Dam to the mouth of Raft River has long been considered a quality trout fishery and has recently obtained a quality smallmouth bass population. From Eagle Rock to the mouth of Raft River, the river is actually the backwaters of Lake Walcott behind Minidoka Dam. This is a quality trout and bass fishery especially when fish are washed into the river from American Falls Dam and upriver water quality is poor and/or water quantity is low. A portion of the river between Raft River and Cold Creek is within the Minidoka Wildlife preserve and boaters are not allowed to enter this area.

In addition to trout, this river reach contains a smallmouth bass and sturgeon fishery that were newly developed during the 1990s. Bass fishing is most common in the lower portion of this reach and sturgeon fishing is best in the first deep pool downriver from American Falls Dam.

Raft River

Several tributaries within the Raft River watershed have been surveyed and found to support native cutthroat trout and other native and nonnative fish species. A list of fish species found during surveys in various Raft River tributaries is given in Table 16.

Table 16. Fish species sampled by the IDFG in the Raft River watershed.

Stream Name	Year of Survey	Species Sampled
Eightmile Creek	1996 and 1999	Cutthroat trout
Sixmile Creek	1996 and 1999	Cutthroat x rainbow trout hybrids
Lake Fork Creek	1998	Rainbow trout
		Mottled sculpin
Sublett Creek	1998	Rainbow trout
		Mottled sculpin
		Brown trout
Cottonwood Creek (trib of Cassia Creek)	2000	Cutthroat trout
		Cutthroat x rainbow trout hybrids
		Brook trout
		Mottled sculpin
Cassia Creek	2000	Cutthroat trout
		Brook trout
		Mottled sculpin
Stinson Creek (trib of Cassia Creek)	2000	Cutthroat trout
		Brook trout
Cottonwood Creek (trib of Raft River)	1999	Mottled sculpin
		Redside shiner
		Speckled dace
		Mountain sucker
Almo Creek	1999	Cutthroat trout

Marsh Creek

Marsh Creek originates in the Albion Mountains south of Burley and flows into the Snake River at RM 659, the Milner Reservoir impoundment. Fish sampling was conducted in 1996 within the upper Marsh Creek watershed. Although Marsh Creek is within the historic range of Yellowstone cutthroat trout, none were sampled (Table 17).

Table 17. Fish species sampled by IDFG in the Marsh Creek watershed.

Stream Name	Year of Survey	Species Sampled
Marsh Creek	1996	Brook trout
		Rainbow trout (hatchery origin)
		Mottled sculpin
		Redside shiner
		Longnose dace
Howell Creek	1996	Brook trout
Land Creek	1996	Brook trout
		Rainbow trout (hatchery origin)
		Mottled sculpin

Goose Creek

Goose Creek and several tributaries within the Goose Creek watershed have been surveyed and found to support native cutthroat trout and other native and nonnative fish species. A list of fish species found during surveys in the Goose Creek watershed is given in Table 18.

Table 18. Fish species sampled by IDFG in the Goose Creek watershed.

Stream Name	Year of Survey	Species Sampled
Goose Creek	1999	Cutthroat trout
		Brook trout
		Mottled sculpin
		Redside shiner
		Speckled dace
		Longnose dace
		Leatherside chub
Big Cottonwood Creek	1999	Cutthroat trout
		Mottled sculpin
Birch Creek	1999	Brook trout
Little Cottonwood Creek	1999	Rainbow trout
Thoroughbred Creek	1999	Cutthroat trout
		Mottled sculpin
		Speckled dace

Dry Creek

The upper reaches of Dry Creek are perennial flowing until it reaches the agricultural area of the Magic Valley where it is diverted for irrigation by the time it reaches Murtaugh Lake. The original stream channel of Dry Creek downstream of Murtaugh Lake does have a small amount of flow that reaches the Snake River at RM 631. Dry Creek has been sampled by IDFG and found to have a wild population of cutthroat x rainbow trout hybrids.

Vinyard Creek

Vinyard Creek is also known as the Devil's Washbowl Spring and is located 0.5 miles upstream of the Twin Falls on the Snake River. The source of the stream is a large spring that feeds a small lake that overflows via a waterfall to form Vinyard Creek. The creek flows for approximately 1,870 feet through a canyon before it discharges to the Twin Falls Reservoir at RM 618. The creek drains a watershed that is irrigated from groundwater sources and the Middle Snake River. Discharge from the spring ranges from 9.9 cfs to 27.5 cfs, depending on the source of information.

Fish surveys were completed in Vinyard Creek in 1991 and 1992 (Partridge and Warren 1994; Warren and Partridge 1994). Species sampled downstream of the waterfall included cutthroat trout, cutthroat x rainbow trout hybrids, rainbow trout, common carp, longnose dace, largescale sucker, mottled sculpin, smallmouth bass and redside shiner. The stream has historically supported a fluvial population of cutthroat trout that migrated downstream into the Snake River then returned to spawn. That fluvial population of cutthroat trout may now be extirpated.

Middle Snake River

The fish fauna in the the Middle Snake River consists primarily of native coldwater species in the families *Salmonidae* (trout), *Acipenseridae* (sturgeon), Cottidae (sculpins), *Cyprinidae* (minnows), and *Catostomidae* (suckers) (USGS 1997a). Table 19 describes the fish species occuring in the Middle Snake River below Shoshone Falls (S_b) above Shoshone Falls (S_a) as native or introduced species.

Indigenous fishes are represented by 26 species in five families. Thirteen additional species have been introduced, primarily to enhance sport-fishing opportunities (Maret *et al.* 1995). Following the construction of large hydroelectric facilities on the mainstem of the Middle Snake River, salmon, steelhead, and Pacific lamprey were extirpated from the region between King Hill and Shoshone Falls (USGS 1997a).

Until the twentieth century, three anadromous species frequented the Middle Snake River and its tributaries as far upstream as Shoshone Falls. These include chinook salmon, steelhead trout, and the lamprey (Myers 1996; FERC 1990; Everman 1896).

Table 19. Fish species in the Snake River (Bahidur 1999).

Family Taxonomy		**Species Taxonomy**		**S_b**	**S_a**
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**		
		Native Origin			
Sturgeon	*Acipenseridae*	White sturgeon	*Acipenser transmontanus*	X	X[1]
Trout	*Salmonidae*	Mountain whitefish	*Prosopium williamsoni*	X	X
		Chinook salmon	*Oncorhynchus tshawytscha*	X	
		Cutthroat trout Yellowstone	*Oncorhynchus clarki bouvieri*	X	X
		Cutthroat trout Finespotted	*Oncorhynchus clarki ssp.*		X
		Rainbow trout	*Oncorhynchus mykiss*	X	X[1]
		Redband trout	*Oncorhynchus mykiss gairdneri*	X	
		Bull trout	*Salvelinus confluentus*	X	
Minnow	*Cyprinidae*	Chiselmouth	*Acrochellus alutaceus*	X	
		Utah chub	*Gila atraria*	X	X
		Leatherside chub	*Gila copei*	X	X
		Peamouth	*Mylocheilus caurinus*	X	
		Northern Pikeminnow	*Ptychocheilus oregonensis*	X	
		Longnose dace	*Rhinichthys cataractae*	X	X

Family Taxonomy		Species Taxonomy		S_b	S_a
Common Name	Scientific Name	Common Name	Scientific Name		
		Speckled dace	*Rhinichthys osculus*	X	X
		Redside shiner	*Richardsonius balteatus*	X	X
		Utah sucker	*Catostomus ardens*		X
		Bridgelip sucker	*Catostomus columbianus*	X	
Sucker	*Catostomidae*	Largescale sucker	*Catostomus macrocheilus*	X	
		Mountain sucker	*Catostomus platyrhynchus*	X	X
		Mottled sculpin	*Cottus bairdi*	X	X
Sculpin	*Cottidae*	Shorthead sculpin	*Cottus confusus*	X	
		Shoshone sculpin	*Cottus greenei*	X	
		Wood River sculpin	*Cottus leiopomus*	X	
		Introduced Origin			
		Coho salmon	*Oncorhynchus kisutch*	X	X
		Golden trout	*Oncorhynchus aguabonita*	X	X
		Brown trout	*Salmo trutta*	X	X
		Brook trout	*Salvelinus fontinalis*	X	X
Trout	*Salmonidae*	Lake trout	*Salvelinus namaycush*	X	X
		Arctic grayling	*Thymallus arcticus*	X	X
Pike	*Eocidae*	Tiger muskie	*Esox lucius x E. masquinongy*	X	
		Goldfish	*Carassius auratus*	X	
		Carp	*Cyprinus carpio*	X	X
		Grass carp	*Ctenopharyngodon idella*	X	X
Minnow	*Cyprinidae*	Tui chub	*Gila bicolor*	X	
		Spottail shiner	*Notropis hudsonius*	X	X
		Fathead minnow	*Pimephales promelas*	X	X
		Black bullhead	*Ameiurus melas*	X	
		Brown bullhead	*Ameiurus nebulosus*	X	X
		Blue catfish	*Ictalurus furcatus*	X	X

Family Taxonomy		Species Taxonomy		S_b	S_a
Common Name	Scientific Name	Common Name	Scientific Name		
Catfish	*Ictaluridae*	Channel catfish	*Ictalurus punctatus*	X	X
		Tadpole madtom	*Noturus gyrinus*	X	
		Flathead catfish	*Pylodictis olivaris*	X	
Livebearer	*Poeciliidae*	Mosquitofish	*Gambusia affinis*		X
Sunfish	*Centrarchidae*	Pumpkinseed	*Lepomis gibbosus*	X	X
		Warmouth	*Lepomis gulosus*	X	
		Bluegill	*Lepomis macrochirus*	X	X
		Smallmouth bass	*Micropterus dolomieu*	X	X
		Largemouth bass	*Micropterus salmoides*	X	X
		Black crappie	*Pomoxis nigromaculatus*	X	X
		White crappie	*Pomoxis annularis*	X	
Perch	*Percidae*	Yellow perch	*Perca flavescens*	X	X
		Walleye	*Stizostedion vitreum*	X	X
Loach	*Cobitidae*	Oriental weatherfish	*Misgurnus anguillicaudatus*	X	
Shad	*Clupeidae*	American shad	*Alosa sapidissima*	X	

Prepared by IDEQ-TFRO. Adapted from IDFG 1996. Sb = Below Shoshone Falls. Sa = Above Shoshone Falls. X^1 = Introduced native fish. In addition to the introduced species, there are three species of the Cichlid family (*Cichlidae)* that are specifically confined to geothermal waters, including Mozambique (Java) tilapia (*Tilapia mossambica*), Redbelly (Zills) tilapia (*Talapia zilli*), and Convict cichlid (*Cichlasoma nigrofasciatum*).

All three runs of chinook salmon (spring, summer, and fall) were at one time found in the Middle Snake River system. Spring and summer runs were the most prevalent with little historical information regarding use of the system by fall chinook salmon, although some references cite this run as occuring in the Middle Snake River.

Native non-anadromous species include cutthroat trout, mountain whitefish, northern pikeminnow, suckers, shiner, dace, and peamouth. There are closely related anadromous species of both white sturgeon and bull trout. Not a great deal is known about historic existence or movements of these species prior to damming of the Snake and Columbia Rivers. Additionally, some ichthyologists and geneticists believe the native redband trout found downstream of Shoshone Falls are a residualized form of anadromous steelhead (IDFG 1998b). White sturgeon do not migrate above Shoshone Falls, thus inhabiting the Snake River from Shoshone Falls downstream to the confluence of the Columbia River (FERC 1997b).

Mountain whitefish, as a native fish species of the Middle Snake River, are probably the most widely distributed native fish species of the *Salmonidae* family found in Idaho. They have persisted, without population augmentation or special management, in the Middle Snake River drainage. Little is known about the local population other than they are widely distributed with the Middle Snake River reach, and they are commonly sampled near flowing riverine habitats (IDFG 1998b).

Primary fish species include native sport fish such as rainbow trout, cutthroat trout, bull trout, steelhead (rainbow trout), chinook salmon, kokanee salmon, whitefish, and white sturgeon. Introduced game fish, such as brown trout, lake trout, brook trout, landlocked coho and chinook salmon, bass, sunfish, perch, crappie, catfish, walleye, northern pike, and tiger muskie, provide sport fisheries where habitat conditions are unsuitable for native species and also provide a diversity of angling opportunity. It should be noted that the most preferred species of fish sought by anglers in Idaho, based on a 1994 study, were 67 percent for coldwater (mostly rainbow trout or any trout) and 33 percent for warmwater (mostly any bass). Most waters suitable for establishment of a warmwater fishery have received introductions. Regulations were developed to improve the quality of bass and provide some trophy opportunity. Additonal species were introduced to existing warmwater fisheries to diversify opportunity and provide forage. Areas with warmwater or mixed water fisheries are fairly numerous in the Middle Snake River and are described in Table 20.

Table 20. Idaho Department of Fish and Game water types by river segment (Bihudar 1999).

Middle Snake River Segment	IDFG Management Goals
Bliss Reservoir	Warm Water
Bliss Pool to Lower Salmon Falls Dam	
Lower Salmon Falls Reservoir	
Upper Salmon Falls Reservoir	
Upper Salmon Falls Pool to Shoshone Falls	Mixed Water
Shoshone Falls Reservoir	
Shoshone Falls Reservoir to Twin Falls Dam	
Twin Falls Reservoir	
Twin Falls Reservoir to Murtaugh Bridge	Cold Water
Murtaugh Bridge to Milner Dam	

Prepared by IDEQ. These water types are IDFG's fisheries management for the segments on the Middle Snake River. Warm water fisheries are supported by warm water or cool water game fish including bass, crappie, sunfish, catfish, northern pike, tiger muskie, walleye, and yellow perch. Mixed water fisheries are supported by a combination of cold water and warm water fish species. Coldwater fisheries are supported by resident populations of salmonid game fish, including trout, char, non-anadromous salmon (kokanee, coho, chinook), and whitefish. Anadromous fisheries are supported by anadromous salmonids (steelhead trout, chinook salmon, and sockeye salmon).

Blackfoot River Subbasin

The Blackfoot River is a major Snake River tributary. The upper river is managed as a wild Yellowstone cutthroat trout fishery. Additional sport fish include brook trout and rainbow trout. The IDFG is trying to rebuild the cutthroat population with catch-and-release rules and decrease brook and rainbow populations with liberal harvest rules. The IDFG is also actively removing pre-spawn rainbow trout and hybrids above Blackfoot Reservoir. Rainbow trout are stocked annually into Blackfoot Reservoir, but since 2000 only sterilized rainbow have been stocked. Sterilization is effective on about 95 percent of the stocked trout. In 1994, the IDFG purchased a 1,720-acre ranch that includes the upper 6.36 miles of the Blackfoot River and began managing it as a Wildlife Management Area (WMA).

The IDFG implemented riparian restoration projects and outplanted fry produced from wild Blackfoot River cutthroat trout using incubation boxes on tributaries on and near the WMA in 1996 and 1997. In 1997 88,600 eggs were taken from 26 cutthroat trout. From these, 75, 500 fry were hatched.

In 1991 and 1992, IDFG trapped 575 and 521 upstream migrating cutthroat trout spawners at above Blackfoot Reservoir. An additional 96 rainbow trout spawners were documented at the trap in 1991. This was near the end of a six-year (1987-1992) drought and was at the beginning of rules to protect wild cutthroat trout in Blackfoot Reservoir and in the upper Blackfoot River. In 1995, the trap captured 1,663 cutthroat spawners (and likely missed at least 200 more during a high water event that topped the trap. In 2001 the trap caught 4,782 spawners of which 4,745 (99.2 percent) were cutthroat and 37 (0.8 percent) were rainbow trout or rainbow-cutthroat hybrids. These 37 fish were removed from the river and stocked in Dike Lake reservoir. In 1978, 1979 and 1980, Thurow (1980) counted between 2000 and 3,000 spawners annually at the Blackfoot River trap.

In 1998, the IDFG, in cooperation with local landowners and Monsanto Corporation, redirected 0.7 miles of the upper Blackfoot River that had been channelized in the 1950s back into its original meandering 1.9-mile section. This increased the length of the river and sent the flow through much-improved riparian and substrate habitat and removed one of the most vulnerable sections of river for piscivorous bird predation on upstream migrating cutthroat trout spawners.

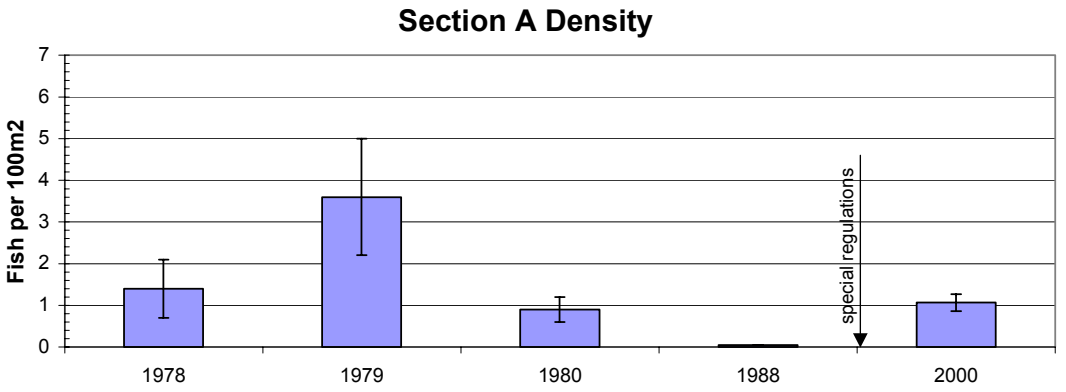
In 1999, the University of Idaho examined samples from 26 Blackfoot River cutthroat trout spawners and compared them genetically to Hayspur Hatchery rainbow trout. Powell reported no rainbow trout haplotypes among the Blackfoot River cutthroat trout samples. In 1999, Powell genetically examined fin clips from 45 *Oncorhynchus spp.* collected in the upper Blackfoot River to determine the rate of rainbow trout introgression. These fish were of various size classes but most were less than age 1+ parr. Nuclear DNA introgression rate was 18 percent. Mitochondrial DNA introgression rate was 27 percent. This information lead to the effort in 2001 to remove rainbow trout and hybrids. In addition to the spawners caught and sorted in 2001, IDFG electrofished the upper Blackfoot River from the confluence of Lanes and Diamond Creeks down to trap, a distance of 32 miles. During the electrofishing surveys, IDFG collected 844 trout of which 128 (15.2 percent) were rainbow trout or hybrids. Fish other than cutthroat trout were removed from the river. The remaining 84.8 percent of the electrofishing samples were cutthroat trout. The IDFG sampled cutthroat on the WMA in 1995 within an upper 2-mile section and a lower 2.5-mile section. A total of 243 cutthroat trout and 2 brook trout were captured in the upper section and 100 cutthroat and 2 brook trout were captured in the lower section. Trout densities (of age 1+ and older fish) were 1.07/100 m^2 and 0.28/100 m^2, respectively.

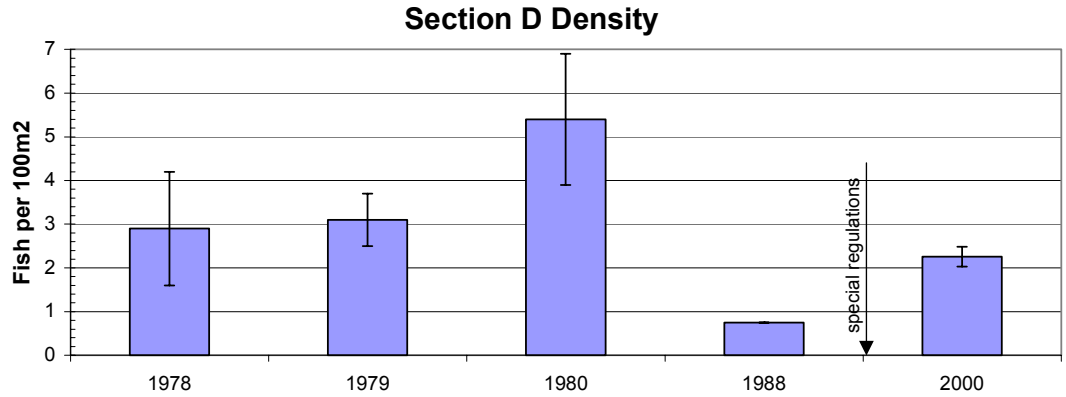
Yellowstone Cutthroat Trout

Yellowstone cutthroat trout population trend data are available for three sites on the Blackfoot River above Blackfoot Reservoir (Figure 16). The sites were sampled intermittently from 1978 to 2000. Adfluvial Yellowstone cutthroat trout in the Upper Blackfoot River above Blackfoot Reservoir declined markedly during the period from 1980 to 1988. This decline was believed to be the result of angler exploitation (LaBolle and Schill 1988). Since angling regulations were changed in 1990, Yellowstone cutthroat trout densities on the river have increased dramatically compared to 1988 levels, but point estimates remain below those done prior to 1980. Although none of the year 2000 point estimates equal or exceed the historical maximum, confidence bars for the 2000 data overlap with at least one estimate from the pre-decline period of 1978-1980 at two of three sites. Additional IDFG information collected at a trapping facility near the mouth of the Blackfoot River supports the recovery observations. In 1991 and 1992, IDFG counted 575 and 521 Yellowstone cutthroat trout spawners, respectively, at a trapping facility during the spring upstream spawning migration. By 1995, this number had increased to 1663 spawners at the trap. In addition, there were four days during 1995 when the trap was overtopped and fish could not becounted. Immediately before and after this event, the trap was catching at least 50 spawners per day so it is likely that the 1995 run was near 2,000 fish (Scully and Mende 2000).

Other Species

Mottled sculpin and speckled dace were the most common non-game fish species captured in the Blackfoot River subbasin by Meyer and Lamansky (2001, in progress), followed by mountain sucker, redside shiner, utah chub, Utah sucker, and Piute sculpin.





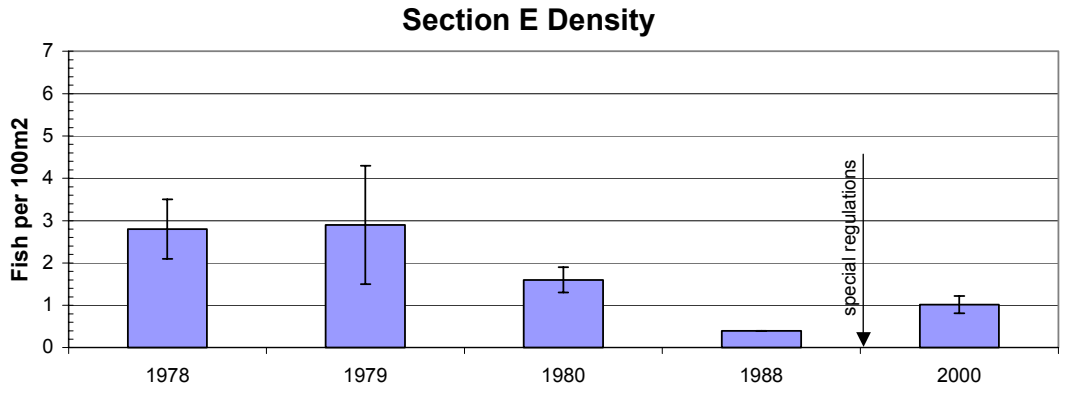


Figure 16. Estimated densities of Age 1+ Yellowstone cutthroat trout in three 1.8 to 4.7-km electrofishing sites on the Blackfoot River, 1978-2000.

Portneuf River Subbasin

Chesterfield Reservoir is 1,600 surface acres and contains 40,000 acre-feet of water at full pool. Chesterfield Reservoir has been an excellent fishery for put-and-grow rainbow trout when there is adequate precipitation for irrigation and excess water to conserve the fish population. In 1994, anglers fished an estimated 157,854 hours and had excellent fishing for 2 to 4-pound trout. Anglers caught 116,331 trout in 1994, harvested 61 percent of their catch and had an average catch rate of 0.7 trout/hour. This highly productive condition deteriorates as Utah chubs that are native to the drainage rebuild in the reservoir a few years after the reservoir is drained and refilled or renovated with rotenone. The upper Portneuf River fishery consists of wild cutthroat trout and is annually stocked with catchable size rainbow trout.

Information on the presence of salmonid species is plentiful. The SBT surveyed fish populations on ceded lands on the Caribou National Forest in 1987 (Crist and Holden 1988). Twenty-one of the sampled streams contained trout; twenty streams were either dry or contained no fish. Heimer *et al.* (1987) documented trout in Pebble, Big Springs, King, and Toponce creeks but found no trout in Twentyfourmile Creek.

Yellowstone Cutthroat Trout

Yellowstone cutthroat trout have been found at 43 (60 percent) of the 72 sites surveyed in the Portneuf River watershed. Non-native salmonids, such as brook trout, rainbow trout, and brown trout, were captured at 9 (13 percent), 9 (13 percent), and 5 (7 percent) of the sites sampled, respectively.

Other Species

Mottled sculpin were common in the Portneuf River watershed (Meyer and Lamansky 2001, in progress). The only other non-game fish captured was mountain sucker and Piute sculpin.

Wildlife

Upper Snake River Subbasin

Federally Listed Endangered and Threatened Species

Gray Wolf (*Canis lupus*)

The gray wolf was designated as an experimental, nonessential population on November 22, 1994. Under section 10(j) of the Endangered Species Act (ESA), a population of a listed species re-established outside its current range but within its probable historic range may be designated as "experimental" at the discretion of the Secretary of the Interior. Reintroduction of the experimental population must further the conservation of the listed species. An experimental population must be separate geographically from nonexperimental populations of the same species. Designation of a population as experimental nonessential increases USFWS management flexibility. For purposes of section 7, except section 7(a)(1), which requires Federal agencies to use their authorities to conserve listed species, nonessential experimental populations located outside National Wildlife Refuge or National Park lands are treated as if they are proposed for listing. This means that Federal agencies are under an obligation to confer, as opposed to consult (required for a listed species), on any actions authorized, funded, or carried

out by them that are likely to jeopardize the continued existence of the species. Nonessential experimental populations located on National Wildlife Refuge or National Park lands are treated as threatened, and formal consultation may be required. Activities undertaken on private or tribal lands are not affected by section 7 of the ESA unless they are authorized, funded, or carried out by a Federal agency. Individual animals used in establishing an experimental population can be removed from a source population if their removal is not likely to jeopardize the continued existence of the species and a permit has been issued in accordance with 50 CFR part 17.22.

This species was once the most abundant large predator in North America. Nearly all of Idaho is thought to have supported gray wolves. Wolves were introduced to Central Idaho and Yellowstone National Park in 1995 and 1996. Human prosecution is the major threat to wolves.

Canada lynx (*Lynx canadensis*)

The Canada lynx was listed as threatened in the contiguous United States on March 24, 2000. Lynx were considered at one time to have been resident species of 16 states in the contiguous United States. As of August 1999, Canada lynx occurred primarily in forest habitats, including the Rocky Mountains from Montana, Idaho and Oregon south to Utah and Colorado. The main threat to lynx may be loss of habitat through a variety of human activities such as logging, road construction, recreational activities, fire suppression and urban development. In the 1980s high fur prices and trapping for fur pelts caused steep declines in lynx numbers. Winter recreation such as snowmobiling or skiing that packs snow may impact the lynx because trails provide bobcats, cougars and coyotes access to traditional deep snow habitats that were once the lynx's domain. On packed snow, bobcats and coyotes could out-compete the lynx for food and space.

The Canada lynx Northern Rocky Mountains Geographic Area encompasses the Upper Snake Province. In this area, Canada lynx occur primarily in Douglas-fir forest, spruce-fir forest, and fir-hemlock forest. Downed logs and windfalls provide cover for denning sites, escape, and protection from severe weather. Earlier successional forest stages provide habitat for the lynx's primary prey, the snowshoe hare. The size of lynx home ranges varies and has been documented between 3 to 300 mi^2. Lynx are capable of moving extremely long distances in search of food or to establish new home ranges. Lynx populations rise and fall following the cyclic highs and lows of snowshoe hare populations. When hare populations are low, the change in the lynx's diet causes the productivity of adult female lynx and survival of young to nearly cease.

The Canada lynx occurs predominantly on Federal lands, especially in the West. The USFWS concluded that the threat to the lynx in the contiguous United States is the lack of guidance to conserve the species in current Federal land management plans. The agency is working with other Federal agencies to conserve lynx habitat. The USFS, BLM, and the National Park Service have signed Lynx Conservation Agreements. The USFS is also undertaking several analyses to amend their forest plans to incorporate direction designed to conserve the lynx. These actions will provide immediate benefits for lynx.

Risk factors specific to the Northern Rockies include timber management, including fire suppression; conversion or alteration of native vegetation; grazing use levels that increase competition for forage resources with lynx prey; changing native plant communities that degrade prey species habitat; and road and trail access and recreational use that compact snow allowing ingress of coyotes into lynx winter habitat, inreasing competition for prey. Risk factors relating to direct mortality include trapping and hunting; predator control activities; and highways. Finally, risk factors affecting movement/dispersal include fragmentation of habitat and corridor areas by development, and highways and other corridors (Ruediger *et al.* 2000).

Conservation Measures are identified for Canada lynx on Federal lands at four scales: rangewide, geographic area, planning area, and home range (Ruediger *et al.* 2000). These measures include addressing risk factors affecting lynx productivity, mortality, movement and dispersal, and other large scale factors as fragmentation and degradation of refugia, lynx movement and dispersal across shrub-steppe habitats, and non-native invasive plant species. Inventory and monitoring of lynx distribution, lynx habitat conditions, and effectiveness and validation of conservation measures are some of the research needs identified.

Grizzly bear (*Ursus arctos*)

In 1975, the USFWS listed the grizzly bear as a threatened species. The Henry's Fork subbasin and Snake River headwaters are on the edge of the Yellowstone grizzly bear population. Periodically, grizzly bears are observed in the Teton River Valley. In Idaho, grizzly bear range averages 200 to 300 mi^2. Grizzlies prefer open meadows and avalanche chutes in the spring and timberlands with berry bushes in late summer and fall. Hibernation occurs from November through April. They begin searching for their den in early fall, digging in north-facing slopes unlikely to be distrubed and where the snow will be deep enough to conceal the den and tracks leading to it.

It is estimated that there were perhaps 200 or fewer grizzly bears in the Yellowstone area at its low point, around the time the species was listed as threatened in 1975. Today, there are an estimated minimum of 400-600 grizzlies in the Yellowstone area. The number of adult breeding females has jumped from less than 30 in 1983 (the first year this sub-population was estimated) to over 100 today. With the growing grizzly population and its expanding need to establish home ranges, the bears have begun reoccupying areas in their historic range where they had been wiped out for more than 40 years

Habitat loss due to loss of major foods, private land development, certain types of resource development that disturb grizzlies, and human-caused mortality are the major threats to the grizzly bear in the Yellowstone area. Hunters who mistake them for black bears, which are legal game, accidentally kill some grizzly bears. But the biggest threat to the grizzly is human-caused mortality. Grizzlies become habituated to humans because "attractants," which include garbage, pet foods, livestock carcasses, and improper camping practices. This can eventually lead to conflicts between people and bears -- not only in populated areas of the grizzly's range but also in back country recreation sites. The management of grizzly bears and their habitat affects human lives both socially and economically. The recovery of grizzly bears in the Yellowstone area has relied heavily on social acceptance of grizzlies and agency efforts to manage bears. As the Yellowstone area is composed of a diverse land ownership pattern and jurisdictions with dissimilar responsibilities for habitat and species management, it is necessary after recovery to continue a coordinated, interagency grizzly bear management and monitoring program that crosses jurisdictional and geographic boundaries.

Outside the Primary Conservation Area, there is rapidly accelerating growth of human populations in some areas in grizzly bear habitat in western Montana, southeast Idaho, and northwest Wyoming. This growth results not only in increased visitor use but also increased residential development on important wildlife habitat adjacent to publish lands. This increased human use, primarily residential development, results in the loss of wildlife habitat and permanent increases in human bear conflict resulting in higher bear mortality rates. Habitat destruction in valleys bottoms and riparian areas is particularly harmful to grizzlies because they use these "corridors" to travel from one area to another when they are searching for food. Some

private landowners and companies are trying to help grizzlies by voluntarily protecting grizzly corridors.

Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle was reclassified from endangered to threatened in the lower 48 States on July 12, 1995 and proposed for delisting on July 6, 1999, with a final decision not yet published. The first statewide nesting survey in Idaho, conducted in 1979, found only 11 nesting pairs. By 1998, population numbers rebounded to about 93 nesting pairs, with 96 young reaching fledging age. About 700 to 900 eagles winter along the Clearwater, Kootenai and Snake River systems and on the large Idaho panhandle lakes.

Eagle numbers plummeted with the introduction of the pesticide DDT. Eagles prey contained DDT residues, which weakened eggshells and caused reproductive failures, nesting failures and direct bird mortality. Lead poisoning, often a result of feeding on waterfowl containing lead shot also threatened the eagle. Habitat loss continues to be a threat to the recovery of the eagle. Nesting areas (both existing and potential), as well as wintering habitat and food sources, must continue to be protected for complete recovery to occur.

Whooping Crane (*Grus americana*)

(Experimental, nonessential July 21, 1997) An Idaho population of whooping crane was reestablished through introduction in Gray's Lake National Wildlife Refuge. The cross-fostering experiment at Gray's Lake NWR was discontinued. Sandhill cranes successfully raised whoopers and taught them the migration route, but the whoopers wrongly imprinted and never mated. Only a few whoopers remain in this population.

Snails

The Snake River from C.J. Strike Reservoir (RM 518) to American Falls Dam (RM 714) provides habitat for the 5 Snake River snails listed as threatened or endangered. On January 13, 1993, four Snake River aquatic snails were listed as endangered: Idaho springsnail or Homedale Creek springsnail (*Pyrgulopsis (Fontelicella) idahoensis*), the Utah valvata snail (*Valvata utahensis*), Snake River Physa snail (*Physa natricina*), and the undescribed Banbury Springs lanx or limpet in the genus *Lanx*. The USFWS also determined threatened status for one aquatic snail species, the Bliss Rapids snail (*Taylorconcha serpenticola*). With the exception of *Lanx*, four of the taxa have declined over all but a small fraction of their historical range.

The Snake River ecosystem has undergone significant transformation from a primarily free-flowing, cold-water system to a slower-moving and warmer system. The habitat requirements for all five species generally include cold, clean, well-oxygenated flowing water of low turbidity. These species are vulnerable to continued adverse habitat modification and deteriorating water quality from one or more of the following: hydroelectric development, load-following (the practice of artificially raising and lowering river levels to meet short-term electrical needs by local run-of-the-river hydroelectric projects) effects of hydroelectric project operations, water withdrawal and diversions, water pollution, inadequate regulatory mechanisms and the possible adverse affects of exotic species, such as the New Zealand mud snail.

The Snake River Aquatic Species Recovery Plan (USFWS 1995) identifies specific recovery areas and short-term recovery goals that will provide downlisting/delisting criteria for each of the five listed species. Actions needed to initiate recovery include:

- Ensure water quality standards for cold-water biota and habitat conditions so that viable, self-reproducing snail colonies are established in free-flowing mainstem and cold-water spring habitats within specified geographic ranges, or recovery areas, for each of the 5 species.
- Develop and implement habitat management plans that include conservation measures to protect cold-water spring habitats occupied by Banbury Springs, *Lanx*, Bliss Rapids snail, and Utah valvata snail from further habitat degradation.
- Stabilize the Snake River Plain aquifer to protect discharge at levels necessary to conserve the listed species cold-water spring habitats.
- Evaluate the effects of non-native flora and fauna on listed species in the Snake River from C.J. Strike Dam to American Falls Dam.

Snake River Physa Snail (*Physa natricina*)

The species occurs on the undersides of gravel-to-boulder size substrate in swift currents in the mainstem Snake River. Living specimens have been found on boulders in the deepest accessible part of the river at the margins of rapids. Taylor (1982b) believed much of the habitat for this species was in deep water beyond the range of routine sampling. The modern historic range in the Snake River extends from Grandview upstream through the Hagerman Reach (RM 573) (Taylor 1982b). At present, two populations (or colonies) are believed to remain in the Hagerman and King Hill reaches, with possibly a third colony immediately downstream of Minidoka Dam.

Utah valvata snail (*Valvata utahensis*)

This snail generally requires cold, clean and well-oxygenated flowing water. They occur in areas with clean mud bottoms and submerged aquatic vegetation. Although they may live near cold-water springs or free flowing mainstem river areas, the snails avoids areas with swift current or pure gravel-boulders.

Free flowing, coldwater environments required by this species have been altered by reservoir development, river diversions, and habitat modification. Water quality has deteriorated in the Snake River due to altered natural flow and pollution. Water quality and habitat conditions in the mainstem Snake River must be improved to begin to recover the snail. Additional studies are needed to address the temperature, substrate and flow requirements.

Recently, the Utah valvata snail was located in the upper Snake River and in the Big Wood River. It appears to be very abundant in the Snake River near the Payne boat ramp (D. Gustafson, personal communication, 2001), occurring with *V. humeralis* and *Fluminicola*. At the boat ramp, the river is lake-like and has little of its normal insects left. Further downstream at the Twin Bridges site at Blackfoot, *Valvata* and *Fluminicola* drop out and *Physella* and *Stagnicola* are abundant (D. Gustafson, personal communication, 2001).

Sage Grouse

Only 2 known sage grouse leks are located south of the Snake River in the Rock Creek drainage. The majority of sage grouse and their habitat are found north of the Snake River on what is known as the Big Desert. This area provides the best long-term data set on sage grouse in the region. Lek routes and production data from wings go back to the 1960s. Sage grouse trends are typical of western trends. Numbers have declined and trends are downward.

Sharp-tailed Grouse

Few if any sharp-tailed grouse are known to reside north and west of the Snake River mostly due to a lack of wintering habitat. South of the Snake River in the Rock and Bannock Creek drainages healthy populations are found but are highly dependent on the Conservation Reserve Program (CRP). Intensive lek searches were conducted in 1995 in these drainages with 64 leks being located.

Mule Deer

Mule deer are distributed throughout the subbasin and are commonly found in brushy canyons and ridge areas. In general, deer populations are stable to increasing throughout much of southeastern Idaho, primarily due to improved fawn survival and limited antlerless harvest. However, habitat quality and quantity on winter ranges has been impacted by livestock grazing, invasion of noxious weed species or juniper, loss of riparian vegetation, and wildfires.

Mule deer management in southeastern Idaho is guided by the White-tailed Deer, Mule Deer and Elk Management Plan (IDFG 1999). Due to habitat changes, recovery of mule deer populations from the losses suffered during the winter of 1992-93 has been slow. Control of fire on private and public lands has allowed competition by juniper to shade out brush species in transitional range between open country and forests.

Wintering ranges are not a limiting factor for mule deer throughout the northern Big Desert and river bottom portions of the Upper Snake River subbasin. Northern and eastern subbasin portions have harsher winter conditions. Migrations are primarily elevational. Some significant south central summer populations of mule deer migrate south from summer ranges to winter ranges beyond the Snake River drainage.

Antlered deer harvest estimates are increasing, with 4-point bucks in the buck harvest ranging up to 60 percent, and hunter numbers generally increasing (Table 21). Harvest management has been conservative in the last 5 years, as IDFG attempted to increase mule deer numbers with severely restricted antlerless harvest.

Table 21. Antlered mule deer harvest estimates, 4-point (or greater) bucks in the antlered harvest, and number of hunters in mule deer analysis unit 15 (approximating the Upper Snake River subbasin), 1996-2000.

Year	Antlered Harvest	% 4 points	# Hunters
1996	99	60	863
1997	198	37	1732
1998	251	48	1460
1999	363	23	2566
2000	306	31	ND

ND = No data available

Rocky Mountain Elk

Rocky Mountain elk are distributed widely throughout the subbasin, but limited primarily to areas of fewer human disturbance. Primary habitats include desert sagebrush, lava flats, sagebrush steppe, and timbered draws and ridges. Elk are noticeably absent to infrequent in river bottom habitats.

Wintering habitats for elk are not of primary concern throughout most of the subbasin. Fall and winter habitat use by elk in the northern portion of the subbasin brings them in conflict with the Idaho National Engineering and Environmental Laboratory, and local crop and livestock producers. Disturbance from human activity is a major limiting factor for elk production in this subbasin.

Rocky Mountain elk are expanding their range from the forests to the shrub-steppe, wheat fields, CRP lands, and other open habitat areas of the Upper Snake River subbasin. These areas provide adequate habitat on public land, however private lands provide additional habitat during winter and spring. Elk have readily adapted to these new habitats and are steadily increasing in number (Table 22). Flight data to determine winter elk populations are not available for this subbasin.

Management of elk in southeastern Idaho is guided by the White-tailed Deer, Mule Deer and Elk Management Plan (IDFG 1999). The plan was developed through a cooperative effort involving the public, IDFG personnel, and private entities. The plan identifies population objectives and habitat relationships for each elk management zone. Elk in the Bannock Zone of southeast Idaho are managed under this framework along with considerations for depredation issues. Because of its proximity to private land, Management Unit 56 within the Bannock Zone, is managed to sustain the current population of 200+ elk with a limited number of depredation complaints. Generally, the unit has the potential to sustain a larger elk population but with the majority of the area being under private ownership, the current population level is the maximum number the area can sustain without conflicts with agricultural operations.

Table 22. Antlered elk harvest estimates, % of 6-point (or greater) bulls in the antlered harvest, and number of hunters in the Big Desert elk analysis unit (approximating the Upper Snake River subbasin), 1996-2000.

Year	Antlered Harvest	% 6 points	# Hunters
1996	74	61	411
1997	78	48	714
1998	128	59	1619
1999	212	25	4211
2000	112	32	1678

Mountain Lion

Mountain lions are distributed throughout much of the Upper Snake River subbasin. Mountain lion habitat includes the sagebrush desert, sagebrush steppe, and timbered draws and ridges. Mountain lions are increasingly living on public lands near human population centers, especially Pocatello Idaho.

No surveys for mountain lion populations occur in the subbasin, although harvest figures are kept. Mountain lion harvest has been aggressive over the last 4 years, particularly in areas to the south of the subbasin as human population precludes tolerance for many lions.

Bald Eagle

Bald eagles are an important wildlife component of the subbasin. Portions of American Falls Reservoir and the Snake River above the Reservoir harbor large numbers of bald eagles in the winter. Bald eagle nests occur frequently along the Snake River itself, most normally upstream

of American Falls Reservoir. Winter bald eagle counts often result in sightings of between 35 and 50 eagles each mid-winter period along the Snake River and American Falls Reservoir (IDFG records).

Waterfowl

Eighteen species of ducks, four species of geese, two species of swans and sandhill cranes occur in the planning area during migration and nesting season (IDFG 1990) (Table 23). Duck and goose nesting and loafing is primarily on rivers, streams, canals, reservoirs, and small ponds. Historically, ducks and geese have utilized these waterways for nesting and resting, and foraged

Table 23. List of common waterfowl species found in the Upper Snake River subbasin.

Common Name	Scientific Name	Common Name	Scientific Name
Mallard	Anas platyrhynchos	Redhead	Aythya americana
Northern pintail	Anas acuta	Canvasback	Aythya valisineria
Gadwall	Anas strepera	Ring-necked duck	Aythya collaris
American widgeon	Anas americana	Lesser scaup	Aythya affinis
Northern shoveler	Anas clypeata	Common goldeneye	Bucephala clangula
Blue-winged teal	Anas discors	Barrow's goldeneye	Bucephala islandica
Cinnamon teal	Anas cyanoptera	Ruddy duck	Oxyura jamaicensis
Green-winged teal	Anas crecca	Common merganser	Mergus merganser
Wood duck	Aix sponsa	Hooded merganser	Lophodytes cucullatus
American coot	Fulicia americana	White-fronted goose	Anser albifrons
Lesser snow goose	Chen caerulescens	Ross' goose	Chen rossii
Canada goose	Branta canadensis	Trumpeter swan	Cygnus buccinator
Tundra swan	Cygnus columbianus	Greater sandhill crane	Grus Canadensis tabida

in adjacent grain fields. As agricultural practices have evolved and wetlands and forage crops have been eliminated, the numbers of ducks frequenting the planning area has decreased. In contrast, Canada geese have made substantial gains in population levels. With the advent of artificial nest platforms and development of security sanctuaries for Canada geese along the Snake River, goose populations have risen to all time highs.

The Snake River below American Falls Dam supports one of the largest wintering concentrations of Barrows Goldeneye in the West. Winter counts of this species by members of the Audubon Society are only exceeded by those for the Puget Sound, Washington, and the Sacramento Delta (M. Collar, Portneuf Valley Audubon Society, personal communication, 2000). American Falls Reservoir and the Fort Hall Bottoms harbor wintering and migrating trumpeter and tundra swans and snow geese. Riverine, palustrine, emergent, and open water wetland habitat types are important for waterfowl in this subbasin. Harvest strategies for waterfowl are fairly aggressive, usually taking the maximum number of days and bag limits allowable by Federal guidelines.

Ducks are not banded in the Upper Snake River subbasin. Counts of Canada goose pairs and single geese indicate relatively stable numbers from Shelley Idaho through American Falls Reservoir (Table 24).

Table 24. Number of Canada goose indicated pairs, and total number of geese seen during aerial surveys of the Snake River and American Falls Reservoir, from Shelley Idaho to American Falls, 1996-2000.

Year	# Indicated Pairs	Total Geese
1996	32	67
1997	79	47
1998	40	74
1999	47	73
2000	95	202

Tundra and trumpeter swans migrate through the Raft River Valley and the Mini-Cassia Area semi-annually on their way to nesting and wintering grounds. Areas around the Minidoka National Wildlife Refuge provide substantial resting areas for both species and in some rare incidents provide nesting habitat for tundra swans.

Agricultural croplands and pasture areas in the Raft River Valley and along Marsh Creek and Goose Creek provide foraging and nesting habitat for sandhill cranes. Most sandhilll cranes leave the area by late September to migrate to their wintering areas in the Southwestern United States.

Turkey

Wild turkeys have been released into the subbasin and have developed a population stronghold along the Snake River basin. They seldom come in competition with human land uses, and draw an increasing interest in hunting them. They are, however habitat limited. Primary habitat includes margins of crop fields, and cottonwood stands along the large river corridor.

California Bighorn Sheep (Ovis canadensis californiana)

Bighorn sheep were extirpated from the Upper Snake River subbasin by the late 1800s. Historical information suggests the major causes for the demise of this species was a combination of contact with domestic sheep and unregulated hunting. Reintroduction of bighorn sheep began in 1986 with the release of 15 sheep at the Big Cottonwood WMA. Subsequent releases in 1987, 1988, and 1993 resulted in a total of 50 sheep being released. The bighorn population in Big Cottonwood Creek has decreased during the past 10 years to fewer than 20 sheep. Disease is suspected, but is unverified as a cause of the population decline. There are no future plans to augment the existing population because of the proximity of domestic sheep grazing allotments. Reintroduction of bighorn sheep in the Jim Sage Mountains began in 2000 with the release of 30 sheep in the Parks Creek watershed, with one subsequent release of 15 sheep in 2001. Although 16 of the 45 released sheep have died, primarily from mountain lion predation immediately following the first release, reproduction has been good and the population is estimated at 49 head. If the mountain lion predation rate increases, management options will be considered to relieve predation pressure to a level that will allow the sheep population to increase and become established. Population levels remain low enough that no hunting opportunity currently exists. While most of the Big Cottonwood watershed and the Jim Sage Mountains are in public ownership, options for management of bighorn sheep within these areas are limited due to the juxtaposition of private lands to the current sheep populations. Private

lands with domestic sheep operations are in close proximity to both populations and will limit management options in the future.

Shira's Moose (Alces alces shirasi)

Historical records indicate no moose were found in the Upper Snake River subbasin prior to 1850. By 1893, moose were plentiful enough in Idaho that the first hunting season was established. However, moose populations were unable to withstand this hunting opportunity, and the season was closed in 1898. Hunting was not reestablished in Idaho until 1946, when a permit system was implemented to limit hunter harvest. Moose are now distributed throughout most of the Upper Snake River subbasin, including the Sublett Mountains. Distribution, abundance and population dynamics of moose in the Sublett Mountains are limited.

Pronghorn Antelope (*Antilocapra americana*)

Antelope populations are limited and scattered throughout the west end of the Upper Snake River subbasin near the town of Malta, Idaho. The most suitable antelope habitat lays west of Interstate 84 in Management Unit 57, which supports 75-100 head of antelope, nearly all of which live on private land. The remaining habitat east of Interstate 84 in Management Unit 56 is suitable for antelope but is currently unoccupied.

Blackfoot River Subbasin

Sage Grouse

Little is known about the sage grouse in the Blackfoot River subbasin. No established lek routes are conducted and wing data is minimal. Helicopter surveys have been conducted during the past 2 years to identify lek sites (Figure 17).

The BLM and the Idaho Department of Lands (IDL) manage much of the public land in this subbasin. Several wildfires and controlled burns over the past 3 decades have removed critical sage grouse habitat. The IDL conducted spray projects to remove sagebrush to increase forage production for livestock over thousands of acres in the 1970s and 80s.

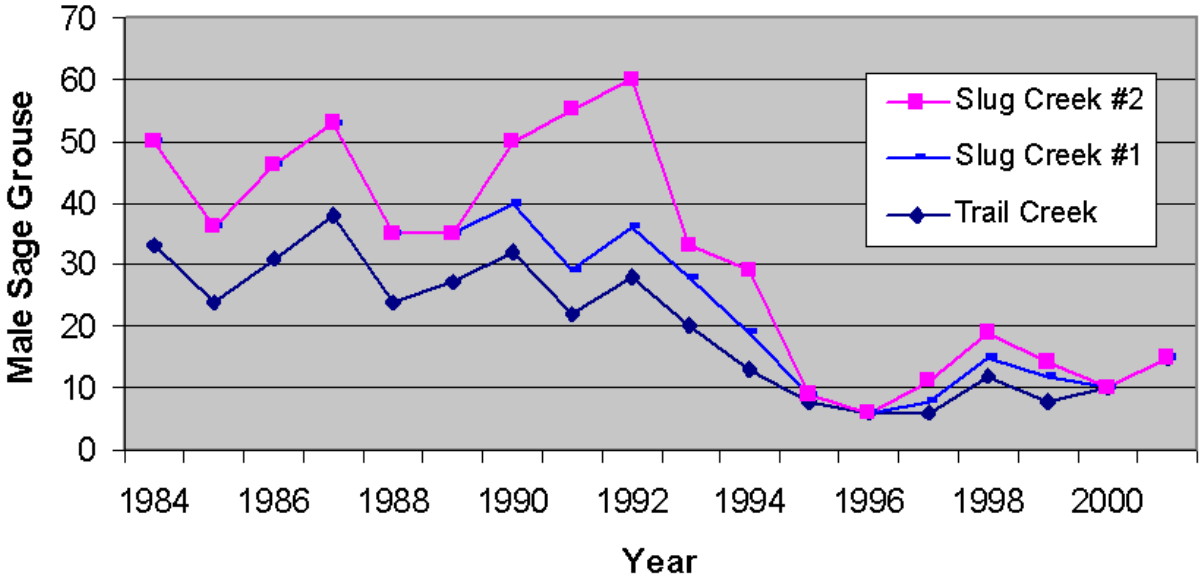


Figure 17. Blackfoot River sage grouse lek routes 1984 – 2001.

Sharp-tailed Grouse

Sharp-tailed grouse are common in the Blackfoot River subbasin and are located primarily in native habitats. There are very little CRP lands within this subbasin. There are no trend routes or wing barrels located in the subbasin, nor have intensive lek searches been conducted.

Mule Deer

Mule deer are distributed throughout the entire Blackfoot River subbasin. They occur in the brushy river bottoms, upland sagebrush steppe types and timbered draws and ridges. Most deer spending summer and fall in the upper subbassin winter out of the subbasin. Deer using summer range in the downriver portions of the subbassin remain in the subbasin. Wolverine Canyon winters a significant number of them.

Flight data to determine winter mule deer populations are available for this subbasin, and deer populations are increasing slowly. This subbasin splits mule deer harvest analysis units for Idaho, and harvests are increasing. Harvest management has been conservative in the last 5 years, attempting to increase mule deer numbers with severely restricted antlerless harvest.

Rocky Mountain Elk

Rocky Mountain elk are distributed throughout the Blackfoot River subbasin. Primary habitats include desert sagebrush steppe, and timbered draws and ridges. Wintering habitats for elk are of primary concern throughout most of the subbasin. Most elk within the subbasin migrate elevationally, and spend most winters in very largegroups either in the Tex Creek WMA, Valley Bottoms near Soda Springs, or Wyoming.

Flight data to determine winter elk populations are available only for a portion of the subbasin. Antlered elk harvest estimates are very high in the upstream reaches of the subbasin.

Harvest management varies drastically throughout the subbasin, which is divided by 3 elk management zones in Idaho.

Mountain Lion

Mountain lions are distributed throughout much of the subbasin. Their habitats include sagebrush steppe, timbered draws and ridges, and rock outcroppings. No surveys for mountain lion populations occur in the subbasin, although harvest figures are kept. Mountain lion harvest has been aggressive over the last 4 years in areas to the south of the subbasin, and human population precludes tolerance for many lions in the subbasin.

Waterfowl

Many species of waterfowl use the Blackfoot River subbasin, which is part of the Pacific Flyway, both for nesting/rearing and over wintering. Species common in the subbasin in the winter include mallard, blue-winged teal, green-winged teal, merganser, cormorant, widgeon, scaup, and Canada goose. Riverine, palustrine, emergent, and open water wetland habitat types are important for waterfowl in this subbasin. Harvest strategies for waterfowl are fairly aggressive, usually taking the maximum number of days and bag limits allowable by federal guidelines.

The IDFG and the USFWS annually band approximately 400-500 individual ducks each summer at Gray's Lake National Wildlife Refuge. Indicated pairs of geese and single geese show a recent steady number during surveys of the Blackfoot Reservoir (Table 25).

Table 25. Number of Canada goose indicated pairs, and total number of geese seen during aerial surveys of the Blackfoot Reservoir, 1996-2000.

Year	# Indicated Pairs	Total Geese
1996	117	241
1997	164	483
1998	148	382
1999	151	365
2000	179	462

Grays Lake National Wildlife Refuge was established for use as an inviolate sanctuary, or for any other management purpose, for migratory birds (16 U.S.C. 715d (Migratory Bird Conservation Act). It was also identified as suitable for (1) incidental fish and wildlife-oriented recreational development; (2) the protection of natural resources; (3) the conservation of endangered species or threatened species.

Grays Lake is located 27 miles north of Soda Springs, in a high mountain valley at an elevation of 6,400 feet. The refuge currently controls 18,500 acres. Additions are proposed to protect more important wildlife habitat, which will eventually increase the refuge to 32,800 acres. While Grays Lake is a natural lake, its water level is regulated according to agreements that balance the needs of wildlife with various off-refuge interests. The "lake" is actually a large shallow marsh. It has little open water and is covered with dense vegetation, primarily bulrush and cattail. Wet meadows and grasslands surround the marsh. Habitat management focuses on measures to benefit cranes and waterfowl.

Portneuf River Subbasin

Sage grouse

Due to intensive agriculture and urban development in conjunction with livestock grazing, the Portneuf River subbasin provides little sage grouse habitat. A small population of birds can be found on the flats east of Bancroft. No established lek routes are conducted. Wing barrels are placed at various locations but very few wings are collected in the fall.

Sharp-tailed grouse

Healthy populations of sharp-tailed grouse exist within the Portneuf River subbasin but are heavily dependent on CRP lands. One lek route to establish population trend has been established and conducted since 1996. Few if any wings are collected from this area. Most native habitats in this subbasin have been converted to agriculture or urban development, and livestock grazing heavily impacts those remaining. Intense lek searches were conducted in 1996, with 33 leks being located.

Mule Deer

Mule deer are distributed throughout the Portneuf River subbasin. They occur primarily in the upland shrub-steppe cover types and timbered draws and ridges. Wintering ranges are a limiting factor for mule deer throughout the subbasin, although excellent winter ranges owned by the USFS, BLM, and IDFG exist. Human disturbance and occupation of winter ranges continues in the subbassin at a high rate. Migratory corridors to winter ranges are affected only slightly by human habitation, and migrations are primarily elevational.

Competition with elk on winter range areas may be keeping mule deer numbers from increasing. Competition with domestic livestock for food and wintering areas are probably moderate in this subbasin, restricted mostly to the southern portions of the subbasin.

Flight data to determine winter mule deer populations are available for portions of this subbasin. Antlered deer harvest estimates are increasing, with 4-point bucks in the buck harvest ranging up to 46 percent, and hunter numbers generally stable (Table 26). Harvest management has been conservative in the last 5 years, attempting to increase mule deer numbers with severely restricted antlerless harvest.

Table 26. Antlered mule deer harvest estimates, % of 4-point (or greater) bucks in the antlered harvest, and number of hunters in mule deer analysis area 21 (a large portion of the Portneuf River subbasin), 1996-2000.

Year	Antlered Harvest	% 4 points	# Hunters
1996	496	46	2085
1997	480	25	2535
1998	459	25	2185
1999	527	27	2239
2000	711	23	ND

ND – No data available

Rocky Mountain Elk

Rocky Mountain elk are distributed widely throughout the subbasin, and are colonizing westward from higher numbers on the east side. Primary habitats include desert sagebrush, sagebrush steppe, and timbered draws and ridges. Wintering habitats for elk are of moderate concern throughout most of the subbasin. Disturbance from human activity is a major limiting factor for elk production in this subbasin.

Flight data to determine winter elk populations are available only for a portion of the subbasin. In 2001, big game unit 74 was flown and an estimated 479 elk were found wintering primarily in the upper reaches of the Portneuf River subbasin. Antlered elk harvest estimates are relatively low but increasing, with 6-point bulls in the bull harvest ranging up to 55 percent, and hunter numbers increasing drastically within the last 5 years (Table 27). Harvest management has been unstable in the last 5 years, including changes in tag types available, and aggressiveness in harvesting antlerless elk.

Table 27. Antlered elk harvest estimates, % of 6-point (or greater) in the antlered harvest, and number of hunters in the Bannock elk analysis unit (approximating the Portneuf River subbasin), 1996-2000.

Year	Antlered Harvest	% 6 points	# Hunters
1996	65	39	619
1997	83	37	1079
1998	155	55	1847
1999	136	47	2149
2000	155	29	2508

Mountain Lion

Mountain lions are distributed throughout much of the Portneuf River subbasin. Their habitats include sagebrush steppe, and timbered draws and ridges. The subbasin is split between mountain lion harvest zones. No surveys for mountain lion populations occur in the subbasin, although harvest figures are kept. Mountain lion harvest has been aggressive over the last 5 years, with peak lion harvest occurring in 1998.

Waterfowl

Many species of waterfowl use the Portneuf River subbasin, which is part of the Pacific Flyway, both for nesting/rearing and over wintering. Species common in the subbasin in the winter include mallard, blue-winged teal, green-winged teal, merganser, cormorant, widgeon, scaup, and Canada goose. Riverine, palustrine, emergent, and open water wetland habitat types are important for waterfowl in the subbasin. Harvest strategies for waterfowl are fairly aggressive, usually taking the maximum number of days and bag limits allowable by Federal guidelines. Counts of Canada goose indicated pairs and single geese show a recent steady number during surveys from Chesterfield Reservoir to Inkom (Table 28).

Table 28. Number of Canada goose indicated pairs, and total number of geese seen during aerial surveys of the Portneuf River subbasin, from Chesterfield Reservoir to Inkom, 1996-2000.

Year	# Ind. Pairs	Total Geese

1996	88	176
1997	46	55
1998	20	50
1999	64	66
2000	28	67

Habitat Areas and Quality

Fisheries

Upper Snake River Subbasin

Big Cottonwood Creek

Aquatic habitats on the BCWMA are exclusively associated with the 2.5-mile reach of Big Cottonwood Creek that bisects the management area. Big Cottonwood Creek supports good numbers of Yellowstone cutthroat trout in addition to a population of mottled sculpin (*Cottus bairdi*) (IDFG 1993).

The Snake River fine-spotted cutthroat trout (SRFCT) and the Yellowstone cutthroat trout may be the same fish. The SRFCT and Yellowstone cutthroat trout are listed as a Species of Special Concern in the State of Idaho while the SRFCT is listed as a federally Sensitive Species with the BLM and USFS (Conservation Data Center 1994).

In 1998, 3 conservation groups and an ecologist petitioned the USFWS to list the Yellowstone cutthroat trout as a threatened species where it currently exists throughout its known historical range (including Montana, Wyoming, and Idaho) (F. Partridge, IDFG, personal communication). The USFWS is currently reviewing the petition and will render a decision on whether listing is warranted at a later date.

Prior to 1987, catchable rainbow trout were released by IDFG in the headwaters of Big Cottonwood Creek. Because most hatchery rainbow trout were of fall spawning stock, there is little likelihood of significant hybridization (F. Partridge, IDFG, personal communication).

Historic intensive domestic livestock grazing, intermittent water flow, and drought have significantly depleted riparian health in the creek below the irrigation diversion on the BCWMA. However, the removal of domestic livestock coupled with 3 years of above average annual precipitation has helped expedite riparian recovery. As riparian vegetation becomes established, stream banks stabilize, and sedimentation and water temperature decrease, fish populations may recolonize this portion of the creek.

Blackfoot River Subbasin

The Blackfoot River subbasin is an important trout fishery. Trout populations in the lower Blackfoot River, at one time an excellent fishery, are dependent on Blackfoot Reservoir for both recruitment of trout to the fishery and non-irrigation season (mid-fall to spring) releases of water to maintain trout habitat (Scully et al. 1993). Upper Blackfoot River subbasin tributaries include Diamond, Lanes, and Sheep creeks (Thurow 1981).

The BLM (1987) surveyed streams within their grazing allotments as to condition of water quality, streambanks, and riparian vegetation. Aside from Wolverine Creek, generally water

quality and streambanks were rated as good with riparian vegetation about evenly split between fair and good. Wolverine Creek included poor ratings of both streambanks and riparian vegetation. Overall rating of Wolverine Creek was poor for three of four reaches surveyed.

The IDFG evaluated substrate and habitat characteristics on four sites on both Brush and Rawlins creeks in 1991 (Scully *et al*. 1993). Pool/run to riffle ratio averaged 10.5:1 in Brush Creek and 3:1 in Rawlins Creek. Sand represented less than 15 percent in riffles at all sites while in pool substrates sand ranged from 17 to 96 percent in Brush Creek and 9 to 47 percent in Rawlins Creek.

Portneuf River Subbasin

Human activity has had a significant impact on the mainstem Portneuf River. In the lower Portneuf River, construction of the 1.5-mile concrete channel through the City of Pocatello in the 1960s eliminated fish and wildlife habitat and created a migration barrier for trout accessing City Creek for spawning (USACE 1992). As a result of the project, channel length was reduced by 4.1 miles and riparian habitat by 144 acres. The concrete channel represents 15 percent of the length of the Portneuf River for the segment from Johnny Creek to Interstate 86.

The upper Portneuf River runs through the 7.8-mile Downey Canal, built in conjunction with the Chesterfield Reservoir. Diversion of the river through the canal eliminated about 16 miles of the Portneuf River. An engineering survey in 1991-1992 of the Downey Canal revealed that 3,500 feet of streambank had severe stability problems, 8,000 feet had moderate stability problems, and 4,500 feet had slight stability problems (SCS 1993). The survey also noted that 4,300 feet of the canal had stream gradients that could lead to serious channel erosion.

A reconnaissance survey by the Natural Resources Conservation Service (NRCS) on the approximately 13.5 miles of Portneuf River between Lava Hot Springs and McCammon revealed streambank conditions to be 33 percent poor, 27 percent fair, 8 percent good, and 32 percent excellent (Portneuf Soil and Water Conservation District 1996). Streambanks in fair or poor condition totaled 77,520 feet (14.7 miles). The Portneuf River below Dempsey Creek to the Portneuf- Marsh Valley Canal diversion was characterized as having vertical banks, with a lack of vegetation for building banks, and lacking large woody debris for in-stream cover for fish. The river below the diversion was less impacted by bank problems than upstream.

As part of the same survey, the NRCS also evaluated the streambank condition of smaller tributaries to the Portneuf River in the Lava Hot Springs to McCammon reach. East and West Bob Smith Creeks had some areas that had downcut approximately 2 feet due probably to cropped fields which have changed the hydrology of the watershed by increasing runoff. The area of the creeks within the Portneuf River subbasin was severely overgrazed. In Dempsey Creek, the lower 14,000 feet of streambank was in poor condition mostly due to livestock concentration on small pastures. Middle Dempsey Creek has also been affected by livestock such that 15,600 feet of streambank is in fair to poor condition. In upper Dempsey Creek, 47,200 feet of streambank along the 59,000 feet of channel was in fair or poor condition. From a fish habitat perspective, a visual estimation on the lower four miles of Dempsey Creek revealed that 50 percent of the banks do not support habitat for fish.

Streambanks and riparian areas have also been evaluated in other tributaries to the Portneuf River. Gore (1986) noted that riparian areas of Marsh Creek near McCammon, Portneuf River from McCammon to Lava Hot Springs, and the Downey Canal had all been degraded. Almost two-thirds of the 1.5 miles of Twentyfourmile Creek below the dam is in poor vegetative condition due to livestock use while the remainder is in fair to good condition (SCS 1993).

The Caribou National Forest has evaluated the stream channel stability and fish habitat condition of numerous streams on the forest. All 303(d)-listed streams in the survey rated good to excellent except Walker Creek, South Fork Hawkins Creek, and Middle Fork Cherry Creek (Caribou National Forest 1985). Habitat in Mink, Bell Marsh, Walker, and Cherry Creeks was in stable condition, though below potential (Caribou National Forest 1992a). Fisheries habitat in the mainstem Mink Creek from Cherry Springs to the Forest Boundary was considered poor (L. Leffert, Caribou National Forest, personal communication).

In the late 1970s, the BLM evaluated habitat conditions for fish in various creeks on BLM land including Walker, Bell Marsh, Goodenough, Garden, and Birch creeks and the Left Hand Fork of Marsh Creek (BLM 1980). Overall, 51 percent of the trout habitat was in poor to fair condition in 1978.

In 1993, the BLM conducted fish habitat surveys (2 sites per stream) on those sections of Walker and Goodenough Creeks, which pass through BLM land (P. Koelsch, BLM, personal communication). Walker Creek below the South Fork confluence had a stable channel with only limited signs of excessive degradation or later movement. Overall riparian condition was considered good with a stable trend. Above the South Fork confluence, the creek channel stability was rated excellent with a riparian condition of good to excellent with a stable or slow upward trend. Goodenough Creek, above Mormon Canyon, had a relatively stable channel with only limited signs of excessive degradation or lateral movement. The riparian condition was rated good to excellent with an upward trend. Conditions of Goodenough Creek above the campground were similar to those observed at the other site above Mormon Canyon.

The BLM in 1996 assessed the condition of that portion of Bell Marsh Creek flowing through BLM land. The stream was considered to be properly functioning but at risk (G. Hogander, BLM, unpublished data).

Wildlife

Upper Snake River Subbasin

Wetlands

Significant wetland habitats are found in the Upper Snake River subbasin (Figure 18). All of these areas support a wide variety of waterfowl including trumpeter swan, mallard, pintail, redhead, and Canada goose, as well as many other species of wetland dependent migratory birds and other wildlife including moose, beaver, several rare fish species, song birds, and many more.

The American Falls Complex

The American Falls Complex includes American Falls Reservoir, the Fort Hall Bottoms, Sterling and Springfield WMAs, the Blackfoot River, and the Snake River upstream to the confluence of the Henrys Fork and South Fork of the Snake River. Ownership is divided among the SBT, private landowners, IDFG, BOR, BLM, and the City of Idaho Falls.

American Falls Reservoir is classified as lacustrine, open water with an unconsolidated bottom of gravel, mud, and organic components. The Fort Hall Bottoms is classified as palustrine with varied vegetation communities consisting of emergent, scrub-shrub, and deciduous forested wetland areas and riverine with cottonwood and willow riparian corridors along the banks. Springfield WMA is a large spring-fed open water habitat with a fringe of

emergent vegetation and willows. The Snake River has good riparian habitat along the banks from American Falls to Blackfoot.

This complex is an important migration corridor for waterfowl in the Pacific Flyway. Thousands of ducks, geese, and swans fly down the Snake River in the fall and remain in the Fort Hall Bottoms and American Falls Reservoir for the winter. Large spring-fed creeks and spring holes in the Bottoms and Springfield WMA provide open water for Canada geese, mallards, pintails, and trumpeter swans throughout the winter. In the spring and summer, the Bottoms and American Falls Reservoir provide excellent breeding habitat for mallards, cinnamon teal, gadwall, lesser scaup, and redheads. Sterling WMA also provides good habitat for breeding ducks.

American Falls Reservoir is part of the Western Hemisphere Shorebird Reserve Network and provides habitat for thousands of shorebirds in the spring and fall. Large populations of colonial nesting birds and neotropical songbirds also use the Fort Hall Bottoms/American Falls Reservoir area. More than 150 different bird species have been observed in this area. Otters, moose, mink, muskrat, and beavers and white-tailed deer are also found in this area.

The Minidoka Complex

This area includes Snake River below American Falls Dam to Lake Walcott within the Minidoka National Wildlife Refuge, and associated tributary streams. The BOR owns virtually all of the shoreline of Lake Walcott and the Snake River. The State Land Board owns isolated sections along the river and Lake Walcott. The USFWS manages the shoreline of Lake Walcott as the Minidoka National Wildlife Refuge. The Idaho Department of Parks and Recreation manages Massacre Rocks and Walcott State Parks and portions of the Snake River and Lake Walcott.

Lake Walcott is classified as lacustrine, open water, and submergent bed with a fringe of palustrine emergent habitat. The reservoir is primarily open water with large areas of submerged vegetation. Some areas are bordered with emergent vegetation (hardstem bulrush and cattail), or with a narrow riparian band of willows, Russian olive (an invasive exotic species), and scattered cottonwoods. Upstream of Lake Walcott, wetlands are riverine with submergent beds and riparian areas with willow and Russian olive. Fall Creek, one of the Snake River tributaries, has high quality inflows. The stream arises from springs about 2-3 miles from the Snake River and

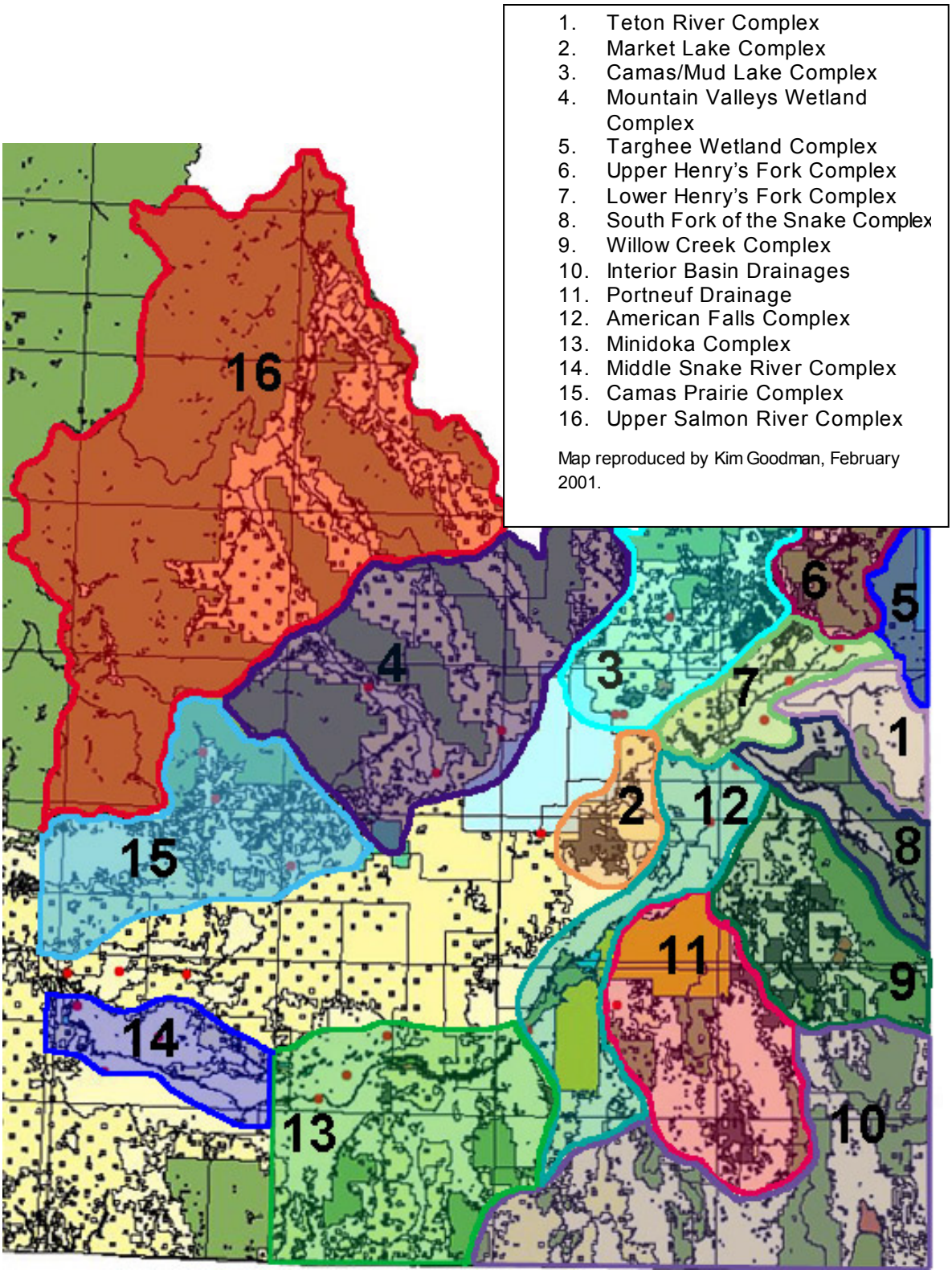


Figure 18. Southeast Idaho wetland focus area significant wetland habitats (Goodman 2001).

supports a commercial trout hatchery. It flows through range and crop lands and has some willow and Russian olive riparian areas.

Waterfowl use the entire Snake River and Lake Walcott areas within this complex. Large numbers of waterfowl use the areas with flowing water from American Falls dam down to the east edge of Minidoka National Wildlife Refuge during migration and winter. This area supports thousands of geese and many species of ducks, including mallards, redheads and pintails. Several hundred tundra swans use the area during migration and many will winter in the complex. Trumpeter swans also use the area during migration, but in much smaller numbers. The major importance of Lake Walcott, however, is as a molting and migration area. During late summer and early fall, as many as 100,000 ducks may be present for molting and staging. Mallards are the predominant species, with large numbers of redheads, canvasbacks, teal, wigeon, shoveler, ruddy duck, and others. Several thousand Canada geese may be present during this period also.

The area supports numerous wintering bald eagles that primarily feed on waterfowl during this period. The Minidoka National Wildlife Refuge has the only persistent and successful nesting colony of white pelicans in Idaho. Other colonial nesting birds on the Refuge include California gull, double-crested cormorant, great blue heron, snowy egret, common egret, cattle egret, and black-crowned night-heron. he Refuge has one of the largest breeding populations of western and Clark's grebes in Idaho. Caspian and Forster's terns also nest on the Refuge. The Refuge support tremendous numbers of aquatic insects, which support the birds and fish (trout, bass, sturgeon, and other warm water fish). There are several miles of high bluffs on Minidoka NWR that house thousands of northern rough-winged and bank swallows, and there are thousands of nesting cliff swallows nearby. These swallows are dependent on the adult stages of the aquatic insects. The first mile of river below America Falls dam attracts a wide variety of rare waterfowl and other aquatic birds; species recorded here include little gull, long-tailed duck, all three species of scoters, yellow-billed loon, mew gull, Thayer's gull, and glaucous-winged gull. An endangered mollusk, the Utah valvata, occurs on the refuge and in the Snake River above and below the refuge. Minidoka National Willdife Refuge has been designated as an Important Bird Area of Global Importance.

Middle Snake River Complex

The Middle Snake River Complex includes mostly private land holdings with a scattering of IDFG and BLM properties. Areas of importance include the stretch of the Snake River from Minidoka Dam to U.S. Highway 93. This stretch of approximately 50 miles provides winter habitat, localized nesting and brood rearing habitat associated with islands. A variety of waterfowl are found, including bufflehead, northern pintail, gadwall, American widgeon, green-wing teal, cinnamon teal, wood duck, American coot, and tundra swans.

Minidoka

Minidoka Dam is on the Snake River, 10 miles northeast of Rupert, Idaho. The dam backs water up the Snake River about 7 river miles below American Falls Dam to Eagle Rock. The reservoir is known as Lake Walcott and has a storage capacity of 210,000 acre-feet. The dam impounds 95,200 acre-feet of active storage for power production and the irrigation of about 120,000 acres of farmland (USFWS 198a). Irrigation releases are made between April and November.

The Secretary of the Interior authorized construction of Minidoka Dam in 1904, and the dam was completed in 1906. In 1908, construction began on the first federal hydroelectric power plant in the northwest. In 1909, it was supplying power for pumping water to lands south of the

Snake River. The original authorized purposes for Minidoka Dam were irrigation and power production. By Executive Order in 1909, President Theodore Roosevelt created the management area now known as the Minidoka National Wildlife Refuge.

Martin and Meuleman (1989) evaluated Minidoka Dam and Reservoir impacts to wildlife. A total of 12,414 acres was quantified by cover type in the study area for pre- and post-construction conditions (Table 29).

Table 29. Minidoka Dam pre- and post-construction cover type acreages (Martin and Meuleman 1989).

	Emergent Wetland	Deciduous Scrub-shrub Wetland	Deciduous Forested Wetland	Lacustrine	Riverine	Sagebrush-grassland	Agricultural	Mining	Total [1]
Pre-	502	433	0	0	3,321	7,990	52	116	12,414
Post-	321	37	4	11,692	106	254	0	0	12,414
Net Change	-181	-396	+4	+11,692	-3,215	-7,736	-52	-116	

1 The study area for these acreages was from the lower end of the Minidoka spillway upstream to the upper end of Lake Walcott. Acreages are for cover types within the boundary of the reservoir and spillway high water lines, plus areas where wetlands have become established around the reservoir and spillway.

Wetland cover types are described in Cowardin *et al.* (1979), and upland cover types are generally described in USFWS (1980c). The pre-construction study area contained mostly sagebrush-grasslands containing 33.6 miles of the Snake River, 2.6 miles of the Raft River, and an estimated 935 acres of emergent and willow-dominated wetlands. Many islands existed in the river channel.

The present-day study area is primarily lacustrine, with an estimated 4,376 acres of submerged plant beds. The shoreline of Minidoka Reservoir and the spillway support 362 acres of wetlands, primarily emergent and willow-dominated. Several islands exist within the reservoir. The 150-acre spillway area below the dam contains a complex of wetlands, uplands, and islands that are valuable wildlife habitat. Although some aspects of the dam and reservoir have been positive, the overall impact has been negative. The assessment of impacts to target wildlife species indicated a net loss of 5,374 habitat units in the Minidoka Dam and Reservoir study area (Table 30).

Table 30. Minidoka Dam impacts to target species in the study area.

	Pre-Construction			Post-Construction			Net Impact[1]	
Target Species	**Acres**	**HSI**	**HUs**	**Acres**	**HSI**	**HUs**	**Acres**	**HUs**
Mallard	3,660	0.20	732	4,528	0.20	906	+868	+174
Redhead	332	0.72	239	6,735	0.70	4,714	+6,403	+4,475
Westerm grebe	0	-	0	321	0.85	273	+321	+273
Marsh wren	935	0.06	56	325	0.81	263	-610	+207
Yellow warbler	433	0.87	377	37	0.95	35	-396	-342
River otter	3,897	0.80	3,118	125	1.0	125	-3,772	-2,993
Mule deer	8,925	0.41	3,659	616	0.40	246	-8,309	-3,413
Sgae grouse	7,990	0.47	3,755	0	-	0	-7,990	-3,755
Total net impact (HUs)								-5,374

1 The study area for these impacts was from the lower end of Minidoka spillway upstream to the upper end of Lake Walcott. Impacts were assessed within the boundary of the reservoir and spillway high water lines, plus areas where wetlands have become established around the reservoir and spillway. The mallard evaluation area included a 100-meter band of upland nesting habitat adjacent to the edge of wetlands.

Wildlife Management Areas

Sterling Wildlife Management Area

This property is located along the western shore of American Falls Reservoir. The elevation is 4,400 feet and the average growing season is 125 days. It consists of three main parcels owned jointly by the BOR and IDFG and is administered by IDFG. The total acreage is 3,332 acres made up of shrub-steppe uplands, and bulrush-cattail wetlands. The landscape is low rolling loess-covered lava reefs interspersed with depressions. A small portion of the uplands is irrigated and farmed, providing benefits in the way of enhanced cover and foodplots for waterfowl and upland wildlife.

The majority of the surrounding landscape is intensively farmed for cash crop production or livestock grazing. The WMA is 44 percent upland, 25 percent marsh, 10 percent wet meadow, 10 percent open water, and 10 percent agricultural. In addition to waterfowl and upland game production, a major benefit of the area is public access for wildlife viewing and hunting. In recent years, a major effort has been made to control Russian olive invasion and bring predator prey relationships into better balance. Dominant wildlife includes a variety of waterfowl and shorebirds, ring-necked pheasant, gray partridge, mourning dove, cottontail rabbit, mule deer, and muskrat (Table 31). Bald eagles, golden eagles, and trumpeter swans frequent the area, particularly in the winter. Management practices include grazing control, wetlands development to promote increased diversity, plantings of winter cover and food plots, access development and control, monitoring of waterfowl nesting success, providing artificial nesting structures, control of Russian olive trees, and noxious weed control.

Table 31. Wildlife species on the Sterling Wildlife Management Area, Idaho.

Common Name	Scientific Name

Common Name	Scientific Name
Mammals	
Mule Deer	
Antelope	
Blacktailed Jackrabbit	
Cottontail Rabbit	
Mink	
Muskrat	
Pocket gopher	
Vole	
Deer mouse	
Marmot	
Porcupine	
Red Fox	
Striped Skunk	
Raccoon	
Coyote	
Badger	
Birds	
Ring-necked Pheasant	
Grey Partridge	
Sharp-tail Grouse	
Sterling	
Mourning Dove	
Yellow Warbler	
Audubon's Warbler	
McGillivary's Warbler	
Yellow-Breasted Chat	
House Sparrow	
Western Meadowlark	
Brewer's Blackbird	
Brown Headed Cowbird	
Lazuli Bunting	
Evening Grosbeak	
Cassin's Finch	
American Goldfinch	
Green-tailed Towhee	
Rufous-sided Towhee	
Savannah Sparrow	
Vesper Sparrow	
Chipping Sparrow	
Brewer's Sparrow	
Song Sparrow	
Oregon Junco	
Common Night Hawk	
Calliope Hummingbird	
Red Shafted Flicker	
Hairy Woodpecker	

Common Name	Scientific Name
Eastern Kingbird	
Western Kingbird	
Western Wood Pewee	
Horned Lark	
Violet-green Swallow	
Black-Billed Magpie	
Common Raven	
Common Crow	
Black-Capped Chickadee	
Dipper	
Sage Thrasher	
Robin	
Hermit Thrush	
Ruby Crowned Kinglet	
Cedar Waxwing	
Northern Shrike	
Loggerhead Shrike	
Starling	
Warbling Vireo	
Marsh Wren	
Red-winged Blackbird	
Yellow-headed Blackbird	
Common Snipe	
American Avocet	
Black-necked Stilts	
Western Grebe	
Double-crested Cormorant	
Tundra Swan	
American Coot	
American White Pelican	
Herring Gull	
California Gull	
Franklin's Gull	
Forster's Tern	
Great Blue Heron	
Black-crowned Night Heron	
Snowy Egret	
White-faced Ibis	
Killdeer	
Long-billed Curlew	
Willet	
Wilson's Phalarope	
Snow Goose	
Canada Goose	
Northern Pintail	
Wood Duck	

Common Name	Scientific Name
American Widgeon	
Mallard	
Gadwall	
Cinnamon Teal	
Green-winged Teal	
Blue-winged Teal	
Northern Shoveler	
Redhead	
Canvasback	
Lesser Scaup	
Ruddy Duck	
Ring-necked Duck	
Bald Eagle	
Golden Eagle	
Northern Harrier	
Northern Goshawk	
American Kestrel	
Roughed-legged Hawk	
Turkey Vulture	
Red-tailed Hawk	
Swainson's Hawk	
Great Horned Owl	
Short-eared Owl	
Reptiles	
Common Garter Snake	
Great Basin Rattler	
Blue Racer	
Gopher Snake	
Rubber Boa	
Western Fence Lizard	
Sagebrush Lizard	
Skink	
FISH	
Chubs	
Amphibians	
Northern Leopard Frog	
Chorus Frog	

Big Cottonwood Wildlife Management Area

The BCWMA was purchased by the IDFG in 1993 for fish and wildlife conservation and federal land access. Prior to its purchase, the property was privately owned and operated as a cattle ranch and farm for nearly 110 years. The property was sought by IDFG because the area provided important habitats for reintroduced California bighorn sheep, transplanted Rio Grande wild turkeys, and one of the few remaining populations of native Yellowstone cutthroat trout. In addition, the acquisition secured public access to thousands of acres of adjacent Federal lands.

To date, management emphasis on the BCWMA has focused on restoring and rehabilitating habitats for a variety of wildlife species. Management priorities included improving upland habitats for bighorn sheep and riparian/wetland habitats in Big Cottonwood Creek for cutthroat trout.

The BCWMA is popular destination for recreationists from Cassia, Minidoka, and Twin Falls Counties. The primary uses of the WMA include mountain bike riding, hiking, sightseeing, fishing, hunting, and horseback riding.

The BCWMA Management Plan identifies legal requirements and land management responsibilities; provides a brief history of these lands and identifies the inventory of natural resources; identifies potential alternatives for management as identified through public and interagency involvement; evaluates the immediate and long-term impacts of each of the management alternatives; and identifies IDFG's preferred alternatives and goals for management. The plan is expected to provide long-term direction for management of the WMA. If monitoring indicates that progress toward identified management goals is not being achieved, the IDFG will adjust management as needed to meet those goals.

The BCWMA is situated at the mouth of Big Cottonwood Canyon. The majority of the WMA is characterized by the Big Cottonwood Creek floodplain, with the remaining portions occupying the toe to upper slopes of Big Cottonwood Canyon. The canyon area is characterized by steep talus slopes, some in excess of 60 percent, broken by numerous bedrock outcroppings. Prominent cover types found on the WMA include 407 acres of sagebrush/grass, 45 acres of riparian/wetland, and 360 acres of agriculture.

The desired future condition of the BCWMA is briefly described as including the following key elements:

1. The sagebrush/grass cover types will be managed for a mosaic of mid to late seral stages as described by Hironaka *et al.* (1983) for the Wyoming big sagebrush/ bluebunch wheatgrass (*Artemisia tridentata wyomingensis/Pseudoroegneria spicatum*) habitat type.

2. The irrigated agricultural cover types will be characterized by a desirable mix of native and non-native grasses and forbs providing habitat for a wide variety of wildlife species. The nonirrigated agricultural cover types will be restored using established range restoration practices to achieve a sagebrush/grass cover type consisting of desirable native plant species beneficial to wildlife.

3. Riparian-wetland habitats on the BCWMA will be managed for the early to mid seral stages as described by Hansen *et al.* (1995) for the narrowleaf cottonwood/red-osier dogwood (*Populus angustifolia/Cornus stolonifera*) community type.

4. Soil erosion will be minimized through minimization of soil disturbance, control or elimination of noxious weeds, and restoration of biologically diverse plant communities.

5. Wildlife habitats will be managed to ensure native wildlife species are restored to desirable population levels and game species are maintained at levels, which will provide hunting, fishing and trapping recreational opportunity.

6. Opportunities for wildlife-associated recreation that minimizes wildlife disturbance will be provided for present and future generations.

7. Identified cultural sites will be protected. Some significant historic sites will be stabilized and protected from natural and human-related degradation.

8. The BCWMA will be a good neighbor to adjoining landowners and an example of interagency cooperation.

Avian point count surveys conducted in 1995, 1996, and 1997 (IDFG, unpublished data) and incidental wildlife observations indicate the presence of at least 120 vertebrate species inhabiting the BCWMA. This includes 85 avian, 29 mammalian, 5 reptilian, and 1 amphibian species.

The BCWMA provides habitat for two big game species. California bighorn sheep were reintroduced in Big Cottonwood Canyon (including the WMA) beginning in 1986 in an effort to reestablish a population in the Magic Valley Region. From 1986-93, 50 bighorn sheep from southwestern Idaho were released in the Big Cottonwood drainage (IDFG 1996). Bighorns frequent the irrigated agricultural lands on the BCWMA in late fall and early winter and occupy the canyon portions of the management area during all seasons. The current status of bighorn sheep in Big Cottonwood Canyon is precarious. Recruitment rates and subsequent bighorn numbers in Big Cottonwood Canyon have steadily declined throughout the 1990s (IDFG 1998). Recent population estimates indicate fewer than 50 bighorn sheep remain (IDFG 1998).

Mule deer (*Odocoileus hemionus*) are year-round residents of the BCWMA and found primarily in association with juniper/sagebrush cover types in Big Cottonwood Canyon and the riparian cover types along Big Cottonwood Creek. Mule deer hunting opportunity is managed under a controlled permit system.

The BCWMA also supports mountain lion (*Felis concolor*) in addition to numerous furbearers like bobcat (*Lynx rufus*), beaver (*Castor canadensis*), muskrat (*Ondatra zibethica*), and mink (*Mustela vison*).

The BCWMA supports huntable populations of ring-necked pheasants (*Phasianus colchicus*) and gray partridge (*Perdix perdix*). Smaller populations of sage grouse (*Centrocercus urophasianus*), California quail, and chukar (*Alectoris chukar*) also inhabit the management area. Among these game birds, only the sage grouse, and possibly the California quail, are native.

Big Cottonwood Creek (including the WMA) is the top priority release site for wild turkeys in the Magic Valley Region (IDFG 1990). From 1988-98, 83 wild Rio Grande turkeys have been released on the BCWMA. Recent efforts to monitor turkey production and recruitment on the BCWMA indicate the population is probably decreasing despite efforts to provide supplemental winter food sources (corn food plots and fruit/mast orchard) and enhance nesting and brood rearing habitat. The future of the wild turkeys at the WMA will likely be dependent on future releases to augment the population.

Many nongame species inhabit the BCWMA. These include the burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), Western small-footed myotis (*Myotis ciliolabrum*) and Townsend's big-eared bat (*Corynorhinus townsendii*), which are considered rare or sensitive by state and/or federal wildlife or land management agencies.

The bald eagle (*Haliaeetus leucocephalus*), a winter inhabitant of the management area listed as Threatened under the ESA, annually uses the large cottonwoods on Big Cottonwood Creek for roosting habitat. The USFWS has primary management authority for the bald eagle.

Six terrestrial wildlife species (burrowing owl, ferruginous hawk, California bighorn sheep, Western small-footed myotis, Townsend's big-eared bat, and sage grouse) and one fish species (Yellowstone cutthroat trout) inhabiting the BCWMA are considered rare or sensitive by state and/or federal wildlife or land management agencies (Conservation Data Center 1994). In

addition, the pygmy rabbit (*Sylvilagus idahoensis*), western toad (*Bufo boreas*), and Ute lady's tresses (*Spiranthes diluvialis*), all considered rare or sensitive, have distributions falling within the boundaries of BCWMA (Conservation Data Center 1994).

The Blackfoot River Subbasin

Upper Blackfoot River Wildlife Management Area

This WMA includes a total of 2,400 acres immediately below the confluence of the two main tributaries that form the Blackfoot River. The Upper Blackfoot River WMA has a history of livestock grazing throughout the 20th century. The original owners grazed sheep on the area into the 1980s and then leased the property to cattlemen for about 10 years up through the mid-90s when IDFG acquired the property. Four dominant vegetation types include willow-dominated riparian areas; sedge-dominated wet meadows; sagebrush grasslands; and aspen and Douglas-fir forests. Many species of wildlife inhabit the area and are particularly visible in the spring, summer, and fall (Table 32). Waterfowl associated with the river and the surrounding sagebrush steppe include several nesting pairs of sandhill crane. Bald eagles are frequently seen, especially in the fall and spring. Big game includes elk, moose, and mule deer, though only moose winter in the area. Both blue and ruffed grouse are common in the surrounding woodlands, and beaver and muskrat are abundant along the river. There are historical records of a sage grouse lek on the property and in the fall of 1999 Columbia sharp-tailed grouse were sighted on the area. Some key management practices include access development and control, protection from grazing, noxious weed control, and baseline plant inventory.

Table 32. Wildlife species found on the Upper Blackfoot River Wildlife Management Area, Idaho.

Common Name	Scientific Name
Mammals	
Moose	*Alces alces*
Elk	*Cervus elaphus*
Mule deer	*Odocoileus hemionus*
Coyote	*Canis latrans*
Black bear	*Ursus americanus*
Badger	*Taxidea taxus*
Striped skunk	*Mephitis mephitis*
Mink	*Mustela vison*
Weasel	*Mustela spp.*
Cottontail rabbit	*Sylvilagus nutallii*
Beaver	*Castor canadensis*
Northern pocket gopher	*Thomomys talpoides*
Deer mouse	*Peromyscus maniculatus*
Mountain vole	*Microtus montanus*
Sagebrush vole	*Lagurus curtatus*
Chipmunk	*Eutamius spp.*
Porcupine	*Erethizon dorsatum*
Raccoon	*Procyon lotor*
Bushy-tailed wood rat	*Neotoma cinerea*

Common Name	Scientific Name
Merriam shrew	*Sorex merriami*
Birds	
Blue grouse	*Dendragapus obscurus*
Ruffed grouse	*Bonasa umbellus*
Bald eagle	*Haliaeetus leucocephalus*
Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Rough-legged hawk	*Buteo lagopus*
Northern harrier	*Circus cyaneus*
American Kestrel	*Falco sparverius*
Great horned owl	*Bubo virginianus*
Black-billed magpie	*Pica pica*
Common raven	*Corvus corax*
American crow	*Corvus brachyrhynchos*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Turkey vulture	*Cathartes aura*
Mallard	*Anas platyrhynchos*
American Widgeon	*Mareca americana*
Gadwall	*Anas strepera*
Common merganser	*Mergus merganser*
Green-winged teal	*Anas carolinensis*
Cinnamon teal	*Anas cyanoptera*
Blue-winged teal	*Anas discors*
Yellow warbler	*Dendroica petechia*
Vesper sparrow	*Poocetes gramineus*
Yellow-rumped warbler	*Dendroica coronata*
MacGillivray's warbler	*Oporornis formosus*
Savannah sparrow	*Passerculus sandwichensis*
Brewer's sparrow	*Spizella breweri*
Song sparrow	*Melospiza melodia*
Chipping sparrow	*Spizella passerina*
Dark-eyed junco	*Junco hyemalis*
Ruby-crowned kinglet	*Regulus calendula*
Steller's jay	*Cyanocitta stelleri*
Spotted towhee	*Pipilo maculatus*
Green-tailed towhee	*Pipilo chlorurus*
House finch	*Carpodacus mexicanus*
Evening grosbeak	*Coccothraustes vespertinus*
American goldfinch	*Carduelis psaltria*
Lazuli bunting	*Passerina amoena*
Calliope hummingbird	*Stellula calliope*
Broad-tailed hummingbird	*Selasphorus platycercus*
Common flicker	*Colaptes auratus*
Yellow-bellied sapsucker	*Sphyrapicus varius*
Eastern kingbird	*Tyrannus tyrannus*

Common Name	Scientific Name
Western kingbird	*Tyrannus verticalis*
Willow flycatcher	*Empidonax trailii*
Willet	*Catoptrophorus semipalmatus*
Long-billed curlew	*Numenius americanus*
Spotted sandpiper	*Actitis macularia*
Killdeer	*Charadrius wilsonia*
Common snipe	*Capella gallinago*
Sandhill crane	*Grus canadensis*
Sora	*Porzana carolina*
Double-crested cormorant	*Phalacrocorax penicillatus*
Amphibians and Reptiles	
Tiger salamander	*Abystoma tigrinum*
Boreal chorus frog	*Pseudacris triseriata maculata*
Northern leopard frog	*Rana pipiens*
Western terrestrial garter snake	*Thamnophis elegans*
Common Garter Snake	*Thamnophis sirtalis*

The Portneuf River Subbasin

The Portneuf River Wetlands Complex includes the Portneuf River subbasin, Marsh Creek, and wetlands and riparian zones associated with these areas. Ownership is primarily private, with a mix of Federal (USFS and BLM), State (IDL, IDFG), Tribal (SBT), and local government lands. The majority of the wetland areas are under private ownership. Dominant wetland types include palustrine emergent and shrub (willow/dogwood) habitats. Irrigation reservoirs, wet meadows, riparian areas, and some peatlands are other wetland habitats found in this complex. This complex supports a variety of different waterfowl and shorebirds including mallards, Canada geese, pintails, and redheads.

Portneuf Wildlife Management Area

The Portneuf WMA is located due east of the Portneuf River on the western face of the Portneuf Mountain Range between Inkom and McCammn, Idaho. It was acquired by the IDFG to preserve and enhance mule deer winter range. The property is comprised of 3,900 acres. Elevation averages 5,000 feet, and there are approximately 93 frost-free days.

The west facing slopes are dissected by a number of steep drainages, and two have year round water and populations of Yellowstone cutthroat. Vegetation is native sagebrush and grasses on the drier aspects and mountain brush, juniper, aspen, and Douglas-fir in moister areas. The robust component of bitterbrush throughout the area is particularly important to wintering mule deer. The area provides good public access for wildlife viewing, upland game and big game hunting. Access to the area is controlled so that some vehicular access is permitted but there are no loop roads. In addition to mule deer, the area provides habitat for a healthy population of elk and moose. Coyote, bobcat, and mountain lion are also known to frequent the area (Table 33). Upland game species include ring-necked pheasant, blue grouse, ruffed grouse, gray partridge, and Columbia sharp-tailed grouse. Golden eagle frequent the area and probably nest in nearby bluffs to the east. A diversity of nongame wildlife inhabits the area, including a wide variety of birds and reptiles. Major management practices include protection from grazing, prescribed fire to promote vegetation diversity, bitterbrush plantings to improve forage for big game,

fertilization to improve forage for big game, road closures and improvements to provide access while minimizing impacts to wildlife, noxious weed control, and annual vegetation monitoring.

Table 33. Fish and wildlife species found on the Portneuf Wildlife Management Area, Idaho.

Common Name	Scientific Name
Mammals	
Moose	*Alces alces*
Elk	*Cervus elaphus*
Mule deer	*Odocoileus hemionus*
Coyote	*Canis latrans*
Bobcat	*Lynx rufus*
Black bear	*Ursus americanus*
Badger	*Taxidea taxus*
Striped skunk	*Mephitis mephitis*
Mink	*Mustela vison*
Weasel	*Mustela spp.*
Cottontail rabbit	*Sylvilagus nutallii*
Black-tailed jackrabbit	*Lepus californicus*
Beaver	*Castor canadensis*
Yellow-bellied marmot	*Marmota flaviventris*
Golden-mantled ground squirrel	*Spermophilus lateralis*
Northern pocket gopher	*Thomomys talpoides*
Deer mouse	*Peromyscus maniculatus*
Mountain vole	*Microtus montanus*
Sagebrush vole	*Lagurus curtatus*
Chipmunk	*Eutamius spp.*
Porcupine	*Erethizon dorsatum*
Raccoon	*Procyon lotor*
Richardson's ground squirrel	*Spermophilus richardsonii*
Bushy-tailed wood rat	*Neotoma cinerea*
Merriam shrew	*Sorex merriami*
Birds	
Blue grouse	*Dendragapus obscurus*
Sage grouse	*Centrocercus urophasianus*
Sharp-tailed grouse	*Tympanuchus phasianellus*
Ruffed grouse	*Bonasa umbellus*
Gray partridge	*Perdix perdix*
Golden eagle	*Aquila chrysaetos*
Swainson's hawk	*Buteo swainsoni*
Red-tailed hawk	*Buteo jamaicensis*
Rough-legged hawk	*Buteo lagopus*
Northern harrier	*Circus cyaneus*
American kestrel	*Falco sparverius*
Great horned owl	*Bubo virginianus*
Black-billed magpie	*Pica pica*
Common raven	*Corvus corax*
American crow	*Corvus brachyrhynchos*

Common Name	Scientific Name
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Turkey vulture	*Cathartes aura*
Mallard	*Anas platyrhynchos*
Common snipe	*Gallinago gallinago*
Yellow warbler	*Dendroica petechia*
House sparrow	*Passer domesticus*
Vesper sparrow	*Poocetes gramineus*
Yellow-rumped warbler	*Dendroica coronata*
MacGillivray's warbler	*Oporornis formosus*
Song sparrow	*Melospiza melodia*
Chipping sparrow	*Spizella passerina*
Savannah sparrow	*Passerculus sandwichensis*
Brewer's sparrow	*Spizella breweri*
Dark-eyed junco	*Junco hyemalis*
Rufous-sided towhee	*Pipilo erythrophthalmus*
Green-tailed towhee	*Pipilo chlorurus*
House finch	*Carpodacus mexicanus*
Evening grosbeak	*Coccothraustes vespertinus*
American goldfinch	*Carduelis psaltria*
Lazuli bunting	*Passerina amoena*
Calliope hummingbird	*Stellula calliope*
Broad-tailed hummingbird	*Selasphorus playcercus*
Hairy woodpecker	*Dendrocopos villosus*
Common flicker	*Colaptes auratus*
Eastern kingbird	*Tyrannus tyrannus*
Western kingbird	*Tryannus verticalis*
Western wood pewee	*Contopus sordidulus*
Horned lark	*Eremophila alpestris*
Violet-green swallow	*Tachycineta thalassina*
Bank swallow	*Riparia riparia*
Black-capped chickadee	*Parus atricappilus*
Sage thrasher	*Oreoscoptes montanus*
American robin	*Turdus migatorius*
Hermit thrush	*Catharus guttatus*
Northern shrike	*Lanius excubitor*
Loggerhead shrike	*Lanius ludovicianus*
American dipper	*Cinclus mexicanus*
House wren	*Troglodytes aedon*
Ruby-crowned kinglet	*Regulus calendula*
Cedar waxwing	*Bombycilla cedrorum*
Common nighthawk	*Chordeiles minor*
Mourning dove	*Zenaida macroura*
Western meadowlark	*Sturnella neglecta*
Pine siskin	*Spinus pinus*
European starling	*Sturnus vulgaris*

Reptiles and Amphibians

Common Name	Scientific Name
Common garter snake	*Thamnophis sirtalis*
Western terrestrial garter snake	*Thamnophis elegans*
Great basin rattlesnake	*Crotalus viridis*
Racer	*Coluber constrictor*
Gopher snake	*Pituophis melanoleucus*
Rubber boa	*Charina bottae*
Sagebrush lizard	*Sceloporus graciosus*
Western fence lizard	*Sceloporus occidentalis*
Western Skink	*Eumeces skiltonianus*
Western toad	*Bufo boreas*
Fish	
Cutthroat trout	*Salmo clarki*
Mottled sculpin	*Cottus bairdi*

Portneuf River Sportsman Access Areas

There are five Sportsman Access areas along the Portneuf River totaling over 200 acres. The Edson Fichter Nature Area is located on the south side of Pocatello and is being developed to serve as an outdoor classroom as well as provide access to the river for fishing. The Crane Creek Sportsman Access area lies directly across the road from the Portneuf WMA. It includes 10 acres adjacent to the river providing access to the Portneuf River for fishing as well as 30 acres of shrub-steppe habitat on the lava reefs between the Portneuf River and Marsh Creek. The Lower Portneuf Sportsman Access area is located immediately upstream of the town of Lava Hot Springs. This access area consists of about 30 acres of property lying on the east side of about 1 mile of the river. It is managed as a fishing access but also provides some waterfowl and upland game hunting opportunity. The Upper Portneuf Sportsman Access area, including 70 acres, lies just below the Bannock-Caribou County line. This area also serves primarily as fishing access and provides opportunity for pursuing Yellowstone cutthroat, rainbow, and brown trout. In recent years there has been considerable fencing work along this access area to protect the riparian area from livestock grazing. This access area provides good waterfowl hunting opportunity, particularly late in the season since spring inflow keeps the Portneuf River from freezing. Mike's Place Sportsman Access area is located about one mile upstream of the Upper Portneuf Access area where Pebble Creek flows into the Portneuf River. It provides good fishing access as well as some waterfowl hunting opportunity over 36 acres of property. A major improvement has been to protect the riparian corridor from livestock grazing. Most of these access areas provide some habitat for big game as well as a variety of waterfowl, furbearers, and nongame wildlife. A species list for these access areas would be essentially the same as that for the Portneuf WMA (Table 33).

Watershed Assessment

The IDEQ completed watershed assessments for both the Blackfoot River and Portneuf River subbasins. Much of the relevant information is detailed throughout this document. A summary of activities is provided in the Past Efforts section of this subbasin summary.

Major Limiting Factors

Fisheries

Upper Snake River Subbasin

Factors commonly listed as limiting the abundance and distribution of native salmonids include hybridization and competition with non-native salmonids, and anthropogenic disturbances to stream habitat due to timber harvest, grazing, dam construction, irrigation diversions, and road building (Rieman and McIntyre 1993; Gresswell 1995). In the Middle and Upper Snake River subbasins, however, few investigations have been made to elucidate which factors are important in determining the patterns of distribution and abundance of native salmonids.

Hybridization and Competition with Non-native Salmonids

Hybridization of Yellowstone cutthroat trout continues to be of concern to fishery managers but many Yellowstone cutthroat trout populations continue to persist. Populations within major river drainages are well connected and composed of many thousands of individuals. Expanding Yellowstone cutthroat trout populations in some streams have been documented during the past 25 years. While hybridization in some tributaries and drainages has occurred, many pure Idaho populations have recently been documented. Additional genetic analysis will undoubtedly confirm many additional populations

Concern has been expressed about the limited genetic sampling conducted on Yellowstone cutthroat trout populations and groups assert that some populations considered pure by IDFG managers may prove to be hybridized with rainbow trout. Although introgression has occurred at a small number of sites sampled to date, data indicate numerous populations of pure Yellowstone cutthroat trout continue to persist in Idaho. Many pure populations are isolated above migration barriers, helping to ensure hybridization risk is minimized. For example, the mainstem Portneuf River below Lava Hot Springs appears to be predominantly rainbow trout (DNA samples have just recently been taken) and few cutthroat trout are observed. Nonetheless, the only two Yellowstone cutthroat trout tributary populations tested to date below Lava Hot Springs (Harkness and Robbers Roost Creeks) both proved to be 100 percent pure based on DNA testing.

Anthropogenic Disturbance

The single most influential limiting factor to native fish populations within the Upper Snake River subbasin is loss of habitat due to riparian and stream channel disturbance and to channel dewatering for irrigation withdrawals. Headwater sections of the various watersheds with the Subbasin contain some of the last remaining stable cutthroat trout populations. Even these areas of have few relatively undisturbed stream segments due to livestock grazing the riparian and headwater spring areas. Other, usually downstream, segments are dewatered or depleted for irrigation withdrawals. These conditions have resulted in the isolation of resident populations and the extermination of migratory fluvial life forms. The Raft River, Goose Creek, Dry Creek, Big Cottonwood Creek, and a number of unlisted small tributary streams no longer even reach the mainstem of the Snake River. Many of these probably historically supported migratory fluvial populations of cutthroat trout but are now either cut off from the mainstem, are completely dry throughout most of their length or of poor habitat quality.

Agriculture and Grazing

Habitat limitations include unscreened irrigation delivery systems, sedimentation, upland and instream habitat disturbances, loss and degradation of functional riparian areas and wetlands, elevated summer temperatures, increased developments in agriculture areas resulting in habitat fragmentation, reduced streambank vegetation and stability. In years of low snowpack, flows in water bodies and reservoir storage can be drafted 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 out competes desirable vegetation and provides less nutrition and cover for wildlife.

The CRP and the Wetland Reserve Program (WRP) have improved habitat for upland and wetland wildlife species. Agricultural practices tend to create monocultural 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.

Blackfoot River Subbasin

Prior to implementation of the *Upper Blackfoot River and Reservoir Fisheries Management Plan*, the limiting factor for the Yellowstone cutthroat trout population was angling. Since then, catch-and-release rules have removed this as an issue. Current limiting factors are livestock grazing in riparian areas, irrigation diversion dams, Blackfoot Reservoir water volume, exotic species competition, and predation.

Livestock Grazing

Headwater tributaries of the upper Blackfoot River are Lanes and Diamond Creeks. These two streams meander across thousands of acres of flat land used for livestock grazing. There are no measures in place to prevent these livestock from damaging riparian areas. Streambanks are mainly clay and loess soils that are very erodible. At the upper end of the 6.3-mile Blackfoot River reach on the WMA, summer (post runoff season from July 16 onward) TSS range from 3 mg/l to 30 mg/l, depending on intensity of livestock grazing. After water passed through the WMA reach, TSS ranged from less than 1 mg/l to 5 mg/l (Table 34). Although riparian conditions on the WMA have improved since rest from grazing began in 1995, substrate sediment is still too high, since the WMA has become a deposition area for sediment drifting in from heavily grazed tributary pastures. Interstitial spaces for over-wintering of juvenile trout and aquatic insect production, and for spawning gravel habitat would all improve if grazing could be set back from riparian areas with corridor fences. Riparian corridor protection in tributaries would also improve tributary habitat for trout.

Table 34. Upper Blackfoot River total suspended solids (TSS) in mg/l for 1998.

Date	Dry Valley Creek	Angus Creek	Blackfoot River Lower WMA	Diamond Creek	Lanes Creek	Spring Creek
June 4	22	12	30			
July 6	65	9	5		2	19
July 16	9	2	3	8	8	6
July 22	18	12	1	3	3	7

August 14	5	3	2	30	3	6
August 27			<1	3	2	11

Livestock management at many locations further down the upper Blackfoot River impacts water quality, substrate, riparian quality, and water temperature. One landowner recently constructed riparian corridor fences on his 2.4-mile river reach. This was done as a cooperative cost-share project with the NRCS.

Irrigation Diversion Dams

There are few diversions off the upper Blackfoot River. Neither of the dams for the two diversions contains fish passage facilities. The upper diversion effectively blocks the cutthroat migration in years when irrigation begins before spawners have gotten past this structure. A fish ladder is needed to ensure that cutthroat spawners can always pass this dam.

An important consideration for maintaining a fishery on the upper Blackfoot Reservoir is public access. Of the 33 miles of the upper Blackfoot River, public access is guaranteed only on the 6.3-mile reach on the Upper Blackfoot River WMA, approximately 3 miles through USFS land immediately below the WMA, and about a 0.5-mile reach through a Caribou County campground at the trap site. Thus, about 69 percent of the upper Blackfoot River, mostly in one continuous reach, is on private property belonging to ten landowners. Fishing access on private land is becoming more difficult as traditional ranchers sell their land to individuals with goals of providing themselves and their guests with private fishing opportunities. Public access can be increased through the purchase of land and/or access agreements at reasonably frequent (every 1.8 miles) intervals along the upper Blackfoot River.

Blackfoot Reservoir Water Volume

The U.S. Bureau of Indian Affairs Fort Hall Irrigation Company manages Blackfoot Reservoir. During the summer irrigation season, irrigators draw the reservoir down about 115,000 acre-feet, which is the average amount of water available for storage from the entire subbasin. The reservoir volume generally stays above 150,000 acre-feet from year to year. In low precipitation years, the reservoir progressively gets lower. In 1992, the reservoir was drawn down to a low of 20,000 acre-feet, or 6 percent of capacity.

The effect of such a prolonged decline in reservoir volume is a reduction in fish production. Less than 600 wild cutthroat spawners were recorded at the Blackfoot River trap in 1991 and in 1992. Low volume also resulted in extremely low return of trout stocked into the reservoir. Improved trout populations are dependent on increased precipitation. At least 150,000 acre-feet of storage are needed at the end of the irrigation season every year. When ample flows are available, flows in the upper Blackfoot River also will be higher and cooler and riparian vegetation more abundant, forming better spawning and early life rearing habitat for trout.

Exotic Species Competition

The Blackfoot Reservoir fishery suffers from competition from Utah chub, Utah sucker, and common carp. Recently, an unauthorized introduction of yellow perch is likely to cause further damage to the trout fishery. Gillnet samples from Blackfoot Reservoir usually contain over 95 percent non-game fish.

Predation

Another possible limiting factor to fish production in Blackfoot Reservoir is predation caused by the increasing populations of double-crested cormorants and white pelicans. These birds swarm when trout are stocked, leaving most anglers believing that predation is a significant problem.

Portneuf River Subbasin

This Portneuf River is highly erodible due to the increased gradient. Habitat is poor and flow is low or nonexistent in winter. The IDFG, NRCS, landowners, and irrigators have worked together to improve riparian habitat and reduce erosion in significant portions of both the channelized reach and below.

Wildlife

Upper Snake River Subbasin

Sage Grouse

Shrub-Steppe Habitat Loss

Most of the area south of the Snake River has been converted from native vegetation to agricultural crops or livestock forage. In recent years, several thousand acres of sagebrush have been burned by wildfires. The majority of sage grouse and their habitat are found north of the Snake River on what is known as the Big Desert, but this area is not without problems. Over the past 15 years, wildfires covering thousands of acres have removed critical sage grouse habitat.

Sharp-tailed Grouse

Agricultural Conversion

Most of the native habitat found in the Upper Snake River subbasin has been converted to agriculture and livestock heavily impact what is left. Recent upward trend response in status is directly related to conversion of cultivated dryland wheat to permanent cover crops in response to the CRP.

Limited Population Data

Little if any trend data exists for sharp-tailed grouse populations. Wing barrels are placed near the towns of Rockland and Pauline to monitor harvest and production.

Mule Deer

Winter Range and Migration Corridors

The loss of mule deer winter range due to housing development continues in portions of the subbassin at a high rate. Migratory corridors to winter ranges are affected only slightly by human habitation and highways.

Forage and Inter-species Competition

Competition with elk on winter ranges and white-tailed deer on river bottom areas are keeping mule deer numbers from increasing. Competition with domestic livestock for food and wintering areas are probably moderate in the Upper Snake River subbasin.

Blackfoot River Subbasin

Sage Grouse

Habitat Loss

The BLM, USFS, and IDL manage public lands in the Blackfoot River subbasin. Private land owners manage much of the productive valley and lower elevation bottomlands. Several wildfires and controlled burns over the past 3 decades have removed critical sage grouse habitat. Agencies and private landowners conducted spray projects to remove sagebrush to increase forage production for livestock over thousands of acres in the 1970s and 80s.

Limited Biological Information

Very little information is available relative to the biology and ecology of sage grouse in the Blackfoot River subbasin. Numbers of birds are anecdotally few relative to local experience. Whether these birds are migratory or resident in behavior is unknown. Consequently, habitat management recommendations by wildlife managers are limited by poor understanding of basic elements of the small population units remaining in the subbasin.

Mule Deer

Loss of Winter Range

The lack of wintering ranges is a limiting factor for mule deer throughout this subbasin. Most deer spending summer and fall in the upper portion of the subbasin winter outside the subbasin. Deer using summer range in the lower portions of the subbassin remain in the subbasin. Wolverine Canyon winters a significant number of mule deer. Migratory corridors to winter ranges are affected most notably by roadways near the town of Soda Springs, Idaho. Migrations to winter range within and outside the subbasin tends to be long distance.

Forage Competition

Competition with elk on winter ranges may be keeping mule deer numbers from increasing. Competition with domestic livestock for food and wintering areas is probably moderate in this subbasin, restricted to large river valleys in the upper reaches of Blackfoot River, and sagebrush/mountain brush grazing lands in the lower reaches.

Portneuf River Subbasin

No information provided.

Artificial Production

No information provided.

Existing and Past Efforts

Fisheries

Efforts Funded by BPA through the Columbia Basin Fish and Wildlife Program

Upper Snake River Subbasin

The Shoshone-Bannock Tribes

Habitat Protection and Restoration

Protection and restoration of streams is a first step in the recovery of native fishes. Several largescale restoration projects have been implemented on the Fort Hall Indian Reservation over the last nine years, including a BPA-funded habitat restoration/enhancement project (#9201000).

Riparian areas on the Fort Hall Indian Reservation have been negatively affected by lateral scouring and downcutting of streambanks caused by years of unrestricted grazing and rapid flooding and drafting of American Falls Reservoir. Negative impacts from lateral scouring and downcutting include siltation of spawning gravels, loss of object cover and pool depth, increasing width : depth ratios of stream channels, and resulting increases in water temperature. The primary goal of the restoration project has been to facilitate recovery of native fish and wildlife populations to near historic levels on the Fort Hall Indian Reservation.

Enhancement and restoration techniques have included the use of instream structures to provide cover for fishes and direct flow from unstable streambanks (i.e., rock and wood wing dams and barbs), sloping of streambanks, revegetation with native riparian species, placement of evergreen revetments, and fencing sensitive riparian areas.

Evergreen revetments have been shown (Moser 1988) to be effective in aggrading sediment, protecting streambanks, and providing cover for juvenile salmonids. Fourteen sites on Spring Creek and Diggie Creek have been restored using these low-cost, low-tech restoration techniques (Taki and Arthaud 1993; Arthaud and Taki 1994; Arthaud *et al.* 1995, Arthaud *et al.* 1996; Moser and Colter 1997, Moser 1998; Moser 1999).

The portion of Clear Creek within the upper buffalo pasture was fenced in 1993 and over 50 instream structures placed to provide juvenile and adult cover for fishes. Several upland streams and springs have been protected with exclosure fencing, including Wood Creek, Ross Fork Creek, and West Fork Bannock Creek. Land leases were obtained on the Portneuf River and Jimmy Drinks Creek to protect sensitive springs and allow recovery from overgrazing (Taki and Arthaud 1993; Arthaud and Taki 1994; Arthaud *et al.* 1995; Arthaud *et al.* 1996; Moser and Colter 1997; Moser 1998; Moser 1999).

Blackfoot River Subbasin

None reported.

Portneuf River Subbasin

None reported.

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

Upper Snake River Subbasin

None reported.

Idaho Department of Fish and Game

In 1996, the IDFG reconnected an unused 1.9-mile natural section of the upper Blackfoot River and installed a water control structure to shunt flow away from a 0.7-mile channelized reach into the natural reach. The area was fenced to exclude cattle. A natural meandering reach of Angus Creek, a tributary to the upper Blackfoot River, was reopened.

Idaho Division of Environmental Quality

Most efforts to improve water quality in the Blackfoot River have been undertaken by the NRCS and Bingham and Caribou Soil Conservation Districts since the mide-1980s(R. Franks, NRCS, personal communication). The projects have concentrated on erosion control from farm fields and reducing impacts of livestock on riparian areas and stream channels.

Work accomplished under the Agricultural Conservation Program (ACP) from 1985 to 1996 includes:

- 10.5 miles of pipeline for water conveyance for livestock and wildlife
- 7 wells to provide water for livestock and wildlife
- 3 spring developments for livestock and wildlife
- 54 troughs for watering livestock and wildlife
- 4 ponds for watering livestock and wildlife
- 700 acres of brush spraying to improve upland livestock and wildlife grazing on rangeland
- 2 miles of cross fencing to improve upland range for livestock and wildlife grazing.

In 1988, 10,500 acres were in the CRP. Enrollment in CRP in 1999 was 11,380 acres. Approximately three miles of cross fence in Sawmill Canyon and on Warbonnet Creek were constructed in 1999 under the Wildlife Habitat Improvement Program (WHIP) to foster proper grazing use on about 5,000 acres of rangeland. On the mainstem Blackfoot River, 200 feet of streambank stabilization using barbs, willow plantings, and rip rap to repair damage caused by flooding was funded under Resource Conservation and Rangeland Development Program (RCRDP) in 1999.

In Bingham County, projects and reduction in dry farming have led to improvements in water quality (S. Engle, NRCS, personal communication). Projects include:

- 48,700 feet of pipeline for water conveyance for livestock and wildlife
- 5 wells to provide water for livestock and wildlife
- 3 spring developments for livestock and wildlife
- 35 troughs for watering livestock and wildlife
- planned grazing system implemented on 27,850 acres
- development of proper grazing use on 28,090 acres
- 6,525 acres of brush management to improve upland livestock and wildlife grazing on rangeland
- 81,800 feet of cross fencing to improve upland range for livestock and wildlife grazing,
- 31,800 feet of streambank fencing built to manage livestock in riparian areas
- 18,000 feet of streambank stabilized by tree revetments
- 600 feet of streambank stabilized by rock rip-rap.

Much of the historic dry cropland has been converted to CRP or pasture and hayland reducing sediment input into subbasin streams. In the early 1980s, there were about 15,869 acres of dry cropland. Presently, 7,362 of those acres are in CRP and 8,179 acres are in pasture or hayland. Estimated erosion rates of dry cropland are 18 tons/acre/year compared to 2 tons/acre/year or less from CRP and pasture/hayland. This nine-fold reduction in erosion rate translates into almost 250,000 tons/year.

The North and Central Bingham Soil Conservation Districts have prioritized several projects to reduce soil erosion in their 5-year plans (North Bingham Soil Conservation District 1998, Central Bingham Soil and Water Conservation District 1998). These projects include reducing wind erosion through wind strip barriers, NO BLO, and fall cropping; introducing and promoting soil conservation technologies and practices (e.g., minimum tillage, mulching, planting grasses and legumes between row crops, cross slope chiseling or subsoiling); and livestock management in riparian areas (e.g., herding, fencing).

Several other entities have also undertaken improvement projects in the Blackfoot River subbasin aimed primarily at reducing sediment input from unstable streambanks. The USFS Caribou National Forest has placed log-revetment structures in Diamond Creek to narrow the stream channel and stabilize cut banks (Heimer *et al.* 1987). The IDFG has also placed tree revetments in the upper Blackfoot River. The USFS Caribou National Forest also built a livestock exclosure on Diamond Creek (Caribou National Forest 1992). The IDFG constructed fish screens on irrigation diversions in the upper Blackfoot River to prevent fish mortality in the itches (Heimer 1984).

Portneuf River Subbasin

Idaho Department of Fish and Game

Sediment is the major pollutant of the Portneuf River and Marsh Creek. Both waters are on Idaho's Section 303(d) list of water quality limited streams. Eroding stream banks contribute significantly to this pollution.

The IDFG and Friends of the Portneuf initiated riparian fencing in the mid-1980s. Fencing began on a two-mile section of the upper Portneuf River upstream of Lava Hot Springs within an area once considered a "blue ribbon" trout stream. The most coveted reach for riparian protection was located on a ranch owned by King Creek Cattle Association. The IDFG constructed an upland stock watering site for the Association and, in return, was given permission to fence the riparian corridor. The fence was built with Section 319 funds obtained by the Friends of the Portneuf.

Upriver from the fishery in the 14-mile channelized reach of the Portneuf River below Chesterfield Reservoir, the NRCS provided State Agricultural Water Quality Project funds to fence corridors anywhere a landowner would provide 25 percent of the project cost. Most landowners in this reach built corridor fences during the mid-1990s.

In 1994, owners of the Arimo Ranch, located on Marsh Creek, asked for assistance in excluding livestock from its 4-mile long riparian corridor. The IDFG received a Section 319 grant in 1995 for the project. Biologists planted willow posts and constructed bio-engineered structures. The IDFG and NRCS monitor riparian restoration in complete enclosures and riparian pasture sections on the Armio Ranch.

Idaho Division of Environmental Quality

Several programs and projects have been undertaken since the mid-1980s in the Portneuf River subbasin to improve water quality. In addition to the efforts of private individuals and non-profit groups, projects have been undertaken by city, county, state, tribal, and federal governments under several funding programs. Probably the largest program to benefit water quality has been the State Agricultural Water Quality Program (SAWQP). Five watershed areas have benefitted from SAWQP treating about 30,000 acres. As part of the Upper Portneuf River SAWQP project, gradient control structures were built in the Downey Canal to control stream energy and its erosive effects on the canal banks. The NRCS oversees three federal programs to improve water quality in the subbasin.

The number of acres enrolled in CRP in Bannock County increased from 57,000 acres in 1988 to 63,000 acres in 1997 while CRP acres in Caribou County went from 28,557 to 42,589 acres for the same time period. Sign-up of land in CRP is for ten years. Additional efforts have included fencing projects of the Friends of the Portneuf and the IDFG. The only non-agricultural related project has been a Section 319-funded engineered wetlands project by the City of Pocatello to treat a portion (~20-25 percent) of the city's stormwater runoff prior to its entry into the Portneuf River.

Results and Accomplishments

The Shoshone-Bannock Tribes

Habitat Protection and Restoration

Initial restoration/enhancement project (#9201000) efforts were based on creating cover through the use of instream structures. Recently, project priorities have shifted to protecting streambanks and allowing natural processes to heal riparian areas and stream channels (wide shallow channels to narrow deep channels). Riparian plantings and revetments have been successful and continue to be a part of restoration efforts (Taki and Arthaud 1993; Arthaud and Taki 1994; Arthaud *et al*. 1995; Arthaud *et al.* 1996; Moser and Colter 1997; Moser 1998; Moser 1999). In addition to protecting sensitive streambanks, revetments provide cover for juvenile and adult salmonids. Willow plantings have become more successful each year with modification and refinement of techniques.

Monitoring and evaluation since project inception in 1992 has included collection of baseline and annual data on relevant biotic and abiotic variables, including fish community composition, biomass and densities, invertebrate community composition and densities, channel morphology, riparian health, and water quality parameters. Stream depth has increased significantly and new areas of clean spawning gravels have been created with the use of instream structures (Moser 1997; Moser 1998). Approximately 0.5 miles of actively eroding streambank has been stabilized, revegetated, and protected with exclosure fencing.

Idaho Department of Fish and Game

Fencing projects on the Portneuf River below Chesterfield Reservoir have been shown to reduce erosion and habitat loss. Documented benefits of the Arimo Ranch fencing project in the Portneuf River subbasin include stream bank stability, recolonization of native riparian plants, and decreased stream turbidity.

Blackfoot River Subbasin

Water Quality Improvement

Whereas benefits of individual projects are not known, data are available to examine the cummulative effects of programs and projects on water quality in Blackfoot River. The best data for such a comparison are from USGS surface water stations. The advantage of USGS data is that the information has been collected in the same way from the same site on a relatively consistent basis. Only one USGS surface water station (13068500, Blackfoot River near Blackfoot) has been monitored on a relatively consistent basis. Information on water quality from Station 13068500 dates back to 1971.

Although documentation of statistical significance is limited, data indicate a trend of improved water quality conditions in Blackfoot River since 1971. Comparisons of suspended sediment, dissolved nitrate-nitrite, and total phosphorus between early (1971-1981) and late (1989-1997) periods all show a decrease in average concentrations. Only total phosphorus concentrations were statistically different between periods. Data were grouped according to early and late periods for two reasons: 1) monitoring did not occur between 1982 and 1989, and 2) implementation of the CRP began in the mid-1980s. Initiation of the CRP program has likely been an important component to water quality improvement in the Blackfoot River subbasin.

It is not clear whether existing programs and projects are sufficient to lead to support of beneficial uses in a timely manner. Despite positive trends in reduction of pollutants, existing status of many of the listed waterbodies seems to indicate current practices will not improve water quality to the degree that all beneficial uses will be supported in the very near future. Therefore, loading analyses were performed for both sediment and nutrients.

Portneuf River Subbasin

Water Quality Improvement

Unfortunately, many of the State programs did not have an adequate monitoring plan set up to document the benefits of implementation. Drewes (1991) in his evaluation of Best Management Practices on dryland farms stated that, based on the parameters studied, there appeared to be some improvement in pollution loading, but data sets for treatment analysis were too small to determine a statistically significant improvement. The NRCS (R. Davidson, personal communication) estimated that erosion control programs of FSA, CRP, and SAWQP have combined to save almost 3 million tons of topsoil annually in Bannock County. There is also anecdotal evidence of improvement. Bannock County in 1994 spent $30,000 on flood damage to roads, an 80 percent reduction from $150,000 spent 10 years previous on road maintenance (letter from Bill Aller, Bannock County Highway Department, to Portneuf Soil and Water Conservation District, 23 February 1995). Much of that savings was attributed to water conservation projects implemented by agriculture.

The existing status of the Portneuf River is evidence that current practices will not improve water quality to the degree that all beneficial uses will be supported in the very near future. Implementation of appropriate Best Management Practices could result in the reduction in some pollutants (e.g., oil and grease) in a relatively short time. However, control of sediment will require a much longer time frame.

Efforts Funded by BPA through the Columbia Basin Fish and Wildlife Program

Idaho Department of Fish and Game and the Shoshone-Bannock Tribes

The Southern Idaho Wildlife Mitigation Implementation Project (Project) is implemented by the IDFG and SBT. The Project is designed to protect, enhance, and maintain wildlife habitats to mitigate construction losses for Palisades, Anderson Ranch, Black Canyon and Minidoka hydroelectric projects in the Middle and Upper Snake River Provinces. Table 35 provides an overview of Project implementation through calendar year 2000.

Table 35. Southern Idaho Wildlife Mitigation Implementation in the Upper Snake River subbasin, Idaho.

Project Name	County/Dam	Year	Managers	Acres	HEP	HUs
Soda Hills	Caribou/Palisades	1998	SBT, IDFG	2,563	Yes	3,896
Big Cottonwood	Cassia	1998	IDFG	230	Yes*	122
Rudeen	Power/Minidoka	2000	SBT	2,450	No	2,002

*Fieldwork completed, data analysis in progress.

Soda Hills Project (No. 00000656-00001)

Biologists conducted mule deer population surveys (aerial trend and herd composition counts) over an extensive area that included the Soda Hills Project. Biologists and volunteers also trapped and radio-collared 25 mule deer fawns in Idaho Ranch Canyon (the western portion of the property) as part of an ongoing statewide fawn mortality research project.

The IDFG monitors off highway vehicle (OHV) use as motorized access to this area continues to cause considerable disturbance to big game. The Soda Hills Project is included in a larger area closed to shed antler collecting during part of the year to minimize human disturbance of big game while they are on their winter range.

Big Cottonwood Wildlife Enhancement Project (No. 00000644-00001)

Weed infestations were located and treated throughout the BCWMA. Project and shrub-steppe restoration efforts have been completed on the 50-acre area. Monitoring indicates emergence of desirable native plant species has been low due to competition from weedy annuals and two consecutive years of drought during the growing season. Managers will continue monitoring in spring 2001.

The 30-acre shrub-steppe rehabilitation area was burned and treated with herbicide to control cheat grass in fall 1999. The area was seeded with a grass/forb mix in fall 2000. Sagebrush seed from adjacent shrub-steppe sites will be collected and seeded over snow in December 2001. Plant emergence and species composition will be monitored each spring.

Pasture rehabilitation was initiated in 2000 as part of the first phase of Big Cottonwood Creek riparian restoration. A 20-acre parcel was chemically treated, mowed, and no-till seeded. Stand establishment was low due to drought and a lack of irrigation water. The parcel will be evaluated in spring 2001 and likely reseeded in fall 2001. A severely downcut segment of the creek was stabilized using juniper revetments. Native willow species, collected on site, were planted throughout the stream segment. Preliminary observations indicate bank stabilization efforts were effective and willow establishment was good. Plans are being finalized to complete

the next phase (spring 2001) of riparian restoration on a 300-foot segment of the creek impacted by agricultural development.

Riparian vegetation monitoring, using established USFS protocol, was conducted in 2000 at nine permanent transects along Big Cottonwood Creek. Results indicate continued improvement in riparian vegetation condition. Recruitment of woody vegetation (primarily willow and cottonwood species), stream sinuosity, bank stabilization, and flood plain width had improved in areas previously impacted by domestic livestock grazing and diversion of water for irrigation. In addition, avian point-count surveys were conducted in 2000 at permanent locations along Big Cottonwood Creek. Qualitatively, results indicate species diversity and abundance are increasing as riparian health improves.

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

None reported.

Results and Accomplishments

None reported.

Subbasin Management

Existing Plans, Policies, and Guidelines

Federal

U.S. Fish and Wildlife Service

Within the Upper Snake River subbasin, several branches of the USFWS are active, including Law Enforcement, Ecological Services Office, Fisheries, and National Wildlife Refuges. The mission statement of the USFWS states, "The U.S. Fish and Wildlife Service's mission is, working with others, to conserve, protect and enhance fish, wildlife, and plants and their habitats for the continuing benefit of the American people."

Law Enforcement

Law enforcement activities focus on potentially devastating threats to wildlife resources such as illegal trade, unlawful commercial exploitation, habitat destruction, and environmental contaminants.

The National Wildlife Refuge System

The National Wildlife Refuge System is national network of lands and waters established for the conservation and management of fish, wildlife and plant resources and their habitats. There are two refuge units located within the Upper Snake River subbasin, including the Minidoka National Wildlife Refuge and Grays Lake National Wildlife Refuge.

Fisheries

The Idaho Fisheries Resources Office provides assistance to the State of Idaho, Native American Tribes, and other interested entities to encourage cooperative conservation, restoration, and management of the fishery resources of the State of Idaho. A primary area of work includes evaluation and fish management planning for the three federal hatcheries in Idaho, including Dworshak, Kooskia, and Hagerman National Fish Hatcheries. The USFWS compiles the information base to assess how each of these three hatchery facilities are meeting established mitigation goals. Our office also helps set up and design studies to evaluate hatchery effectiveness and various management scenarios. The office also works with the IDFG, Washington Department of Fish and Wildlife, IPC, NMFS, USGS-Biological Resource Division, the Nez Perce and SBT in evaluation of various fish management programs in the Snake River Basin.

Ecological Services

The USFWS Ecological Services Office operates under a number of authorities and through a number of programs, including:

Endangered Species

The USFWS and the NMFS, share responsibility for administration of the ESA. The ESA directs these agencies to identify species whose status warrants listing as endangered or threatened, develop and implement recovery programs for listed species, work with state resource agencies and federal agencies to protect and recover listed species, and to implement a program to permit certain activities with listed species.

Environmental Contaminants

Contaminants specialists focus on detecting toxic chemicals; addressing their effects; preventing harm to fish, wildlife and their habitats; and removing toxic chemicals and restoring habitat when prevention isn't possible. They are experts on oil and chemical spills, pesticides, water quality, hazardous materials disposal, and other aspects of pollution biology.

Partners for Fish and Wildlife

Offers technical and financial assistance to private (non-federal) landowners to voluntarily restore wetlands and other fish and wildlife habitats on their land. The USFWS also provides biological technical assistance to U.S. Department of Agriculture agencies implementing key conservation programs of the Farm Bill.

Federal Projects

The USFWS evaluates the impacts of water resource development projects on fish and wildlife; makes recommendations to mitigate (avoid, reduce and compensate for) these impacts and enhance fish and wildlife; and provides technical assistance to private individuals, organizations, and businesses regarding project impacts.

Natural Resources Conservation Service

The NRCS is an agency with professionally staffed field offices serving Bannock, Bonneville, Blaine, Camas, Cassia, Gooding, Jefferson, Jerome, Lincoln, and Power 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 the CRP, Public Law 566 (P.L. 566 Small Watershed Program), River Basin Studies, Forestry Incentive Program (FIP), WHIP, Environmental Quality Incentives Program (EQIP), and WRP.

Tribal Government

The Shoshone-Bannock Tribes

The SBT have off-reservation treaty rights under the 1868 Fort Bridger Treaty, 15 Stat. 673, as reaffirmed in State v. Tinno, 497 P.2d 1386, 94 Idaho 759 (1972). As set forth under this decision, the SBT have the right to hunt, fish and gather on unoccupied lands of the United States. The Idaho Supreme Court has defined unoccupied lands to include state public lands as well, which would include the navigable waterways of the State of Idaho, including the Snake River.

The SBT understand that the treaty-guaranteed land base is the core and integral foundation of tribal existence and is crucial to its autonomy as a sovereign nation. Accordingly, the SBT successfully undertook a land acquisition program to purchase fee lands located within the reservation from monies received in their land claims settlement. Today, the Fort Hall Indian Reservation is comprised of 96 percent tribal/trust lands and individual tribal members and non-indians hold the remaining 4 percent in fee. The reservation population is approximately 5,500 with the tribal resident membership at approximately 3,600. The SBT's territory forms a sizable geographic area for the exercise of jurisdiction, supports a residing population, is the basis of the tribal economy, and provides an irreplaceable forum for cultural vitality based on religious practices and cultural traditions premised on the sacredness of land.

Since 1975, the SBT have demonstrated a long-range commitment to preserving and enhancing the air, water, open space, and quality of life for present and future generations of the tribes who reside on the tribal homelands. The tribal government has established environmental protection, land use, fisheries, fish and game, cultural resources, and natural resources departments funded by the EPA, BPA, and Department of Energy. Tribal programs are also funded by the tribal license and permit fees set forth in various ordinances and codes.

State Government

Idaho Department of Fish and Game

Idaho Code Section 36-103 contains the fish and wildlife policy of the State of Idaho.

> "All wildlife including all wild animals, wild birds, and fish, within the state of Idaho, is hereby declared to be the property of the state of Idaho. It shall be preserved, protected, perpetuated, and managed. It shall only be captured or taken ata such times or places, under such conditions, or by such means, or in such manner, as will preserve, protect, and perpetuate such wildlife, and provide for the citizens of this state and, as by law permitted to others, continued supplies of such wildlife for hunting, fishin and trapping."

The IDFG was provided statuatory authority via the Idaho Fish and Game Commission and the Director of the IDFG to fulfill this policy. A series of plans direct the management of fish and wildlife resources by the IDFG. *The Fisheries Management Plan 2001-2006* provides policies, management goals, and program direction for fisheries resource acitivities. Fishery management plans by drainage address specific management direction for individual water bodies and inculude those waters within the drainage areas of the Upper Snake, Portneuf and Blackfoot rivers subbasins of this effort. Drainage areas of reference include Main Snake River-C.J. Strike Reservoir to Lake Walcott; Salmon Falls Creek, Goose Creek, Rock Creek, and Raft River Drainages; Snake River-Lake Walcott to confluence of South Fork and Henrys Fork; Portneuf River Drainage; and Blackfoot River and tributaries.

The State Water Plan was "formulated for the conservation, development, management and optimum use of all unapproriated water resources and waterways of this state in the public interest [Idaho Code 42-1734A]." Included in the plan are statements of objectives and policies for water use, conservation, protection, management and river basins. *The State Water Plan* provides direction and opportunity for maintaining "and, where possible, enhancing water quality and water related habitats….and assuring that due consideration is given to the needs of fish, wildlife, and recreation in managing the water resources of the state."

Idaho Soil Conservation Commission

The ISCC was created in 1939 from Idaho legislation originated to deal with the soil erosion crisis of the Dust Bowl. Today, the ISCC'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 ISCC consists of five members appointed to five-year terms by Idaho's Governor. The ISCC 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 ISCC 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). The ISCC 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).

Local Government

Soil and Water Conservation Districts

Soil and water conservation districts (Districts) 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. 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 to promote resource conservation implementation. Districts are active in the Idaho TMDL process and are the lead agency for TMDL implementation plans on private agriculture and grazing lands.

Each District in the subbasin receives 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 (ISCC) and other funding agencies, institutions or organizations. Working cooperatively with other entities, Districts provide technical assistance to agriculturists and other private landowners based on long-standing agreements with the NRCS, ISCC, Idaho Association of Soil Conservation Districts and other federal and state agencies.

Districts develop five-year *Resource Conservation Plans* to manage conservation efforts throughout their district, updating the plan annually. Goals, objectives, and tasks are prioritized and specified for resources (e.g., erosion control, water quality, soil health, irrigation water management, fish and wildlife habitat, public outreach program), and areas of concern.

Goals, Objectives, Strategies, and Recommended Actions

Fisheries

Idaho Department of Fish and Game

The Wildlife Policy of Idaho and mission statement for the IDFG is contained in Idaho Code, Section 36-103, which states,

> "All wildlife, including all wild animals, wild birds, and fish, within the state of Idaho, is hereby declared to be the property of the state of Idaho. It shall be preserved, protected, perpetuated, and managed. It shall be only captured or taken at such times or places, under such conditions, or by such means, or in such manner, as will preserve, protect, and perpetuate such wildlife, and provide for the citizens of this state and, as by law permitted to others, continued supplies of such wildlife for hunting, fishing, and trapping."

In order to accomplish IDFG's mission to preserve, protect, perpetuate and manage fish and wildlife resources and to provide for their use by the public, the following guiding principles have been developed:

Management

1. The IDFG will advocate that fish and wildlife receive equal treatment with all other resources in land and water management decisions.

2. The fish and wildlife resources of Idaho belong to the residents of the State and, while national interests will also be considered, these resources will be managed for the recreational and other legitimate benefits that can be derived primarily by the residents of Idaho.

3. Fish and wildlife management will be designed to provide a variety of consumptive and nonconsumptive recreational opportunities, as well as scientific and educational uses.

4. Fish and wildlife habitat and populations will be preserved, protected, perpetuated, and managed for their intrinsic and ecological values, as well as their direct benefit to man.

5. The IDFG will support sport fishing, hunting, and trapping as traditional and legitimate uses of Idaho's fish and wildlife resources.

6. The IDFG will manage wildlife at levels that provide for recreational opportunity but do not result in significant damage to private property.

7. The IDFG will use the best available biological and sociological information in making resource decisions and supports research efforts to provide state-of-the-art techniques and data.

Habitat Protection

- The IDFG will actively support and participate in efforts to protect or enhance the quality of water in Idaho's lakes, rivers, and streams.

- The IDFG will oppose legislation, land and water use activities, policies or programs that result in significant and unwarranted loss of fish and wildlife habitat or populations and will advocate project designs that minimize or eliminate such losses.

- The IDFG will advocate strictly-controlled use of pesticides and other substances that can result in direct or indirect mortality to fish or wildlife and their replacement with less toxic materials or elimination wherever possible.

Mitigation

- Whenever unavoidable fish and wildlife habitat or population losses occur, the Department will, where practical and legally possible, actively seek compensation under the following guidelines:

- For long-term losses caused by habitat elimination or degradation, compensation by acquisition and improvement of alternate habitat will be sought rather than monetary restitution. Compensation must be permanent and include funding necessary for annual

operations, maintenance, and monitoring if these are required to insure that target goals for fish and wildlife benefits are achieved.

- Monetary restitution, based on costs to replace lost resources, will be sought for losses caused by direct mortality if replacement of animals is not feasible.

- Whenever possible, replacement of losses will be by the same fish and wildlife species or by habitat capable of producing the same species that suffered the loss, and compensation programs will be located in the immediate area of loss.

- Offsite locations and different species may be substituted in compensation programs if "onsite" and "in kind" compensation is not possible.

- Compensation levels will be based on loss of habitat and loss of potential for fish and wildlife production and recreation rather than numbers of animals or days of use of animals occurring at the time of loss.

- In jointly funded projects requiring fish and wildlife mitigation, participating entities will share mitigation credit proportional to their contribution.

The State of Idaho's *Fisheries Management Plan for 2001-2006* provides fisheries management goals, including:

1. Increase sport-fishing opportunities in Idaho.

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

3. Maintain or enhance the quality of fish habitat.
4. Fully utilize fish habitat capabilities by increasing populations of suitable fish species to carrying capacity of the habitat.

5. Maintain or improve angler success rates for fishable species.

6. Maintain or restore wild native populations of fish in suitable waters.

Direction for habitat protection objectives of the IDFG shall be to:

1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features and processes necessary to ensure protection and restoration of the aquatic systems.

2. Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplain, wetlands, up-slope areas, headwater tributaries, and intact refugia. These linkages must provide migration routes to areas critical for fulfilling aquatic species life history requirements.

3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, bottom configurations, and natural flow regimes.

4. Maintain and restore ground water and surface water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the ecosystem, benefiting survival, growth, reproduction, and migration.

5. Maintain and restore the sediment regime sufficient to support the aquatic ecosystem process. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.

6. Maintain and restore ground water and instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be provided as needed to meet fish management goals.

7. Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering and flow, appropriate rates of surface erosion, and channel migration and to supply amounts and distributions of large woody debris sufficient to sustain physical complexity and stability.

8. Mitigation for activities that influence natural flow regimes or hydrology should include following daily and seasonal natural flow patterns.

The IDFG will encourage and actively work with land managers in the development of implementation of measures to evaluate watersheds. Watershed evaluations should:

1. Focus on ecosystem planning.

2. Describe those factors limiting aquatic habitats and the impacts of land use activities.

3. Determine local fish population species and health of the habitat.

4. Determine the physical and biological processes that effect local aquatic health.

5. Include input from local Watershed Advisory and/or citizen's groups.

6. The product of a watershed evaluation should guide and prioritize management actions, help determine aquatic and riparian management objectives, appropriate boundaries for riparian management areas, and help to prioritize restoration activities where needed.

7. The IDFG will encourage adoption of habitat and population restoration practices that will place the highest priority on protection of those habitats that provide full function for survival of all inland native fish.

The IDFG restoration goals are to:

1. Maintain options for future recovery by ensuring a secure, well-distributed, and diverse constellation of natural habitats and co-adapted populations remain in place over the long term.

2. Secure existing populations of aquatic species, including fish, and maintain the critical areas supporting healthy ecosystem functions.

3. Maintain stream flow patterns and volumes to provide fish and wildlife habitat for all life stages.

Native Salmonid Assessment Research

Goal 1. Protect and rebuild populations of native salmonids in the Middle and Upper Snake River subbasins to self-sustaining, harvestable levels.

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

Strategy 1.1. Coordinate with other ongoing projects and entities to avoid data duplication and to prioritize sampling efforts.

Strategy 1.2. Use electrofishing and snorkeling to estimate presence/absence and abundance of salmonids throughout the Middle and Upper Snake River Provinces.

Strategy 1.3. Identify, describe, and measure stream habitat and landscape-level characteristics at the fish sampling sites.

Strategy 1.4. 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 1.5. 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.

Objectives and Programs as given in the *IDFG Fisheries Management Plan* for the mainstem Snake River include:

Objective 1. Improve water quality in the Snake River for fish spawning and rearing and for recreational uses.

Program: Work with regulatory and land management agencies, irrigation companies, municipalities, Watershed Advisory Groups (WAG's), and private owners to improve water quality in the Snake River.

Program: Assist in the development of wetlands at the ends of irrigation drains and other nutrient rich water sources to filter sediments and nutrients from irrigation returns. Identify Section 319 funding opportunities and provide technical assistance to WAGs.

Objective 2. Improve water quantity in the Snake River for fish spawning and rearing and for recreational uses.

Program: Work with regulatory agencies, BOR and irrigation companies to improve water management in the Snake River to improve flows during white sturgeon spawning periods.

Program: Work with the IDWR to define conditions under which water can be diverted for aquifer recharge while not impacting fish or riparian resources.

Table 36. Fisheries management direction by water as listed by the IDFG for the mainstem of the Snake River and adjacent waters.

Water	Miles/Ac	Fishery			Management Direction
		Type	Species Present	Management	
Shoshone Falls Reservoir	1.2/60	Mixed	Rainbow trout Smallmouth bass	General	Investigate potential of catchable rainbow trout to provide fishery in high turnover reservoir. Consider stocking smallmouth bass.
Backwaters of Shoshone Falls Reservoir to Twin Falls Dam	1/	Mixed	Rainbow trout Smallmouth bass	General	Manage as a yield fishery with approximate catch rate of 0.5 fish/hour. Investigate need to supplement smallmouth bass.
Twin Falls Reservoir	1/96	Coldwater	Cutthroat trout Rainbow trout Rainbow trout x cutthroat trout hybrids	General	Emphasize protection of native cutthroat trout and rainbow trout x cutthroat trout hybrid populations. Oppose any project, which would increase size of reservoir. Manage as a unit with reach upstream to Murtaugh Bridge.

Water	Miles/Ac	Fishery			Management Direction
		Type	Species Present	Management	
Backwaters of Twin Falls Reservoir to Murtaugh Bridge	11.6/	Coldwater	Cutthroat trout Rainbow trout x cutthroat trout hybrids Rainbow trout	General	Stock fingerling cutthroat trout if necessary to improve recruitment. Emphasize maintenance of trophy fishery. Evaluate potential for improved trout management with special regulations. Evaluate potential for developing smallmouth bass fishery. Work to improve summer flows.
Murtaugh Bridge to Milner Dam	8.5/	Coldwater	Cutthroat trout Rainbow trout Smallmouth bass	General	Work on improving habitat through improved flow management. Evaluate potential for spawning in Dry Creek. Determine need for hatchery program in IPC bypass reach.
Milner Reservoir	22/3,000	Warmwater	Smallmouth bass Largemouth bass Yellow perch Brown bullhead Channel catfish	General	Emphasize establishment of self-sustaining warmwater fish species. Continue stockings of channel or blue catfish. Improve warmwater fish habitat by placing cover structures on reservoir bottom.
Backwaters of Milner Reservoir to Minidoka Dam	15/	Coldwater	Cutthroat trout Rainbow trout Smallmouth bass	General	Use fingerling program to improve recruitment. Stocking in Lake Walcott may need to be increased to improve downstream fishery. Maintain catch rate of 0.5 fish/hour. Work to improve flow management.
Lake Walcott (Minidoka Reservoir)	29/11,850	Mixed	Rainbow trout Cutthroat trout Yellow perch Brown bullhead Smallmouth bass Largemouth bass	General	Stock subcatchable or catchable rainbow trout on an annual basis. Monitor bass and trout populations and adjust management direction to conform with findings.
Dierkes Lake	/100	Mixed	Rainbow trout Largemouth bass Bluegill Smallmouth bass	Put-and-take trout Trophy General	Put-and-take for rainbow trout. Work to improve bass/bluegill fishery. Consider smallmouth bass introduction. Monitor trophy bass regulation to improve bluegill population structure.
Murtaugh Reservoir	/827	Warmwater	Channel catfish Yellow perch Brown bullhead	General	Low winter pool limits fishery potential.
Wilson Lake	/484	Warmwater	Brown bullhead Yellow perch Channel catfish Largemouth bass	General	Experimentally stock channel and/or blue catfish in lake periodically and evaluate. Continue to emphasize high quality bullhead angling in the lake. Consider other

Water	Miles/Ac	Fishery			Management Direction
		Type	Species Present	Management	
					introductions, including tiger muskie, smallmouth bass, and bluegill.
Emerald Lake	/30	Mixed	Rainbow trout Channel catfish Largemouth bass Bluegill	Put-and-take trout General	Stock regularly with hatchery rainbow trout as needed to maintain catch rate of approximately 0.7 fish/hour. Investigate methods of controlling avian predators.
Vinyard Creek	0.5/	Coldwater	Cutthroat trout Rainbow trout Rainbow trout x cutthroat trout hybrids	Wild	Preserve aesthetic qualities of area. Strongly oppose any development of trails into area. Protect unique population of cutthroat trout and hybrid trout, which spawn and rear in stream. Strongly oppose any project, which would raise height of Twin Falls Dam and inundate Vinyard Creek. Manage for 1.0 fish/hour; change regulations if necessary.

Objectives and Programs as given in the IDFG *Fisheries Management Plan* for Goose Creek and Raft River watersheds include:

Objective 1. Develop management options for fishing on cyclic walleye populations in Salmon Falls Creek and Oakley reservoirs.

Program: Establish annual monitoring programs for both reservoirs to determine year class strength of Age 1 and 2 walleye. Develop suitable biennial fishing rules based on year class strength to take advantage of strong year classes.

Objective 2. Improve forage fish populations in Salmon Falls Creek and Oakley reservoirs for walleye.

Program: Improve habitat for forage fish spawning and rearing during low water years by working with local fishing clubs to create additional vegetative structure for yellow perch spawning and rearing.

Objective 3. Protect and restore wild Yellowstone cutthroat populations in drainages above Shoshone Falls.

Program: Work with land management agencies on reestablishing watersheds and riparian habitats in drainages with recent fire damage.

Program: Work with land management agencies on improving degraded riparian habitats with the implementation of improved grazing practices.

Program: Maintain Yellowstone cutthroat trout genetic integrity by stocking only sterile rainbow trout in cutthroat drainages.

Program: Work with local WAGs to improve water quality and reduce sediment loadings.

Program: Identify Section 319 funding opportunities to improve water qualilty.

Objective 4. Protect leatherside chub populations in Goose Creek and Raft River drainages.

Program: Provide information to land management agencies and public on identification, population status and distribution of leatherside chub in the drainages.

Program: Work with local regulatory agencies and landowners to minimize impacts of livestock grazing on riparian areas.

Objective 5. Improve water quality for fish habitat in lower reaches of streams in section.

Program: Work with regulatory agencies and landowners to reduce sediment and nutrient loads in streams flowing into the Snake River.

Table 37. Fisheries management direction by water as listed by the IDFG for tributaries to the Snake River.

Water	Miles/acre	Fishery			Management Direction
		Type	Species Present	Management	
Goose Creek from Oakley Reservoir to headwaters (within Idaho)	44/	Coldwater	Cutthroat trout Rainbow trout	Wild	Improve quality of cutthroat trout fishery. Improve catch rate to 1.0 fish/hour. Use only sterile rainbow trout in drainage. Stock only in Oakley Reservoir and Trapper Creek.
Big Cottonwood Creek from Walls Ranch to headwaters	15/	Coldwater	Cutthroat trout	Wild	Place emphasis on cutthroat trout and preservation of stream habitat. Maintain catch rate of 1.0 fish/hour.
Oakley Reservoir	/1,350	Mixed	Walleye Rainbow trout Cutthroat trout Yellow perch	General	Intensify management of walleye with annual monitoring of both walleye and forage species. Establish flexible fishing rules depending on walleye year class strength. Maintain catch rate of 0.5 trout/hour. .
Tributaries to Sublett Reservoir	30/	Coldwater	Cutthroat trout Brown trout	Wild	Manage as a wild trout fishery with emphasis on preservation of stream qualities for spawning and

Water	Miles/acre	Fishery			Management Direction
		Type	Species Present	Management	
			Rainbow trout		rearing. Consider re-establishing native cutthroat trout. Continue cooperation with USFS and Sublett Irrigation District to maintain riparian vegetation and protect stream habitat. Maintain catch rate of 1.0 fish/hour.
Sublett Reservoir	/113	Coldwater	Cutthroat trout Rainbow trout Brown trout Kokanee	General	Stock with fall fingerling cutthroat trout. Closely monitor spawning runs of rainbow trout, cutthroat trout, and brown trout for spawning success. Experiment with kokanee and evaluate. Maintain close cooperation and coordination with Sublett Irrigation District to assure public access. Catch rate of 0.5 fish/hour.
Cassia and Clyde creeks Conner to Forest boundary.	5/	Coldwater	Rainbow trout Brook trout Cutthroat trout	Put-and-take trout	Stock and evaluate return to creel. Catch rate 0.7 fish/hour.
Other streams in Raft River and Goose Creek drainages	361/	Coldwater	Cutthroat trout Rainbow trout Brook trout	Wild	Emphasize protection of native cutthroat trout in streams where present. Maintain catch rate of 1.0 trout/hour. Evaluate streams for reintroduction of native cutthroat trout. Emphasize harvest opportunity for brook trout. Work with landowners and land management agencies to improve habitat.
Independence lakes #1 and #2	/28	Coldwater	Cutthroat trout Rainbow trout Arctic grayling	General	Stock cutthroat trout every three years and Arctic grayling as available in Independence #2. Catch rates of 0.7 fish/hour. Support USFS policy of non-motorized access only.

Wildlife

None reported.

Research, Monitoring and Evaluation Activities

Fisheries

BPA-funded Research, Monitoring and Evaluation Activities

Snake River Native Salmonid Assessment (Project No. 980002)

The Snake River Salmonid Assessment is an ongoing research project initiated in August 1998 to assess the current status of native salmonids in the Middle and Upper Snake River Provinces in Idaho (Phase I), identify factors limiting populations of native salmonids (Phase II), and develop and implement recovery strategies and plans (Phase III). The inventory phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the Middle and Upper Snake River Provinces, and concurrent habitat measurements are being used to 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. 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.

Results

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 Goose, Raft, Rock, Bannock, Portneuf, Blackfoot. 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). 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 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 Research, Monitoring and Evaluation Activities

None reported.

Wildlife

BPA-funded Research, Monitoring and Evaluation Activities

None reported.

Non BPA-funded Research, Monitoring and Evaluation Activities

None reported.

Statement of Fish and Wildlife Needs

Fisheries

- Continue to inventory native salmonids in the Upper Snake River Province to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation.
- 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.
- Develop genetic-DNA markers for redband trout so that the degree of introgression with introduced rainbow trout can be quantified and the degree of variability between and among populations of redband trout can be determined.
- Continue coordinated collection of water temperature data throughout the Upper Snake River subbasin.
- Minimum instream flow study for winter habitat and trout production in the Snake River below American Falls Reservoir, and a conceptual plan and strategy for providing that winter flow.
- Minimum fishery pool study for sustained trout production in American Falls Reservoir and a conceptual plan and strategy for providing that minimum fishery pool.
- Minimum instream flow study for winter and late summer habitat and trout production in the Snake River between American Falls Reservoir and Gem State dam, and a conceptual plan and strategy for providing those minimum flows.

Wildlife

- Life history study of the ecology of remnant sage grouse populations in the Blackfoot River and Portneuf River subbasins, including recommendations and strategy for restoring these populations.

Snake Upper Subbasin Recommendations

Projects and Budgets

Continuation of Ongoing Projects

Project: – 199505702 – Southern Idaho Wildlife Mitigation – Upper Snake

Sponsor: **Shoshone Bannock Tribe**

Short Description:

Protect, enhance, restore and maintain wildlife habitats to mitigate for construction losses at Palisades and Minidoka dams.

Abbreviated Abstract

Historically the Columbia River Basin (Basin) supported numerous populations of anadromous and resident fish and abundant wildlife. The development and operation of hydroelectric dams on the Columbia River and its tributaries has contributed to the decline of fish and wildlife populations throughout the Basin. In 1980, Congress passed the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Act) (Public Law 96-501). The Act established the Northwest Power Planning Council (Council) and directs the Council to prepare a program to protect, mitigate, and enhance fish and wildlife affected by hydroelectric projects in the Columbia River Basin. The Council implements the Columbia River Basin Fish and Wildlife Program (Program) to address fish and wildlife impacts and to ensure that wildlife receives equitable treatment in matters concerning the hydropower system.

SIWM-US is an ongoing mitigation project that is consistent with the Council's Fish and Wildlife Program. Southern Idaho Wildlife Mitigation - Upper Snake (SIWM-US) is an ongoing programmatic project derived from the Southern Idaho Wildlife Mitigation (SIWM) project. The Southern Idaho Wildlife Mitigation - Upper Snake project will continue to implement SIWM wildlife mitigation actions in the Upper Snake Province. The Northwest Power Planning Council's Fish and Wildlife Program currently includes the Minidoka and Palisades hydropower projects in the Upper Snake Province.

The total unannualized habitat losses estimated by biologists for the Minidoka and Palisades projects combined is 47,573 HUs. Projects implemented by SIWM through calendar year 2000 provided 17,105 HUs of mitigation credit to BPA and leaves 30,468 HUs (64%) remaining unmitigated. SIWM-US proposes to complete mitigation for construction and inundation losses by providing 22,851 HUs (3/4ths of the total remaining HUs) through protection and 7,617 HUs (1/4th of the total remaining HUs) through enhancement within 10 years (i.e., by 2013).

Large tracts of public land, as well as mitigation project lands, are in need of rehabilitation as a result of past management practices and recent wildfires. Native plants are preferred for wildlife habitat restoration and rehabilitation actions; however, the availability of native plants and seeds is unpredictable and demand often exceeds supply, especially for regionally adapted ecotypes. Often natural resource managers are not able to obtain sufficient supplies of native plant materials and end up having to use non-native plants in an attempt to control soil erosion and help prevent infestation by noxious weeds. SIWM-US proposes to

establish a plant materials center on former cropland at the Deer Parks Wildlife Mitigation Unit to provide native plants and seeds for use on mitigation units and other public and private lands.

SIWM-US proposes to develop and implement a Tier 2 level monitoring plan/ program for the Middle and Upper Snake provinces. The current monitoring program is not adequately staffed or funded.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
199206100	Albeni Falls Wildlife Mitigation	SBT and IDFG is a member of the interagency work group supporting this project and there is close coordination with both projects.

Relationship to Existing Goals, Objectives and Strategies

Historically, salmon and steelhead migrated through much of the Columbia River Basin. The Basin supported numerous populations of anadromous and resident fish and abundant wildlife. The development and operation of hydroelectric dams on the Columbia River and its tributaries has contributed to the decline of fish and wildlife populations throughout the Basin. In 1980, Congress recognized the significance of these declines and passed the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501). The Act established the Northwest Power Planning Council (Council), which is directed by the Act to prepare a program to protect, mitigate, and enhance fish and wildlife to the extent affected by the development and operation of hydroelectric projects in the Columbia River system. The Northwest Power Planning Council (Council) implements the Columbia River Basin Fish and Wildlife Program (Program) to address fish and wildlife impacts and to ensure that wildlife receive equitable treatment in matters concerning the hydropower system.

SIWM-US is an ongoing mitigation project that is consistent with the Council's Fish and Wildlife Program. SIWM-US addresses several goals of the program including, but not limited to, the following sections: Overall Vision (Section III A-1) "Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River ecosystem..."; Planning Assumptions (Section III, A-2) "This is a habitat based program, rebuilding healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them…"; Scientific Principles (Section III, B-2) Principles 1-8; Biological Objectives (Section III, C-1) "Recovery of fish and wildlife affected by the development and operation of the hydro system that are listed under the Endangered Species Act"; (Section III, C-2a.4) "Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses; Coordinate fish and wildlife activities throughout the basin…; maintain existing and created habitat values; and monitor and evaluate habitat and species responses to mitigation actions," and Wildlife (Section III, D-7) "Complete the current mitigation program for construction and inundation losses and include wildlife mitigation for all operational losses as an integrated part of habitat protection and restoration" (NWPPC 2000).

SIWM-US is a habitat protection, enhancement, and restoration project. As such, the project addresses the Council's primary wildlife strategy to complete the current mitigation program for construction and inundation losses as described in the Council's Fish and Wildlife Program (NWPPC 1995 and NWPPC 2000). Construction and inundation wildlife habitat losses associated with the Minidoka and Palisades projects have been identified (Martin et al.1989;

Sather-Blair et al 1985) and are now listed in Appendix C, Table 11.4 of the Council's Fish and Wildlife Program (NWPPC 2000).

The subbasin summaries for the Upper Snake Province (Isaeff et al. 2001; Gregory et al. 2001; Reynolds et al. 2001; Stovall 2001) describe the limiting factors affecting fish and wildlife populations within the province. In general, habitat-related issues encompass the primary limiting factors for fish and wildlife. These habitat issues fit into several non-exclusive categories: loss, degradation, fragmentation, quantity, and quality (Gregory et al. 2001).

Stovall (2001) noted that most of the native wildlife habitat found in the Upper Snake River Subbasin has been lost through conversion to agriculture, and livestock heavily impact what is left.

In the Snake Headwaters Subbasin, altered flood regimes minimize the potential for large flood events that are required for the regeneration of cottonwood gallery forest along the South Fork Snake River. Lack of regeneration threatens one of the last remaining intact globally-threatened narrow-leaf cottonwood/red-osier dogwood communities left in the western U.S. as well as habitat for the Ute ladies' tresses (*Spiranthes diluvialis*), listed as threatened under the Endangered Species Act (Isaeff et al. 2001). Isaeff also notes that agricultural conversion of native grasslands and aspen forests along the Snake River significantly limits habitat availability and travel cover for grassland species and large mammals. The Natural Resource Conservation Service (NRCS) has identified agriculture, grazing and loss, and degradation of functional riparian areas and wetlands as limiting factors affecting fish and wildlife throughout the Snake Headwaters Subbasin (Isaeff et al. 2001). Idaho Department of Fish and Game (IDFG) wildlife habitat managers in the Snake Headwaters Subbasin have extensive noxious weed problems. Weeds such as Canada thistle, Russian knapweed, and leafy spurge are invading wet meadow areas and purple loosestrife has been found in Wildlife Management Area (WMA) marshes and in several locations along the Snake River. IDFG managers also note that water quantity and water quality are two prevalent conservation issues associated with WMA management (Isaeff et al. 2001).

Reynolds (2001) reports that IDFG considers the following to be limiting factors affecting fish and wildlife populations 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 (i.e., converting sagebrush range to non-native grasses) decrease or eliminate wildlife habitat in quality and quantity. Roads, power lines, 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 (i.e., 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 (i.e., starling, feral cat, red fox, raccoon) thrive in the subbasin. 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 (i.e., 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 that provide wildlife habitat (Merigliano 1996). 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 they spend using wildlife habitat for recreational purposes are increasing in the subbasin. Disturbance by recreational activities may displace wildlife. Recreational disturbance may include but is not limited to, motorized and non-motorized use, winter recreation, and water-related recreation.

Riparian areas and wetlands are important for both terrestrial and aquatic species. Influences that destroy or degrade riparian and wetland areas often threaten aquatic species. Reynolds (2001) reports the primary terrestrial factors that affect or threaten aquatic resources in the Medicine Lodge Creek drainage, a Closed Basin Subbasin stream (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 that 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.
- Degraded stream channels and streambanks along some streams continue to impair water quality. Many of the streams within the Upper Snake Province are on the Clean Water Act (CWA) 303(d) list for Idaho. Factors for listing include siltation, nutrients, thermal modifications, bacteria, habitat alterations, and oxygen-depleting substances (Isaeff 2001). Actions taken to improve water quality often have positive impacts to wildlife habitat. For example, streambank erosion control is needed to reduce total maximum daily load (TMDL) in the Little Lost River, a Closed Basin Subbasin stream with a population of bull trout

(Reynolds 2001). Reducing streambank erosion through better riparian vegetation management will benefit both aquatic and terrestrial species.

- An estimated 386,000 acres (56 percent) of wetland habitat were lost in Idaho between 1780 and 1980 (Dahl 1990). Many remaining wetlands have been degraded by actions such as hydrologic alteration and impacts to vegetation and soils, reducing wetland function. Less than 4 percent of the wetlands in the Henrys Fork basin and approximately 22 percent in Southeast Idaho basins have protection beyond the regulatory provisions of the CWA. Most of the protected wetlands are in the emergent vegetation category. Deciduous forested wetlands, non-willow shrub wetlands, and peatlands are currently under-protected and should be of high priority for conservation activities (Jankovsky-Jones 1996, 1997).

Review Comments

With the acquisition having been completed, the proposed work provides for ongoing O&M activities. Project sponsors indicate credits will be applied to Palisades and Minidoka.

Budget

FY2003	FY2004	FY2005
$3,592,141 Category: High Priority Comments: None	$5,030,256 Category: High Priority	$4,960,284 Category: High Priority

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Sponsor: Shoshone Bannock Tribes

Short Description:

Provide conditions to maintain a self-perpetuating Tribal subsistence and trophy trout fishery through implementation of habitat restoration, enhancement and protection activities on the Fort Hall Indian Reservation.

Abbreviated Abstract

Streams on the Fort Hall Reservation have suffered from decades of unrestricted grazing and rapid flooding and drafting of American Falls Reservoir. Negative impacts from loss of bank vegetation and resultant lateral scouring and downcutting of streambanks include: siltation of spawning gravels, loss of object cover and pool depth, increasing width to depth ratios of stream channels and resulting increases in water temperature. The primary goal of the project is to facilitate recovery of native fish and wildlife populations to near historic levels on the Fort Hall Reservation. Enhancement and restoration techniques thus far have included use of instream structures to provide cover for fishes and direct flow from unstable streambanks (i.e. rock and wood wing dams and barbs), sloping of streambanks, revegetation with native riparian species and fencing of project areas and sensitive riparian areas. Since 1992, overall fish population densities have increased seven fold from pre-project levels in Clear Creek. Stream depth has increased significantly in project areas, and new areas of clean spawning gravels have been created. Many areas of actively eroding streambank have been stabilized, revegetated and protected with exclosure fencing. Monitoring and evaluation since project inception in 1992 has included collection of baseline and annual data on relevant biotic and abiotic variables, including fish community composition, biomass and densities, invertebrate community composition and densities, channel morphology, riparian health, and water quality parameters.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
Not applicable	Not applicable	Not applicable

Relationship to Existing Goals, Objectives and Strategies

Council's 2000 Fish and Wildlife Program

This project addresses the following objectives from the Council's 2000 Fish and Wildlife Program. How these objectives are addressed are in italics.

Overarching Objectives.

- ✕ A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife.----*The primary goal of this project is to protect and restore Snake River basin ecosystems to normative conditions which support diverse native assemblages of aquatic life. These goals are achieved through on the ground protection/restoration activities and collaboration with other private, state and federal stakeholders on achieving desired habitat conditions.*
- ✕ Mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem.----*This project provides direct mitigation*

for damage to riverine ecosystems in and along the Upper Snake River by operations of Palisades and American Falls reservoirs.

- ✕ Sufficient populations of fish and wildlife for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest.---- *This project indirectly increases numbers of fish on and off the Fort Hall Indian Reservation and provides for treaty right harvest of native and non-native fishes under the Fort Bridger Treaty of 1868. In addition, benefits to spring creek fisheries on the Fort Hall Bottoms directly enhance off Reservation harvest in the Snake River and American Falls Reservoir by providing cold water refugia and spawning and rearing habitat.*

Objectives for Biological Performance
Resident Fish Losses

- ✕ Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health and diversity of all species including game fish species, non-game fish species, and other organisms.----*This project helps link both land and water as ecosystem elements through protection and restoration of riparian areas and fish habitat on and off the Fort Hall Reservation.*
- ✕ Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the hydrosystem.---- *This project protects and expands fish habitat and ecosystem functions through restoration/enhancement activities. Monitoring of key habitat elements throughout the project's history has allowed adaptive management and refinement of techniques to significantly effect abundance and productivity of fish.*
- ✕ Achieve population characteristics of these species within 100 years that, while fluctuating due to natural variability, represent on average full mitigation for losses of resident fish.----*Protection of riparian areas from livestock grazing with fencing and altered grazing regimes (and attitudes) is fundamental to this restoration project. Continued protection will, over the long term, allow for natural variability of resident fish populations and provide conditions conducive to perpetuation of native fish assemblages.*

Upper Snake Subbasin Summary

This project addresses several major limiting factors to native fishes outlined in the subbasin summary, specifically, riparian and stream channel disturbance from livestock grazing and agricultural practices. In addition, other anthropogenic disturbances resulting in altered flow regimes have limited maintenance and recovery of native fish species in the basin. This project addresses restoration of altered habitat through protection and restoration projects (fencing, rest-rotation grazing schemes, and riparian revegetation). In addition, project funds are used to collaborate with other managers in the basin to pursue goals related to hydrosystem operation and agricultural diversion screening for the benefit of fish and wildlife. Work continues on other limiting factors crucial to recovery of native Yellowstone cutthroat trout, including introgression and competition with exotics.

Review Comments

CBFWA questions the rationale used to select and prioritize the various enhancement projects. It was clear that monitoring and evaluation of projects is occurring; however, it was not clear

how disturbances elsewhere in the subbasin are affecting the completed habitat projects and what strategies are being used to protect past and future investments.

Budget

FY2003	FY2004	FY2005
$ 175,000 Category: High Priority Comments: None	$ 179,000 Category: High Priority	$ 183,000 Category: High Priority

Project: 33001 – Assessment of genetic population structure and risk of introgression and hybridization to native trout in the Middle and Upper Snake River provinces

Sponsor: Idaho Department of Fish and Game (IDFG) – Idaho Office of Species Conservation and University of Idaho

Short Description:

Detect and quantify levels of hatchery produced O. mykiss introgression within, and assess genetic diversity and genetic population structure of native Yellowstone cutthroat trout and redband trout in the Middle and Upper Snake River Provinces.

Abbreviated Abstract

This project seeks to detect and quantify levels of introgression from hatchery produced *O. mykiss* within native Yellowstone cutthroat trout populations and native redband trout populations. This project will also assess genetic diversity and genetic population structure within Yellowstone cutthroat and redband trout throughout the Middle and Upper Snake Provinces. This project will provide the genetic information fisheries managers to assess risk, and to protect and restore these two ecologically and economically important native species. Specifically, this genetic information will assist in prioritization of populations for conservation and management purposes, as well as identifying suitable populations for translocations, reintroduction's, and all currently proposed or ongoing broodstock development programs.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
33010	Shoshone-Bannock Tribes Fish Production Program	This project will share genetic results to allow a complete and comprehensive analysis of genetic population structure of redband trout populations throughout the Middle and Upper Snake River Provinces.
199800200	Snake River Native Salmonid Assessment	This project will provide population information to prioritize populations/sample locations for further genetic study. This project will also provide non-lethally collected fin tissue for genetic analysis.

Relationship to Existing Goals, Objectives and Strategies

The rationale behind this project is to provide critically needed genetic information to aid state and federal agencies in the protection, restoration, and prioritization of native resident trout populations in the Upper and Middle Snake River Provinces. The genetic information obtained from this project will directly assist managers in meeting the goals and objectives for resident fish outlined in the 2000 Fish and Wildlife Program (NPPC 2000) that state:

"Restore native resident fish species (subspecies, stocks and populations) to near historic abundance throughout their historic ranges where original habitat conditions exist and where habitats can be feasibly restored."

And:

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

This project also addresses goals and objectives directly outlined for resident fish in the 1994 Fish and Wildlife Program (FWP), Section 10 (NPPC 1994) or goals and objectives that the Council "believes should be applied to resident fish" (Section 7.1). The 1994 FWP states that a:

"Thorough and comprehensive approach to conserving genetic diversity is needed for native species" (Section 10.2B)

And requests a recommendation for the:

"Approach to identify provisional genetic conservation units for production and harvest, and rules for taking action with regard to those conservation units" (Section 7.1B.1).

Numerous additional state and regional conservation and management summaries have identified the need for genetic information with regards to hybridization and introgression, genetic diversity, and genetic population structure of native resident trout populations. The most notable examples of these requests for genetic information are outlined below:

1. **Middle and Upper Snake River Basin Summaries 2001 (NPPC 2001).**

The Statements of Fish and Wildlife Needs in the Subbasin summaries for the Middle and Upper Snake Provinces clearly identify the need for the genetic work outlined in this proposal:

"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 *Oncorhynchus* populations throughout the middle and upper Snake River provinces should allow a better assessment of the impacts of past hatchery produced *O. mykiss* introductions and allow a better evaluation of the possible future genetic risks native Oncorhynchus populations face with regards to hybridization and introgression."

"Develop genetic-DNA markers for redband trout so that the degree of introgression with introduced rainbow trout can be quantified and the

degree of variability between and among populations of redband trout can be determined."

2. **Memorandum of agreement for conservation and management of Yellowstone cutthroat trout among Montana, Idaho, Wyoming, Nevada, Utah, U.S. Forest Service, Yellowstone National Park, Grand Teton National Park (MOA 2000).**

This memorandum of agreement between the above resource agencies explicitly states as its' goals and objectives that the agencies:

> "Ensure the persistence of the Yellowstone cutthroat subspecies within its historic range. Manage YCT to preserve genetic integrity and provide adequate numbers and populations to provide for protection and maintenance of intrinsic and recreational values associated with the fish."

"Identify genetic purity of existing populations. Prioritize populations based on genetic purity, population size, unique characteristics, and management goals. Secure and if necessary enhance all known and suspected genetically pure YCT populations, and high priority introgressed populations."

"Increase the number of stream populations by restoring YCT within their native range."

3. **"Cutthroat Trout Management: A Position Paper: Genetic Considerations Associated with Cutthroat Trout Management. Publication Number 00-26" (UDWR 2000).**

This position paper developed by the U.S. Fish and Wildlife Service, U.S. Forest Service, Colorado Division of Wildlife, Idaho Department of Fish and Game, Montana Fish, Wildlife and Parks, Nevada Division of Wildlife, New Mexico Game and Fish, Utah Division of Wildlife Resources, and Wyoming Game and Fish Department explicitly states as its goals and objectives that:

"The primary management goal for conservation populations is to preserve and conserve unique genetic, ecological, and behavioral characteristics of the subspecies that exist on a population by population basis."

"The primary management goal for core conservation populations is to facilitate long term persistence of each subspecies in a genetically pure condition."

"Core conservation populations will serve as the primary source for gametes for introductions and re-introductions through transplants and brood stock development."

"Identification of core populations will require complete genetic analysis to validate purity."

4. **Yellowstone cutthroat trout Oncorhynchus clarki bouvieri Status Review, USDA Forest Service (May 1996).**

In this status review the author clearly outlines specific needs for Yellowstone cutthroat management including:

"Yellowstone cutthroat populations need to be screened for genetic purity. This is especially true for populations in Idaho and Wyoming where only limited testing has occurred to date."

"Information on genetic status will provide a clearer understanding of the need for protection."

"Consideration should be focused on genetic restoration of hybridized populations through repeated introductions of genetically pure individuals. Population specific genetic information will be needed to evaluate the applicability of this option."

Review Comments

This project would utilize samples that have already been collected. Information from this study is essential for the development of the Yellowstone cutthroat plan. Although the CBFWA believes the proposed work should be categorized as a "High Priority" since management efforts would benefit from the activities, the CBFWA identified four issues that need to be addressed. First, although the proposed genetic techniques are technically valid, the CBFWA suggests that using existing fin clip samples to determine population structure can be problematic due to collection design (e.g., samples need to be collected over a large area of stream and samples need to represent various age classes). Typically no more than 10 fish per 100m section of stream should be collected. In addition, lengths and sometime weights need to be collected as well. This is to ensure that adults make up the majority of samples. If only juveniles are collected from a short section of stream, in essence siblings could make up the entire sample, thus providing inaccurate population structure makeup. Samples and sample locations need to be geo-referenced. In addition, samples need to be archived for future use. This and other resident fish genetic projects need to be coordinated among all labs to determine which loci are used and to ensure that methods and techniques are the same.

Second, regarding management applications of resultant genetic data, notably lacking from the discussion is the need or potential to replace the stocking of nonnative rainbow trout with progeny from broodstock developed from pure populations of Yellowstone cutthroat trout or redband. In previous reviews the ISRP has indicated that, if a management decision is made to continue stocking fish to augment fisheries in waters inhabitable to native fishes, the brood stock source for such stocking should be from the native fishes. The proposal suggests that Idaho's stocking database may be useful in predicting hybridization and introgression levels and therefore a good predictor of genetic risks to resident trout populations from historical rainbow trout stocking. Using an historical stocking model as a guide to suggest where it may be "safe" to stock non-native rainbow trout, especially where unimpeded access (connectivity) is involved, appears to be playing with fire. Changing environmental conditions could render historic stocking/introgression risk assumptions/relationships invalid. A more comprehensive policy of using progeny from native broodstock for stocking purposes would be less risky.

Third, per the ISRP's comments, the sponsors have modified, through the "fix-it loop," their proposal to include the analysis of redband trout from Oregon waters. Although the proposal sponsors include a personal communication reference (BPT personnel) with respect to the allocation of samples from Malheur Subbasin waters, the CBFWA has identified an oversight. The Statement of Work that the BPT has submitted to BPA for Project 199701900 provides for the collection of samples (i.e., fin samples) and genetic analysis of salmonid species, which includes redband trout, from the locations identified in the revised Proposal 33001. The CBFWA suggests that the BPT should make available, if requested by the sponsors of Proposal 33001, the results from the genetic analyses (techniques used in Project 199701900 are the same as those proposed in 33001) that have and will be obtained through Project 199701900. The CBFWA believes the allocation of funds to Proposal 33001 for the analysis of samples from Oregon would result in unnecessary duplicative efforts in a province where only $500,000 is available for new work. The CBFWA suggests that funding the Oregon portion of the Proposal 33001 would create a duplication of effort and entail an inefficient use of resources. In addition,

the CBFWA expressed concern relative to the lack of coordination with the ODFW's staff, specifically their geneticist. Given the CBFWA concerns about duplicative efforts, the geneticists from ODFW, IDFG and MDFWG should meet to coordinate their efforts.

Budget

FY2003	FY2004	FY2005
$ 228,458 Category: High Priority	$ 237,596 Category: High Priority	$ 247,100 Category: High Priority

Project: – 33002 – Establish Instream Flow and Reservoir Pool Habitat for Native and Other Trout in the Upper Snake River/American Falls Fragment Area

Sponsor: **Idaho Department of Fish and Game (IDFG)**

Short Description:

Assess instream flows and American Falls Reservoir fishery pool shortfall for sustainable Yellowstone cutthroat trout and other game fish species. Identify options and long-term strategies for improving water quantities where necessary.

Abbreviated Abstract

The native distribution of Yellowstone cutthroat trout in Idaho includes the Snake River subbasin upstream from Shoshone Falls (Behnke 1992). Currently, high quality habitat for these and other trout is restricted to the Snake River above American Falls Reservoir. Degradation of the quantity and quality of habitat due to habitat fragmentation from water impoundments and diversions has resulted in reduced distribution and abundance of Yellowstone cutthroat trout. Sport fisheries for stocked exotic trout are similarly limited by degraded habitat.

Irrigation and hydroelectric dams on the mainstem Snake River and Blackfoot River define a habitat fragment for Yellowstone cutthroat trout. Trout in American Falls Reservoir are entrained downstream through the outlet works and Idaho Power Company hydroelectric turbines with annual pool withdrawal. However, the dam is not equipped for upstream fish passage. Consequently the reservoir and dam is the effective lower component of the system fragment. The fragment includes American Falls Reservoir, Portneuf River and tributaries, Fort Hall Bottoms spring streams of the Fort Hall Reservation, the mainstem Snake River upstream approximately 85 km to Gem State Dam, and the largest fragment tributary, the Blackfoot River upstream to the Government Dam (Blackfoot Reservoir).

The habitat quality of this fragment area is limited by heavily regulated stream flows by dams and diversions and periodic reservoir pool reduction. Minimum fishery flows for the Snake River above and below American Falls Dam and the Blackfoot River below Blackfoot Reservoir are non-existent. American Falls Reservoir does not have a minimum fishery pool. Frequent biologically dewatered conditions occur which prevents consistent production of mature cutthroat trout for tributary migration and spawning. Hatchery trout cannot provide a consistent sport fishery.

This project will pursue the goal of increased instream flows and a minimum viable fishery pool at American Falls Reservoir. It will focus efforts to gather water management and delivery information, undertake instream flow incremental methodology studies and develop

options for providing the water necessary and consistent with Idaho water law. The proposal supports Section 10.5B.1 of the Fish and Wildlife Program that calls for the "investigation of the life history, habitat needs and threats to persistence of native salmonids upstream of Hells Canyon Dam." Outcome of the study and strategy development will open the door to instream flow and American Falls Reservoir minimum fishery pool conditions that will restore conditions capable of sustaining Yellowstone cutthroat trout and other trout.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
9201000	Habitat Restoration/Enhancement Fort Hall Reservation	Streams on the Fort Hall Reservation connect directly to American Falls Reservoir and have been affected by American Falls dam construction and operation.
980002	Snake River Native Salmonid Assessment	Important populations of Yellowstone cutthroat trout have been verified in this fragment area. Reservoir and mainstem rearing of large cutthroat to maturity for tributary spawning will enhance this species. Other game fish will proper.

Relationship to Existing Goals, Objectives and Strategies

The project addresses principles of the 1994 Fish and Wildlife Program as outlined in Section 10.1A. That section calls for the protection, mitigation and enhancement of resident fish populations affected by construction and operation of dams. The Fish and Wildlife Program recognizes the importance of water quantity and quality as components of watershed habitat objectives (FWP 7.6D), and identifies water right acquisitions as one program measure to accomplish these objectives.

The need for the project is identified within the Upper Snake River Subbasin Summary (pages 116-117):

- Minimum instream flow study for winter habitat and trout production in the Snake River below American Falls Reservoir, and a conceptual plan and strategy for providing that winter flow.
- Minimum fishery pool study for sustained trout production in American Falls Reservoir and a conceptual plan and strategy for providing that minimum fishery pool.
- Minimum instream flow study for winter and late summer habitat and trout production in the Snake River between American Falls Reservoir and Gem State dam, and a conceptual strategy for providing those minimum flows.

Because these items are linked together by Water District 1 water management and uses beyond the immediate American Falls Reservoir fragment area. Adjustments in one fragment area will affect the others. Therefore a system study including each of the three study areas in one project is appropriate.

Review Comments

None.

Budget

FY2003	FY2004	FY2005
$ 104,100 Category: Recommended Action	$ 318,800 Category: Recommended Action	$ 228,200 Category: Recommended Action

Project: – 33003 - Sage Grouse Distribution and Habitat Use in the Upper Snake River Basin, Blackfoot and Willow Creek Drainages.

Sponsor: Idaho Department of Fish and Game (IDFG)

Short Description:

Document sage grouse trends, movements, habitat use and survival to develop a recovery plan.

Abbreviated Abstract

The status of sage grouse populations and habitats has been a concern to sportsman and biologists for >80 years. Due to population and habitat declines sage grouse are being considered a candidate species for listing under the Endangered Species Act. Despite the well-known importance of this habitat to sage grouse and other sagebrush obligates the quality and quantities of sagebrush habitats have declined considerably the last 50 years. Until the early 1980's herbicide treatment (primarily with 2,4-D) was the most common method to reduce sagebrush on large tracts of rangeland. In virtually all documented cases herbicide application to blocks of sagebrush rangeland resulted in major declines in sage grouse breeding populations. Using fire to reduce sagebrush has become more common since most uses of 2,4-D on public lands were prohibited.

Most of the land area in the upper Blackfoot and Willow Creek drainages consists of a grass shrubs steppe mix and is managed by the State Land Board, BLM and private land owners. Over the years a concerted effort has been made to improve livestock forage availability by reducing sagebrush through the use of herbicides and fire. The effects of these treatments on sage grouse is not well understood, but local landowners and hunters report significantly fewer birds than were found 20-30 years ago. Little information is known about the current population. During the past 2 years through BLM challenge cost-share agreements we have used a helicopter in the spring to locate sage grouse leks, but no information is available on trends, movements, habitat use or survival. By radio collaring adult and juvenile birds we hope to answer those questions and help wildlife and land managers make informed decisions regarding habitat alterations and rehabilitation efforts.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
Not applicable	Not applicable	Not applicable

Relationship to Existing Goals, Objectives and Strategies

Through preliminary helicopter lek searches conducted over the past 2 years we can conclude that a highly fragmented remnant sage grouse population exists but additional areas need to be searched. Intensive lek searches need to be conducted and trend routes established to begin

monitoring population levels. No information regarding seasonal movements, nest success, survival or impacts from hunting or predators are available.

The area once supported a visible population of sage grouse but over the past 20-30 years an intensive sagebrush removal program has left the habitat highly fragmented. To help us better understand what can be done to rehabilitate the habitat we need to document the current population and determine how the birds are using the available habitat and what other causes may be influencing their survival.

Review Comments

None.

Budget

FY2003	FY2004	FY2005
$ 211,716 Category: Recommended Action	$ 168,300 Category: Recommended Action	$ 168,300 Category: Recommended Action

Project: – 33004 - Survival of adfluvial Yellowstone cutthroat trout in the upper Blackfoot River drainage.

Sponsor: Idaho Department of Fish and Game (IDFG)

Short Description:

This proposed project identifies which life stage survival is most limiting the population growth of Yellowstone cutthroat trout in the upper Blackfoot River drainage.

Abbreviated Abstract

Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri)* is classified by the Idaho Department of Fish and Game as a species of special concern. The upper Blackfoot River drainage supports one of Idaho's most important Yellowstone cutthroat trout (YCT) populations. Historically, the Blackfoot River run of YCT supported a tremendous fishery. In 1958, harvest in the Blackfoot River exceeded 14,000 fish. The popularity of the fishery was due in part to the large size of fish harvested (about 20% > 500 mm). During the next two decades, however, the fishery experienced precipitous declines. In 1988, harvest dropped to less than 1,000 fish. In 1990, conservation efforts began with the implementation of restrictive harvest regulations and habitat improvement projects. Currently, harvest on YCT is closed throughout the upper Blackfoot River drainage. We are optimistic that the harvest closure will stabilize the population, but a better understanding of survival at each stage of the life cycle is critical to restoration efforts. We propose a study to estimate production per female spawner (adult-to-recruit survival) and estimate survival during the reservoir rearing stage (recruit-to-adult). That basic survival information will provide a framework for restoration where managers can focus efforts on the specific life-stage with the greatest potential to enhance the cutthroat populations.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
Not applicable	Not applicable	Not applicable

Relationship to Existing Goals, Objectives and Strategies

Upper Snake Subbasin Summary

This proposal addresses the first fisheries need stated in the Upper Snake River Subbasin Summary: "Continue to inventory native salmonids in the Upper Snake River Province to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation." The work proposed here will identify critical spawning habitat in the upper Blackfoot drainage and help determine which life stage survival (recruit-to-adult or adult-to-recruit) of YCT is most limiting restoration efforts.

IDFG 2001 Fishery Management Plan

One of the management objectives for the upper Blackfoot River is to "work on habitat improvement, particularly on upper valley tributaries." The work proposed here will help prioritize habitat improvement projects by identifying important spawning and rearing locations.

Review Comments

This work will allow for the collection of survival/mortality data which is needed for developing management strategies for this species.

Budget

FY2003	FY2004	FY2005
$ 137,500 Category: recommended action	$ 56,650 Category: recommended action	$ 58,650 Category: recommended action

Project: 33008 - Assessing effects of Columbia River Basin anadromous fish flow management on the aquatic ecology of the Henry's Fork watershed.

Sponsor: Henry's Fork Foundation

Short Description:

This multi-partner project will assess the effects of the Columbia River Basin hydroelectric operations on aquatic ecology of the Upper Snake River Subbasin, specifically the Henry's Fork watershed.

Abbreviated Abstract

This multi-partner project proposed by the Henry's Fork Foundation in cooperation with the Idaho Department of Fish and Game will assess the effects of the U.S. Bureau of Reclamation's management of stream flows in the Henry's Fork in order to provide flows for listed species of salmon in the lower Snake and Columbia rivers. Flow augmentation for salmon, combined with the manipulation of stream flows for irrigation purposes, may be a limiting factor to the fishery and other aquatic resources in the Henry's Fork. In order to store water for flow augmentation and irrigation, the USBR controls how much water is released in the Henry's Fork during the winter storage season. The resulting low flows pose a concern to biologists who worry about the

effects on trout and trumpeter swan populations. Diversion of water for irrigation in the summer has led to concerns about elevated stream temperatures and impacts on fish. There is a lack of sufficient data, however, on how trout respond to various flow regimes and more information is needed to guide water management decisions. The focus of the project is juvenile and adult trout population dynamics in correlation with various flow regimes imposed by flow augmentation, irrigation, and hydropower. Recruitment of juvenile trout has been identified as a limiting factor and survival is correlated to stream flows and the availability of habitat. The research will assess juvenile trout populations (fall and winter), winter dispersal and survival, and recruitment of juvenile trout to the next age class. We will also estimate annual populations of adult trout in correlation to stream flows. The study will correlate estimates of age-specific abundance to observed flow management scenarios across four reaches of the Henry's Fork. This project is essential to the adaptive management of the Columbia River Basin's hydroelectric project and it is anticipated that the results can provide decision-making support for several Reasonable and Prudent Actions. The information will help agencies manage the hydrologic system to benefit salmon in the Lower Snake River and trout in the Henry's Fork.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
Not applicable	Not applicable	Not applicable

Relationship to Existing Goals, Objectives and Strategies

This project is essential to the continued and improved adaptive management of the Columbia River Basin's hydroelectric project because it fulfills two of four Overarching Objectives of the Northwest Power Planning Council's Fish and Wildlife Program. This project will assess any effect that anadromous fish flow management scenarios have on aquatic resources of the Upper Snake River subbasin. This project will assess that the Overarching Objective: "A Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife," is maintained. Further, this project specifically entails "mitigation across the basin for adverse effects to fish and wildlife caused by the development and operation of the hydrosystem," as evaluation and monitoring across the basin is necessary to assess any effect of a management action, especially within an ecosystem as large as the Columbia Basin. In particular, the Henry's Fork Foundation's project will examine the Bureau of Reclamation's Snake River Area providing 427,000 acre feet of water per year for salmon flows, the resulting winter and summer flows in the Henry's Fork, and how this effects trout populations.

This project addresses also the Program's two components of biological objectives, 1) biological performance, and 2) environmental characteristics. This project is designed specifically to "describe responses of populations to habitat conditions, described in terms of capacity, productivity, and life history diversity" (biological objective component one) and assess the environment (biological objective component two) describing the environmental conditions and changes sought to achieve the desired population characteristics. Although this project is meeting the two components for biological objectives, it does not achieve the objectives for Anadromous Fish Losses or the Substitution for Anadromous Fish Losses; however, this project meets the objective components in the plan for Resident Fish Loss, specifically this project will "maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health, and diversity of all species including game fish species, non-game fish species, and other organisms;" and "protect and expand habitat and ecosystem functions as the means to

significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the hydrosystem."

This project meets the objective to "Further development of Biological Objectives at the Basin Level." This project accomplishes this through the continued monitoring and evaluation of anadromous fish flow management on the aquatic ecology of the Upper Snake River Subbasin. Results from this project will allow informed and knowledgeable decisions to be adapted to management scenarios of effects of flow on aquatic systems in the upper subbasins, which ultimately affect water management and flow decisions throughout the Columbia River basin. Lastly, results from this project help with objectives and strategies that will be used to develop future iterations of the Upper Snake River Subbasin Plan.

It is the understanding of HFF that the Bonneville Power Administration lacks sufficient data to establish RPA actions relevant to the Upper Snake. Further, the Biological Opinion stated that because of ongoing negotiations in a general adjudication of water rights under way in Idaho, the Bureau of Reclamation (BOR) could not adequately define its proposed action to facilitate consultation for its 11 irrigation projects in the Snake River Basin. NMFS has agreed the current consultation with regard to BOR's projects in the Snake River Basin and to exclude those projects from this biological opinion. NMFS anticipated using a supplemental biological opinion on these projects before water from these projects was needed for irrigation use in the 2001-growing season.

However, because the Columbia River Basin is an ecosystem without easily separable components, results for this project can easily be incorporated and provide support in decision making of several Reasonable and Prudent Actions. Because this project will assess the effects of recently-mandated flow management scenarios of the Columbia River Basin on trout ecology of the Henry's Fork of the Snake River, it can be incorporated into many of the RPA's that are incorporating annual planning (Actions 1, 2, 3, 5, and 9) and annual operations (Actions 14, 15, 17, and 18), flow-related RPA's (Actions 28, 32, 35, 54), and subbasin plan RPA's (Actions 154) listed in the biological opinion.

Review Comments

CBFWA believes that the proposal does not address how it mitigates for losses created by the Federal Hydrosystem. The hydrologic problems in the Henry's Fork watershed are a result of over allocating water for irrigation needs and not the operations of the Federal Hydroelectric Dams. Additional monitoring will likely confirm that over-winter survival is the limiting factor, but this is already well established. Past attempts to reduce this limiting factor have had minimal success, so how will information collected result in new and innovative management alternatives? Responses to ISRP concerns link this data to reservoir operations but a long history both in the Missouri River and Columbia River basins where reservoir operators are not inclined to modify water flows for fish and wildlife unless mandated, makes this an unlikely outcome.

Budget

FY2003	FY2004	FY2005
$ 211,596 Category: recommended action	$ 203,342 Category: recommended action	$ 203,342 Category: recommended action

Project: – 33010 - Shoshone-Bannock Tribes Fish Production Program

Sponsor: **Shoshone Bannock Tribe**

Short Description:

Assess history, current status and future fish production needs of the Shoshone-Bannock Tribes in the Upper Snake Subbasin.

Abbreviated Abstract

Since 1992 the Shoshone-Bannock Tribes have pursued the construction and operation of a hatchery (project 9500600) to reintroduce native Yellowstone cutthroat trout *(Oncorhynchus clarki bouvieri)* to Fort Hall Reservation streams and supplement hybridized fisheries with limited spawning and rearing habitat. During the three step process required under the Artificial Production Program, $264,299 dollars were spent on a master plan, NEPA and design and engineering of the facility. In addition, $800,000 was authorized to purchase a hatchery property with the preferred water quality characteristics. The project received an unfavorable review by the Independent Scientific Review Panel (ISRP) and was removed from the three step funding process in 2000. The ISRP did not feel that step three documentation provided enough evidence that reintroduction of Yellowstone cutthroat trout or production for put and grow fisheries was needed for the Fort Hall Reservation or the Duck Valley Reservations. Since the unfavorable review, additional questions related to production needs in water bodies adjacent to or on the Fort Hall Reservation have come to fore. We propose a Scientific Oversight Committee be funded which will determine the history, status and future production needs in water bodies on and near the Fort Hall Reservation. Ideally, the independent committee will direct future research and production initiatives in the Upper Snake Subbasin in a holistic manner without political constraints or directives. Recommendations and findings of the committee will be incorporated into the subbasin planning process for the Upper Snake Subbasin.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
980002	Snake River Native Salmonid Assessment	Assessment of the status of native salmonids in the Middle and Upper Snake River (Idaho Fish and Game)
9201000	Habitat Restoration/Enhancement Fort Hall Reservation	Has provided bulk of data on status of Fort Hall Reservation fish populations, including Yellowstone cutthroat trout.

Relationship to Existing Goals, Objectives and Strategies

The following paragraphs address specific Fish and Wildlife Program objectives and constraints;

Councils 2000 Fish and Wildlife Program

Overarching Objectives.

- Mitigation across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem. T*his project provides direct mitigation through production initiatives for damage to riverine ecosystems and loss of productive fish habitat in and along the Upper Snake River by operations of Palisades and American Falls reservoirs.*

- Sufficient populations of fish and wildlife for abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest. *This project will define production needs in the basin to insure opportunities for Tribal trust and treaty right harvest and for non-Tribal harvest.*

Under 16 USC '839(b)(2)

- The Shoshone-Bannock Tribes (S-B) submit this proposal as a recommended component of the Planning Council's fish and wildlife program under 16 USC 839(b)(2) to protect, mitigate and enhance fish and wildlife resources. The proposal should be accepted because it satisfies the requirements of 839(b)(6) which must be followed by the Planning Council. Specifically the proposal (i) complements existing and future activities of the Shoshone-Bannock Tribes and the State of Idaho, (ii) is based upon best available science and, (iii) protects the Shoshone-Bannock federal treaty rights to hunt and fish.
- We have prepared this proposal to comply with the peer review requirements of 839(b)(10) -- namely that the project be based on sound scientific principles, benefit fish and wildlife, and have a clearly defined objective and outcome with provisions for monitoring and evaluation. Moreover, given our unique experience and expertise in Upper Snake River fish and wildlife matters, we represent to the Council that this project is necessary to achieve "equitable" treatment for fish and wildlife enhancement with other Columbia River power system purposes.

Upper Snake Subbasin Summary

Statement of Fish and Wildlife Needs

Fisheries

- Continue to inventory native salmonids in the Middle and Upper Snake River subbasins to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation. This inventory is nearly completed and will provide key information for the Scientific Oversight Committee to provide production recommendations in the Upper Snake Subbasin on and near the Fort Hall Reservation.

Review Comments

CBFWA found that it was difficult to decipher what was being proposed. Bringing a group of experts together chosen from all competing entities within a specific geographical area would provide direction for resident fish resources in the upper Snake River province; however, specific rules for who and how they will be selected, and safeguards that would ensure independence of the board are not supplied. Once established, would this group continue? If so, why were no funds allocated to out-year budgets? CBFWA believes that the general concept is good but unless the proponent provides additional detail, the current proposal is inadequate. Responses to ISRP concerns still do not provide specifics about this process. CBFWA proposes that the sponsors consult with the CDAT to develop procedures to appoint board members.

Budget

FY2003	FY2004	FY2005
$ 90,000 Category: high priority	$	$

Project: 33011 - Implementing land use for resource and community sustainability at the regional and county level.

Sponsor: Idaho Department of Fish and Game
University of Idaho
Montana State University
Idaho Office of Species Conservation.

Short Description:

Resource and community information will be assembled into a GIS decision support system to be used by county commissioners and planners in implementing land use.

Abbreviated Abstract

We will develop a technologically state-of-the-art and administratively realistic software package and computer-based system for land-use planning in Madison, Fremont, and Teton counties in Southeast Idaho. A verified inventory of aquatic, terrestrial, and physical resources, including species habitats, areas of species diversity, and linkage areas, will be developed and included in a GIS. Results of social and community resource assessments based on representative surveys, focus groups, and public forums, will also be delineated, mapped, and included in the GIS database. Applicable coverages will be developed at 1:24,000 scale. Legends and interfaces to access these coverages and view their databases will be developed. Coding, rules, and sub-models of important database elements based on sensitivity to disturbance, relative rarity, land-use type, and risk will be developed. Sensitivities and priorities will be scaled at the county and regional levels. The finalized system delivered to cooperating counties will operate on the GIS program, ArcView, for use with desktop computers. It will have a user interface that does not require prior training in GIS or biology. County planners, commissioners, and citizens will use it to obtain critical information for informed decision-making in comprehensive planning, zoning plan development or modification, and development proposal reviews and evaluations.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
199505702	Southern Idaho Mitigation	Identification and protection of important habitats
19881084	Streamnet	Use inventory data as part of the project's database.
980002	Snake River Native Salmonid Assessment	Use inventory data as part of the project's database.

Relationship to Existing Goals, Objectives and Strategies

This project will develop a database and computer-based system that will have significant and practical use for land-use planning and public participation in the study area. It also will develop a prototype, methodology, computer-based system, and public-input process that could be applied in other counties in Idaho and for watersheds across the American West.

Additionally, this project overlaps with the following programs and ongoing efforts. Its efforts and products will work to enhance or supplement these programs as described and facilitate information exchange and development as necessary.

The Southern Idaho Wildlife Mitigation Implementation Project (Project) (No. 00000386-00001) is implemented by the Idaho Department of Fish and Game (IDFG) and the

Shoshone-Bannock Tribes (SBT). The Project is designed to protect, enhance, and maintain wildlife habitats to mitigate construction losses for Deadwood, Anderson Ranch, and Black Canyon projects in the Middle and Upper Snake River Provinces. Important fish and wildlife habitats identified by this project will be considered by the SIWM mitigation project as it evaluates hydroproject mitigation.

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. This project's inventory information will be incorporated into the database to provide information on important fish distributions and habitats.

The Henry's Fork Foundation assessment of all the fish-bearing streams in the upper and lower Henrys Fork hydrologic units (Gregory 1997a, 1998a, and 2000a; Gregory and Van Kirk 1998). This study, when combined with work conducted by the U.S. Forest Service (USFS) (as reported in Jaeger et al. 2000) and the Idaho Department of Environmental Quality on Teton hydrologic unit streams provides a subbasin-wide assessment of trout distributions (Appendix A) and a nearly complete subbasin view of fish habitat. This information will be used in the database of county natural resources.

The effort of Henry's Fork Corridors Working Group is to prioritize lands and resources for conservation, which is facilitated by the Teton Regional Land Trust and many other partners. Long-term success of the working group project requires resources needed to compile and map data such as will be accomplished by this proposal.

The U.S. Fish and Wildlife Service's Rocky Mountain Population of Trumpeter Swan Working Group's draft concept plan for enhancing the Rocky Mountain Population of trumpeter swans on units of the National Wildlife Refuge System (NWR). This draft is presently out for public review. The intent of the plan is to develop integrated management objectives on NWRs and help define roles for other FWS programs with the goal for restoring the Rocky Mountain Population of Trumpeter Swan. The draft document finds that a study of all the interrelated factors (swan, vegetation, fish, river flows, ice conditions, temperatures) on the Henrys Fork is needed. The working group's
biological data will be used in this proposal and coordination between the projects will occur.

The Southeast Idaho Wetland Focus Area Wetland Conservation Plan (Plan), which was developed by the Southeast Idaho Wetland Focus Area Working Group. 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 U.S. Fish and Wildlife Service, The Nature Conservancy, Teton Regional Land Trust, IDFG, NRCS, and the Bureau of Land Management (BLM). Wetland inventories and important habitat delineation will be shared between the projects.

The Soil and Water Conservation districts (SCD), including East Side SWCD, Madison SWCD, Jefferson SWCD, and West Side SWCD. 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 this project, SCDs can provide technical assistance based on long-standing agreements with the NRCS, Idaho Soil Conservation Commission, and other federal and state agencies. (Idaho Soil Conservation Commission 2001). CRP and other inventories of these programs will be used in the databases of this project. Coordination between counties, the SWCDs, and this project will enable potential funding of

development mitigation, maintenance of open space and habitat reserves on private lands, and provide social and biological information to private landowners through the SWCD outreach.

The Idaho Bird Conservation Plan and Idaho Partners in Flight. The plan covers in detail four habitats considered the highest priority habitats for birds in Idaho: Riparian; Non-riverine Wetlands; Sagebrush Shrublands; and Dry Ponderosa Pine/Douglas Fir/Grand Fir Forests. Information in the plan and Partners in Flight cooperators will be consulted for technical assistance on this project.

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 is responsible for organizing wetland conservation efforts at the regional and local levels. This project's outputs will assist IWJV in prioritizing wetlands and important habitats for protection.

The Idaho One plan is a cooperative state effort to assist farmers in developing a conservation plan. The One plan provides information on federal and state regulatory issues, an outline for a farm conservation plan, and information (including GIS information) to farmers to help them in developing a plan. Farm conservation plans assist with water quality and fish and wildlife habitat protection and help farmers qualify for many federal programs aiding farmland conservation and BMPs, farming, and natural resource protection. Project information and products will be disseminated via the Idaho One plan to assist farmers with land and habitat conservation.

The Habitat Improvement Program (HIP) is administered by IDFG to create and improve habitat for upland game and waterfowl on public and private land. Initiated in 1987, the program is designed primarily to help private landowners in their desire to use their property to the benefit of upland game birds and waterfowl. Funded by fees collected from upland bird and state waterfowl hunting validations, landowners are provided with financial assistance for waterfowl nesting structures, wildlife ponds, irrigation systems, fence materials, food plots, and herbaceous, shrub and tree plantings to provide food, and nesting, brood-rearing, and winter cover. In counties included in this project, identified habitats for upland bird and waterfowl may be prioritized and improved through the HIP program. Nesting cover, woody cover, food plots, ponds, and nest structures are the main practices implemented.

StreamNet databases and information will be used in assembling fish distribution and habitat information for this project.

The Teton Regional Land Trust is a regionally active non-profit organization seeking to preserve fish and wildlife habitats and rural communities in the upper Snake River valley. Through stewardship, easements, and outreach; the Trust is a vitally important and active in regional resource protection.

Review Comments

The Henry's Fork watershed has a wealth of information while other watersheds have far less information to work with. The amount of work done within this watershed has clearly identified the limiting factor as over winter juvenile survival; however, the fishery continues to support heavy use so the limiting factors maybe a normal condition. Areas that are highly impacted and

are poorly studied would likely result in greater benefits to fish, fisheries, ecology of the area, and the watershed..

Budget

FY2003	FY2004	FY2005
$ 243,051 Category: high priority	$ 214,100 Category: high priority	$ 264,500 Category: high priority

Project: 33013 - Evaluation of Pisces fish protective water intake system.

Sponsor: Balaton Power, Inc.

Short Description:

Complete development and testing of the Pisces Unit in a controlled location to evaluate fish reaction and fish passage efficiency.

Abbreviated Abstract

Balaton Power, Inc (Balaton) is a Canadian-based publicly held company whose operations, site acquisition, and marketing operations are based in Boise, Idaho. Balaton has developed a unique fish passage technology, called the Pisces, which has undergone successful conceptual development and hydrologic testing. Balaton is submitting this proposal to request funding to move forward and develop a prototype Pisces for controlled testing in riverine conditions.

The Pisces is a float mounted water intake system designed to prevent induction of fish and debris into water withdrawal systems, including penstocks for hydroelectric facilities, run of river supply systems, irrigation and industrial water withdrawal systems. In addition, the Pisces is designed to create turbulent flows in the surface water layers, which attract juvenile salmonid fish and can divert them toward safe passage facilities.

The potential applications of the Pisces include:

1. Large, medium and small hydroelectric projects where the unit can be placed to not only prevent entrainment of juvenile downstream migrants but will also provide a mechanism to direct juveniles toward safe bypass.
2. Direct water withdrawal projects, such as irrigation canals, industrial water users, small hydro penstocks and others.

Scale models of the Pisces have been tested to evaluate intake sources and water flow patterns as water passes through to unit. This testing has produced positive results verifying the conceptual design of the Pisces. However, there are no formal guidelines published or agency-sponsored processes for evaluating new fish passage and protection technologies such as the Pisces. This lack of criteria and standard process for evaluating new technologies has made it difficult for Balaton to obtain support from regulatory resource agencies responsible for directly or indirectly managing fish passage. In the absences of formal guidelines Balaton has structured this proposal to follow guidelines developed by the American Fisheries Society Bioengineering Division (AFS 2000).

Balaton recognizes that new fish protection and passage technologies need to be evaluated and applied in a step-wise manner that will allow investigators and fishery managers to make application decisions using data and information from rigorous scientific assessments. Balaton

hopes that by developing the multi-agency collaborative process outlined in this proposal, it will facilitate acceptance of this technology if testing is successful.

Relationship to Other Projects

Project ID	Title	Nature of Relationship
Not applicable	Not applicable	Not applicable

Relationship to Existing Goals, Objectives and Strategies

The need for downstream passage at hydroelectric facilities for anadromous and riverine fish species is well established. A lower cost adaptable solution providing both effective downstream fish passage and water withdrawal system that will not entrain the fish species of concern would be a benefit to small hydroelectric facilities, agricultural and industrial water users. The Pisces Unit provides a potentially biologically sound, low cost, low maintenance, adaptable solution providing fish passage around hydroelectric dams and preventing fish entrainment into water intake systems

Review Comments

There appears to be a lack of coordination with IDFG and the reviewers question the lack of cost share. In addition, the reviewers question whether it is appropriate for BPA funds to be used in the development of a product that the reviewers perceive will then be sold for profit. The proposal should be submitted for consideration in the Mainstem/Systemwide Province the "Innovative" process.

Budget

FY2003	FY2004	FY2005
$ 273,500 Category: Do Not Fund		$

Research, Monitoring and Evaluation Activities

Fisheries

BPA-funded Research, Monitoring and Evaluation Activities

Snake River Native Salmonid Assessment (Project No. 980002)
The Snake River Salmonid Assessment is an ongoing research project initiated in August 1998 to assess the current status of native salmonids in the Middle and Upper Snake River Provinces in Idaho (Phase I), identify factors limiting populations of native salmonids (Phase II), and develop and implement recovery strategies and plans (Phase III). The inventory phase is being used to assess presence/absence and abundance of native salmonids in all major watersheds of the Middle and Upper Snake River Provinces, and concurrent habitat measurements are being used to 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. 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.

Results

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 Goose, Raft, Rock, Bannock, Portneuf, Blackfoot. 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); 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 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.

Habitat Restoration/Enhancemnt Fort Hall Reservation (Project No. 199201000)

Objective 1: Data collection at project locations. Variables measured in treatment and control strata in Clear Creek and Big Jimmy Creek will include stream cross-section profiles, substrate composition, bank stability, instream and riparian vegetation composition, water temperature, and invertebrate and fish population estimates. Variables measured in Spring Creek, other Bottoms streams, and select mountain streams will be similar, yet not so exhaustive (Table 1).

Task 1.1: Measure stream habitat variables in project locations for pre and post treatment evaluation (Table 1).
Variables to be evaluated will include, but not be limited to: stream channel profile, discharge, substrate composition, percent cover by cover type, bank composition/stability, pool:riffle ratio, *p*H, DO, specific conductance, Total Dissolved Solids, riparian vegetation composition, and canopy density. Substrate composition will be measured with a McNeil-Ahnell core sampler. Water temperature will be monitored with Stowaway temperature recorders.

Task 1.2: Obtain fish and invertebrate compositions, invertebrate reference collections, population estimates, genetic information (completed 2000), and trends for all streams that will be affected by habitat restoration efforts (Table 1).

A backpack electrofisher will be used to sample fish in small streams, a tote barge to sample moderately sized streams, and an electrofishing boat to sample Portneuf and Blackfoot rivers, Bannock, Spring and lower Clear creeks. Estimates will be made using the Peterson mark-recapture method from boat samples, and the Zippin multiple pass method—or modified single pass method to reduce injury (Mesa and Schreck 1989)—with the backpack and tote barge electrofishers. Invertebrates will be sampled with Serber and/or Hess samplers and Ponar substrate dredges.

Objective 2: Install habitat improvement structures to increase existing juvenile and adult salmonid habitat. Figures 1-3 show currently installed structures.

Task 2.1: Evaluate habitat enhancement projects implemented in previous years to determine which methods most effectively increased salmonid biomass, usable habitat and bank stability. Analysis of variance (ANOVA) will be used to compare pre and post treatment stream width, maximum water depth, mean water depth, maximum silt depth and mean wetted silt depth. ANOVA will also be used to compare changes in substrate pertaining to usable spawning gravel after structure placement. Species diversity indices will be used to quantify aquatic invertebrate community health. Fish populations will be sampled during spring or fall to determine which type of habitat had the greatest success increasing numbers and biomass of wild trout.

Task 2.2: Construct and install selected habitat structures in project areas. Figure 3 shows proposed installations. Unstable banks on Spring Creek, Clear Creek and Diggie Creek will be protected using simple wing dams, barbs and woody structures at multiple sites along the length of the stream. Big Jimmy, Jeff Cabin, Diggie, Kinney, Jimmy Drinks, Ross Fork, and Bannock creeks may also be treated similarly. No river mile locations are available, but project areas are parallel to Snake River miles 726 through 750.

Task 2.3: In close proximity to treatments, monitor fish populations annually revegetation mortality seasonally, and stream cross-section profiles annually or biennially for evaluation.

Task 2.4: Maintain bank and channel treatments.

Objective 3: Protect and restore riparian habitats of Reservation streams.

Task 3.1: Plant willow poles (500 spring / 500 fall) of native willow and/or cottonwood and seedlings of native riparian grasses in heavily eroded and unstable bank areas. If soil in upper banks becomes dry, water on an as needed basis.

Task 3.2: Erect fences to protect riparian areas and critical spawning habitats, yet provide adequate livestock access to water. Erect fence to protect bank revegetation where banks have been sloped. Protection enclosures will be erected on spring streams and springs Reservation wide. (approximately 0.25 miles annually).

Task 3.3: Maintain fences on an as needed basis. Enclosures will remain in place as long as necessary, until changing grazing leases or restored riparian vegetation warrant removal.

Needed Future Actions

Fisheries

- Continue to inventory native salmonids in the Upper Snake River Province to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation.
- 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.
- Develop genetic-DNA markers for redband trout so that the degree of introgression with introduced rainbow trout can be quantified and the degree of variability between and among populations of redband trout can be determined.
- Continue coordinated collection of water temperature data throughout the Upper Snake River subbasin.
- Minimum instream flow study for winter habitat and trout production in the Snake River below American Falls Reservoir, and a conceptual plan and strategy for providing that winter flow.
- Minimum fishery pool study for sustained trout production in American Falls Reservoir and a conceptual plan and strategy for providing that minimum fishery pool.
- Minimum instream flow study for winter and late summer habitat and trout production in the Snake River between American Falls Reservoir and Gem State dam, and a conceptual plan and strategy for providing those minimum flows.

Wildlife

- Life history study of the ecology of remnant sage grouse populations in the Blackfoot River and Portneuf River subbasins, including recommendations and strategy for restoring these populations.

Actions by Others

Efforts Funded Outside of the Columbia Basin Fish and Wildlife Program

Upper Snake River Subbasin

None reported.

Blackfoot River Subbasin

Idaho Department of Fish and Game

In 1996, the IDFG reconnected an unused 1.9-mile natural section of the upper Blackfoot River and installed a water control structure to shunt flow away from a 0.7-mile channelized reach into the natural reach. The area was fenced to exclude cattle. A natural meandering reach of Angus Creek, a tributary to the upper Blackfoot River, was reopened.

Idaho Division of Environmental Quality

Most efforts to improve water quality in the Blackfoot River have been undertaken by the NRCS and Bingham and Caribou Soil Conservation Districts since the mide-1980s(R. Franks, NRCS, personal communication). The projects have concentrated on erosion control from farm fields and reducing impacts of livestock on riparian areas and stream channels.

Work accomplished under the Agricultural Conservation Program (ACP) from 1985 to 1996 includes:

- 10.5 miles of pipeline for water conveyance for livestock and wildlife
- 7 wells to provide water for livestock and wildlife
- 3 spring developments for livestock and wildlife
- 54 troughs for watering livestock and wildlife
- 4 ponds for watering livestock and wildlife
- 700 acres of brush spraying to improve upland livestock and wildlife grazing on rangeland
- 2 miles of cross fencing to improve upland range for livestock and wildlife grazing.

In 1988, 10,500 acres were in the CRP. Enrollment in CRP in 1999 was 11,380 acres. Approximately three miles of cross fence in Sawmill Canyon and on Warbonnet Creek were constructed in 1999 under the Wildlife Habitat Improvement Program (WHIP) to foster proper grazing use on about 5,000 acres of rangeland. On the mainstem Blackfoot River, 200 feet of streambank stabilization using barbs, willow plantings, and rip rap to repair damage caused by flooding was funded under Resource Conservation and Rangeland Development Program (RCRDP) in 1999.

In Bingham County, projects and reduction in dry farming have led to improvements in water quality (S. Engle, NRCS, personal communication). Projects include:

- 48,700 feet of pipeline for water conveyance for livestock and wildlife
- 5 wells to provide water for livestock and wildlife
- 3 spring developments for livestock and wildlife
- 35 troughs for watering livestock and wildlife
- planned grazing system implemented on 27,850 acres

- development of proper grazing use on 28,090 acres
- 6,525 acres of brush management to improve upland livestock and wildlife grazing on rangeland
- 81,800 feet of cross fencing to improve upland range for livestock and wildlife grazing,
- 31,800 feet of streambank fencing built to manage livestock in riparian areas
- 18,000 feet of streambank stabilized by tree revetments
- 600 feet of streambank stabilized by rock rip-rap.

Much of the historic dry cropland has been converted to CRP or pasture and hayland reducing sediment input into subbasin streams. In the early 1980s, there were about 15,869 acres of dry cropland. Presently, 7,362 of those acres are in CRP and 8,179 acres are in pasture or hayland. Estimated erosion rates of dry cropland are 18 tons/acre/year compared to 2 tons/acre/year or less from CRP and pasture/hayland. This nine-fold reduction in erosion rate translates into almost 250,000 tons/year.

The North and Central Bingham Soil Conservation Districts have prioritized several projects to reduce soil erosion in their 5-year plans (North Bingham Soil Conservation District 1998, Central Bingham Soil and Water Conservation District 1998). These projects include reducing wind erosion through wind strip barriers, NO BLO, and fall cropping; introducing and promoting soil conservation technologies and practices (e.g., minimum tillage, mulching, planting grasses and legumes between row crops, cross slope chiseling or subsoiling); and livestock management in riparian areas (e.g., herding, fencing).

Several other entities have also undertaken improvement projects in the Blackfoot River subbasin aimed primarily at reducing sediment input from unstable streambanks. The USFS Caribou National Forest has placed log-revetment structures in Diamond Creek to narrow the stream channel and stabilize cut banks (Heimer *et al.* 1987). The IDFG has also placed tree revetments in the upper Blackfoot River. The USFS Caribou National Forest also built a livestock exclosure on Diamond Creek (Caribou National Forest 1992). The IDFG constructed fish screens on irrigation diversions in the upper Blackfoot River to prevent fish mortality in the itches (Heimer 1984).

Portneuf River Subbasin

Idaho Department of Fish and Game

Sediment is the major pollutant of the Portneuf River and Marsh Creek. Both waters are on Idaho's Section 303(d) list of water quality limited streams. Eroding stream banks contribute significantly to this pollution.

The IDFG and Friends of the Portneuf initiated riparian fencing in the mid-1980s. Fencing began on a two-mile section of the upper Portneuf River upstream of Lava Hot Springs within an area once considered a "blue ribbon" trout stream. The most coveted reach for riparian protection was located on a ranch owned by King Creek Cattle Association. The IDFG constructed an upland stock watering site for the Association and, in return, was given permission to fence the riparian corridor. The fence was built with Section 319 funds obtained by the Friends of the Portneuf.

Upriver from the fishery in the 14-mile channelized reach of the Portneuf River below Chesterfield Reservoir, the NRCS provided State Agricultural Water Quality Project funds to

fence corridors anywhere a landowner would provide 25 percent of the project cost. Most landowners in this reach built corridor fences during the mid-1990s.

In 1994, owners of the Arimo Ranch, located on Marsh Creek, asked for assistance in excluding livestock from its 4-mile long riparian corridor. The IDFG received a Section 319 grant in 1995 for the project. Biologists planted willow posts and constructed bio-engineered structures. The IDFG and NRCS monitor riparian restoration in complete enclosures and riparian pasture sections on the Armio Ranch.

Idaho Division of Environmental Quality

Several programs and projects have been undertaken since the mid-1980s in the Portneuf River subbasin to improve water quality. In addition to the efforts of private individuals and non-profit groups, projects have been undertaken by city, county, state, tribal, and federal governments under several funding programs. Probably the largest program to benefit water quality has been the State Agricultural Water Quality Program (SAWQP). Five watershed areas have benefitted from SAWQP treating about 30,000 acres. As part of the Upper Portneuf River SAWQP project, gradient control structures were built in the Downey Canal to control stream energy and its erosive effects on the canal banks. The NRCS oversees three federal programs to improve water quality in the subbasin.

The number of acres enrolled in CRP in Bannock County increased from 57,000 acres in 1988 to 63,000 acres in 1997 while CRP acres in Caribou County went from 28,557 to 42,589 acres for the same time period. Sign-up of land in CRP is for ten years. Additional efforts have included fencing projects of the Friends of the Portneuf and the IDFG. The only non-agricultural related project has been a Section 319-funded engineered wetlands project by the City of Pocatello to treat a portion (~20-25 percent) of the city's stormwater runoff prior to its entry into the Portneuf River.

Table 38. Subbasin Summary FY 2003 - Funding Proposal Matrix

Project Proposal ID	33001	33002	33003	33004	33008	33010	33011	33013	199201000	199505700
Provincial Team Funding Recommendation	High priority	Recommended action	Recommended action	Recommended action	Recommended action	High priority	High priority	Do not fund	High priority	High priority
Fisheries (from: Statement of Fish and Wildlife Needs, Upper Snake Subbasin Summary)										
Continue to inventory native salmonids in the Upper Snake River Province to determine current status and major factors limiting their distribution and abundance, and based on these findings, develop and implement plans and strategies for recovery where populations are at risk of extirpation.	+			+		+				
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.	+					+				
Compare rates of hybridization and introgression between hatchery produced *O. mykiss* and native populations of Yellowstone cutthroat, redband trout, and westslope cutthroat trout.	+					+				
Develop genetic-DNA markers for redband trout so that the degree of introgression with introduced rainbow trout can be quantified and the degree of variability between and among populations of redband trout can be determined.	+									
Continue coordinated collection of water temperature data throughout the Upper Snake River subbasin.									+	
Minimum instream flow study for winter habitat and trout production in the Snake River below American Falls Reservoir, and a conceptual plan and strategy for providing that winter flow.		+								
Minimum fishery pool study for sustained trout production in American Falls Reservoir and a conceptual plan and strategy for providing that minimum fishery pool.		+								
Minimum instream flow study for winter and late summer habitat and trout production in the Snake River between American Falls Reservoir and Gem State dam, and a conceptual plan and strategy for providing those minimum flows.		+								
Fisheries Habitat (from: existing Goals, Objectives, Strategies, and Recommended Actions, Upper Snake Subbasin Summary)										
Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features and processes necessary to ensure protection and restoration of the aquatic systems.							+		+	
Maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplain, wetlands, up-slope areas, headwater tributaries, and intact refugia. These linkages must provide migration routes to areas critical for fulfilling aquatic species life history requirements.							+			+
Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, bottom configurations, and natural flow regimes.		+			+				+	
Maintain and restore ground water and surface water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the ecosystem, benefiting survival, growth, reproduction, and migration.		+			+				+	

Project Proposal ID	33001	33002	33003	33004	33008	33010	33011	33013	199201000	199505700
Provincial Team Funding Recommendation	High priority	Recommended action	Recommended action	Recommended action	Recommended action	High priority	High priority	Do not fund	High priority	High priority
Maintain and restore the sediment regime sufficient to support the aquatic ecosystem process. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport.		+			+				+	
Maintain and restore ground water and instream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be provided as needed to meet fish management goals.		+			+					
Maintain and restore the species composition and structural diversity of plant communities in riparian zones and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering and flow, appropriate rates of surface erosion, and channel migration and to supply amounts and distributions of large woody debris sufficient to sustain physical complexity and stability.									+	
Mitigation for activities that influence natural flow regimes or hydrology should include following daily and seasonal natural flow patterns.		+			+					
Wildlife (from: Statement of Fish and Wildlife Needs, Upper Snake Subbasin Summary)										
Life history study of the ecology of remnant sage grouse populations in the Blackfoot River and Portneuf River subbasins, including recommendations and strategy for restoring these populations.			+							
Wildl ife Mitigation (from: Efforts Funded by BPA through the Columbia Basin Fish and Wildlife Program and from Goals, Objectives, Strategies, and Recommended Actions, Upper Snake Subbasin Summary)										
Mitigate construction losses for Palisades, Anderson Ranch, Black Canyon and Minidoka hydroelectric projects in the Middle and Upper Snake River Provinces through the Southern Idaho Wildlife Mitigation Program.										+
For long-term losses caused by habitat elimination or degradation, compensation by acquisition and improvement of alternate habitat will be sought rather than monetary restitution. Compensation must be permanent and include funding necessary for annual operations, maintenance, and monitoring if these are required to insure that target goals for fish and wildlife benefits are achieved.										+

These Projects are referenced by ID above:

33001 - Assessment of genetic population structure and risk of introgression and hybridization to native trout in the Mid and Upper Snake Provinces.
33002 - Establish Instream Flow and Reservoir Pool Habitat for Native and Other Trout in the Upper Snake River/American Falls Fragment Area.
33003 - Sage Grouse Distribution and Habitat Use in the Upper Snake River Basin, Blackfoot and Willow Creek Drainages.
33004 - Survival of adfluvial Yellowstone cutthroat trout in the upper Blackfoot River drainage.
33008 - Assessing effects of Columbia River Basin anadromous fish flow management on the aquatic ecology of the Henry's Fork watershed.
330010 - Shoshone-Bannock Tribes Fish Production Program
330011 - Implementing land use for resource and community sustainability at the regional and county level
330013 - Evaluation of Pisces fish protective water intake system.
199201000 - Southern Idaho Wildlife Mitigation – Upper Snake.
199505700 - Habitat Restoration/Enhancement Fort Hall Reservation.

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

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